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NOVEMBER 1972

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MECCANO Magazine

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MAP HOBBY MAGAZINE

ABC

FRONT COVER

Motor Barge *Nutfield* and butty *Raymond* leave Cassiobury Park Bottom Lock, No. 76, on the Grand Union Canal. Picture taken in May 1970, by J. H. Talbot; since then cargo-carrying traffic has virtually ceased on this part of the canal which runs, incidentally, little more than a stone's throw from MM's offices.

NEXT MONTH

December issue includes do-it-yourself enamelling (fine for Christmas presents!), how a small brewery works, and Bailey bridges.

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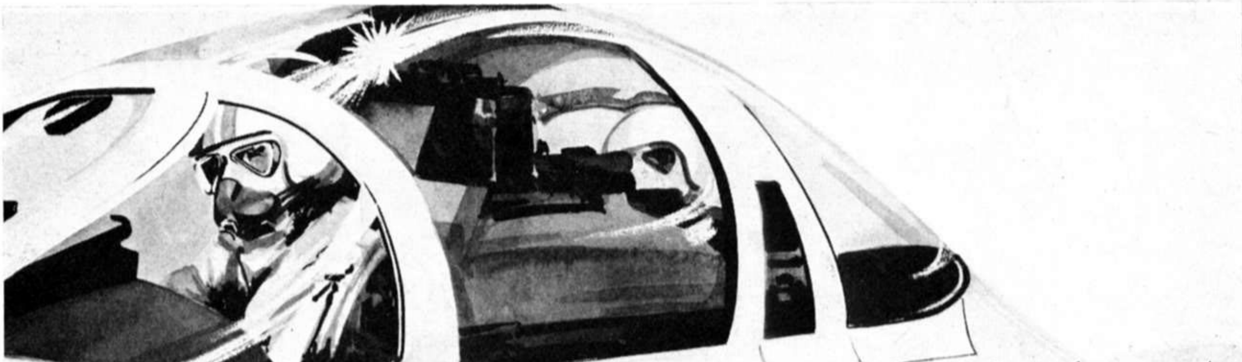

"You have control"...

The smell of leather and oil mingled with warm paint; a half-deadened scream of two GEJ79 jets through a closed glass canopy; a blow on the chest that almost kicks the air out of you; the whole sky rushing to meet you – your eyes are pushed into your skull and your cheeks are being torn from your face – a dull pain is in your neck, chest and stomach. Then calm.

The sun glints on the blue sea. The carrier is far below; planes look like toys on its deck. Your air speed indicator reads 500 knots, and is swiftly rising. Two other planes on your sortie join you, flying wing-tip to wing-tip to the target firing area. Suddenly you're there. On your left, one of the Phantoms rolls and sweeps away in a vertical dive. Now a tiny dart, it straightens out and two dull red flashes burst from the mud as its first rockets explode – it whips upwards, curving round, almost lazily, on its back, while the aircraft on your right goes in.

Then your turn. The landscape tips on its side, as the Mach Indicator needle flickers towards Mach 1. Your head feels heavy and you can hardly move your hands. Your face mask is suffocating and the pure oxygen you are breathing no longer seems to keep you as alert.

Emptiness is in your stomach as you flatten out over the target; trees flash past the wings; you glimpse the target marker burning on the edge of the water. It's in your sights! You press the red button and pull the stick hard back. Below, the marker is almost blotted out by a cloud of flame and smoke.

The second run, and as you pull out through the smoke, you see the napalm bomb burst in a flash of bright flame reaching out across 250 ft., and swell like a huge tangerine until the thick, black smoke shuts it off, and you are climbing high and away.

You have time now to see one of the other Phantoms dive again, streaking in low and fast, with the Vulcan Gatling Gun; nicknamed 'Puff the Magic Dragon'; pouring an almost solid wedge of exploding shells into the burning target. For a few minutes you circle high above, whilst the damage is inspected. You find yourself sweating. You're slightly lightheaded, through pure oxygen and excitement and your ears pop again. The radio crackles, "Ground control reporting, target totally destroyed"

You turn for home, aiming to land on an area little larger than a tennis court, with catch-wires trailing across the deck to grab a hook under the tail. The tennis court is also moving; up and down, and from side to side. Your landing must be calculated within inches and less than 10 m.p.h. If you miss all four wires, just flick a switch on the control stick and the jet's after-burner should, hopefully, hurl the plane away from the deck at a 45-degree angle.

You catch the first wire at 140 mph, and something is slammed across your chest, as you stop in less than 80 ft. You are helped, shaking, but exhilarated, from your seat.

You have just flown a practice firing sortie in a US Navy Phantom F-4J based on USS Saratoga. It sounds exciting, but it can be even more than that, it can be frightening. The Phantom, probably the finest interceptor/ground attack aircraft yet devised, can fly at 1600 mph and 40,000 ft.; can deliver all modern weapons and is capable of carrying up to 8 tons of armament. A fully loaded Phantom can climb 4 miles high in 48 seconds, yet it can fly easily at speeds which make safe carrier or short strip landings possible. A Phantom unleashes a total thrust of 34,000 pounds from its 2 J79-GE10 jet engines and uses sufficient fuel in 60 seconds at full throttle to drive an average American car across America.

Revell's large 1/32 scale model of the Phantom-4J is 21¾" long. It features a fully detailed J79 after-burning engine, detailed cockpit with dual hinged canopies, a completely detailed cockpit interior lay out, and a detachable nose-cone which reveals the radar scanning dish. The model also has folding wings, two crew members in authentic flying suits, 4 Sparrow missiles, movable wheels and official US Navy markings.

You may never experience the flight that we have described, but you can still experience the thrill of making up this superb Revell kit of an aircraft which has been called "The World's Finest Operational Fighter". You don't have to follow the kit instructions either. Perhaps you would prefer to make the British Phantom Variant with "Spey" engines by scratch building; or the "Blue Angels" model – even the Daily Mail Trans-atlantic Race winner. Remember – "you have control!"

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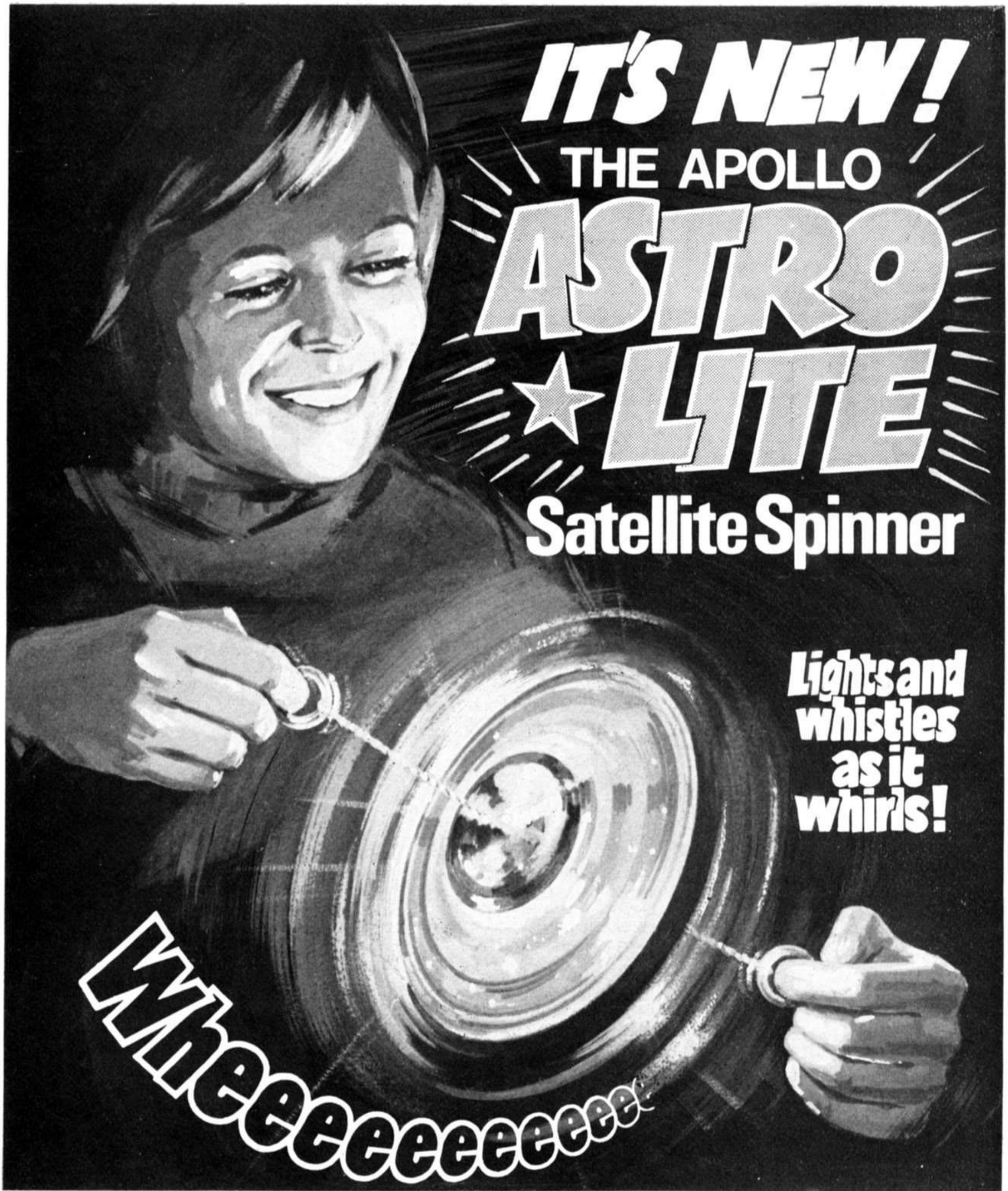

Round and round it whirls! As it whirls round it makes a whistling sound—and lights up too! See how fast it goes — see how bright it glows! The sparkling craze that's sweeping America comes to Britain! Go crazy—take a spin round to your local toyshop now—for Astro Lite. Made by Meccano.


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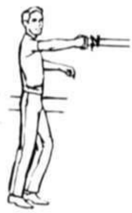

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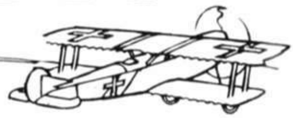

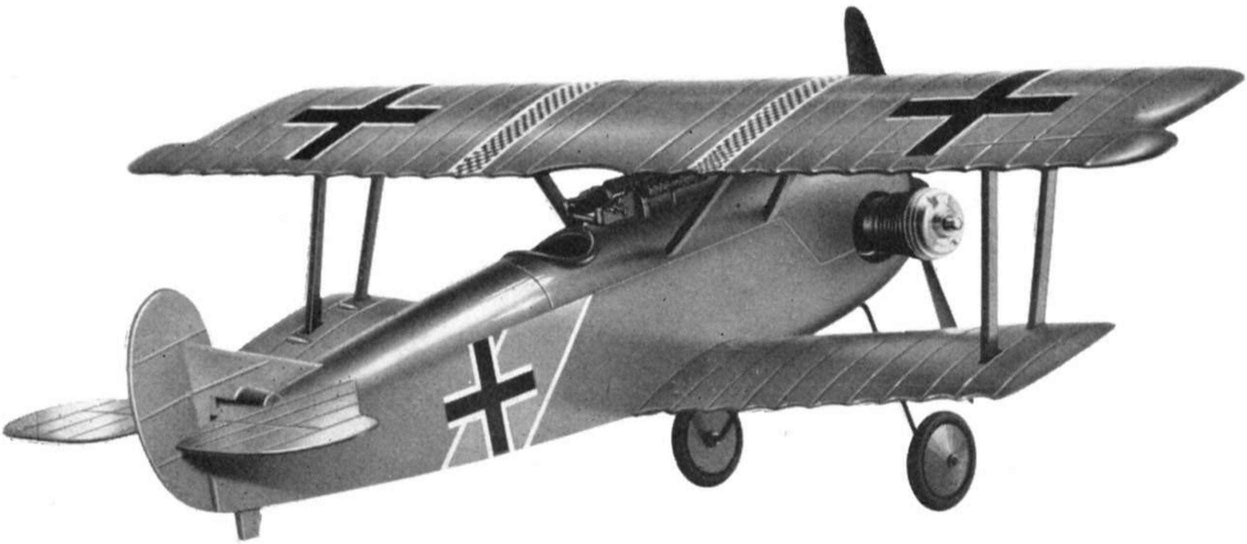

Pride of the von Richthofen Flying Circus in World War 1, the Fokker DV11 is reproduced as a superb flying model. It features:

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ON THE EDITOR'S DESK

In this issue is a report on a highly successful Meccano exhibition held at the beginning of September, which particularly mentions the lively interest shown by the public in the models on show. It seems an appropriate time to remind readers that the 42nd Model Engineer Exhibition will be taking place early next year (January 2–13) and that there is a Meccano competition class. Last year this was poorly supported and people said that they didn't realise that there was a category for such models. Entry forms are now available, so what about showing the thousands of visitors to the "M.E." just what can be done in Meccano?

Trees

We mentioned the subject of planting trees on this page some months ago, and we are pleased to note that 1973 has been designated National Tree Planting Year, and that the Government have a committee to publicise the idea. A. P. Major, who contributes the interesting article on how semi-mature trees are moved around in this issue, tells us that the Sand and Gravel Association is already running a scheme for its members to plant trees to hide their workings, and the National Farmers Union is asking all its members to plant at least one tree somewhere, to increase standing timber and stop the decline of trees in some areas.

An example of what is happening all over is demonstrated to us each day as we drive to work. One of the roads we use has been straightened and widened, and this has cost at least a couple of dozen fine mature trees as well as several hundred yards of splendid hedgerow. So far a dozen young trees have been planted along one stretch, and it looks probable that a hedge will be allowed to develop beside the new fencing. The road has always been remarkable for the variety of wildlife encountered along it, and it is to be hoped that the balance will be restored in the next year or two as new growth becomes established and offers homes for the various species.

Blue Bear

The remarkable vehicle in the picture is the "Caravan of the Blue Bear" and is used to deliver Butagaz containers to caravan sites and domestic consumers. It was photographed by John Coulson while on a visit to Northern France and is a typical and amusing example of French advertising gimmickry; it appears to be built on a rear-engined Renault chassis.

Exhibitions

South Manchester Models Group will be holding their 12th exhibition Friday–Sunday November 10–12 at St. Albans, Church Hall, Lindsell Road, Broadheath, Altrincham, Cheshire. Included will be 3½ in. and 5 in. live steam passenger-hauling, OO, OO3 and N gauge railway layouts, stationary steam engines, traction engines, R/C aircraft, boats, and land vehicles, and a film show. Many of the exhibits will be working. Times are Friday 1800–2130, Saturday 1000–2100, Sunday 1100–2030. Refreshments, car parking etc. Adults 15p, children and o.a.p. 5p.

On November 18/19 (Saturday 1000–2000, Sunday 1000–1800) Stafford Railway Circle will hold their annual exhibition in the Borough Hall, Eastgate Street, Stafford. Working layouts in almost all scales from N to L.G.B. narrow gauge, including O gauge live steam and a display of Hornby tinplate equipment. Adults 20p, children 10p.

Car Colours

A detailed analysis by the Austin/Morris Group reveals surprising changes in customers' choice of colour for new cars. On the whole small cars are getting brighter and larger ones noticeably darker. Joint favourites out of a range of 13 colours are Glacier White and Harvest Gold, with Teal Blue in third place, although sportier models such as the GT versions sold best in Bronze Yellow or Blaze (a vivid orange). Strangely, perhaps, numbers of MGBs etc. sold were equal in each of the five colours mentioned.

Surveys into colours have an obvious application in sales promotions—if the wrong colours are produced, sales figures can fall. There is also the aspect of purchase of paint—Austin Morris use over two million gallons a year and with the price of a gallon of paint they wouldn't want to get stuck with a few thousand gallons of an unpopular colour!

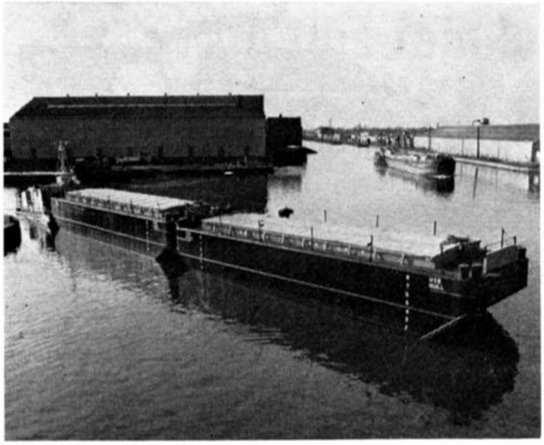
Ship Model Competition

The Trustees of the National Maritime Museum are to hold a biennial competition for ship model makers beginning in 1975. This is to stimulate interest in ship models, make good use of the Museum's ship plans service, and help to encourage even higher standards of ship modelling.

A plaque will be awarded in each of two sections, one for sailing vessels, the other for powered vessels. Medals and certificates will also be awarded, and there will be a special class for junior model makers. The Trustees will reserve the right not to make an award if a sufficiently high standard is not reached.

It is also intended that exhibitions of winning and other high standard entries should be held each time the awards are made.

Full details of the classes and conditions are available on request from the Head of the Ships Department, National Maritime Museum, Romney Road, Greenwich, SE10 9NF.



Bigger Waterways for Britain?

New developments may bring a change in policy towards our inland water routes

By J. H. Talbot

THE waterway era in Britain ended in 1894 with the opening of the Manchester Ship Canal. It had been an era of optimism, enterprise and industry, when over 4,000 miles of canals and river navigations had been built to serve the needs of the Industrial Revolution. It is probably true to say that no other form of transport has ever had such a profound effect on life in Britain. The coming of rail and air transport has established a more flexible and speedy service, but it should be realised that before the canal era there was *no* method of conveying goods inland in bulk.

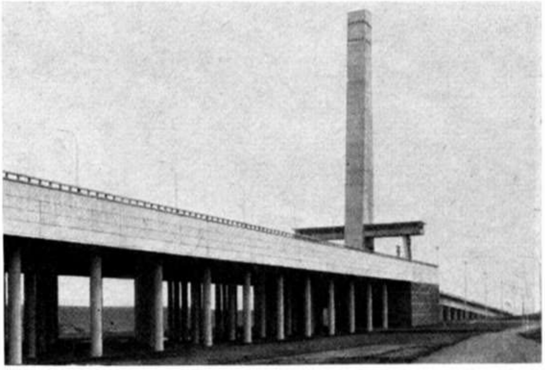
Even as the Ship Canal was nearing completion, most of the British canal network had already begun to decline. The canals had been built piecemeal, to serve essentially local needs, and it was more by accident than design that a national waterways network had evolved. There were differences in gauge, so that boats from one canal could not enter another. There was no clearing house for tolls, so that payment for the passage of a boat over waterways of different ownership was made unnecessarily complicated. Above all, the railways had come. They gave an impression of urgency, which contrasted with the leisurely movement of a canal boat, and often provided a superior service. They quickly made inroads into the canal companies' profits. However, many waterways refused to die; they could only be made subservient to the steam train if the railway companies bought them up and closed them.

Some independent waterways successfully fought the railways. These were mainly river navigations, which had larger locks and could carry correspondingly larger vessels. They were better equipped to fight a price-cutting war—a war which quickly brought many of the narrow canals, with their 7 ft. wide locks and 30-ton boats, to their knees. The use of water transport has declined steadily until in 1970 the traffic carried on the nationalised system, administered by the British Waterways Board, was only 6.1 million tons (or 79.3 million ton-miles). This is less than half of one per cent of the nation's total freight traffic. However, the figure does not include the Manchester Canal or other privately-owned routes.

The waterways of Europe have fared better. In France, for example, the development of water transport was under way a century before the movement began in Britain. The French system, amounting to nearly 5000 miles, was built largely at Government initiative as part of a coherent transport plan. At least one major canal, the 195-mile Marne-Rhine route, was built at the same time as what would have been, in Britain, a competing railway. The dimensions of craft were standardised as part of the Freycinet modernisation programme established in 1879, so that almost the entire system is capable of carrying peniches, which are self-powered barges of 350 tons capacity. The annual tonnage carried is currently about 108 million and has increased substantially during the past decade. France's waterways are about to receive another fillip, with the completion in 1976 of the Rhone navigation. This will complete a 1350-ton barge route from the North Sea to the Mediterranean. Over half of the route will be comprised of canal and 12 locks will overcome the 520 feet fall from Lyons to Marseilles.

There are over 12,000 miles of commercial waterways in the Common Market countries and many improvement and enlargement schemes are in progress. Of course, the Rhine and other major rivers form the heart of the system and this fact is often used to explain the lack of canal development in Britain. However, even this great waterway is dependent upon huge capital expenditure and a substantial maintenance programme; the level of the river has fallen by 20 feet in the last century, while the task of canalising the Rhine between Strasbourg and Basle, which began in 1932, has only just been completed. Among the many other projects in hand are the enlargement of the Canal du Rhone au Rhin and the entirely new Elbe Lateral Canal, 71 miles long. In Belgium the Charleroi-Brussels Canal has been enlarged to 1350-ton standard. This necessitated the construction of the 1556-yard Ronquieres inclined plane, eliminating 28 locks and the 1149-yards Goudarville Tunnel. Three further planes of this type are to be built in France and Germany and two in the U.S.S.R., while a 350-ton plane recently built on the Canal de la Marne au Rhin is to be duplicated.

Top, New British Waterways push-tug *Freight Pioneer* with two BACAT-type barges, on trial on the Aire and Calder Navigation at Goole. *(Photo British Waterways Board)*
Left, tug and barges on the 17-mile Gloucester and Sharpness Canal, one of the few modern waterways in Britain capable of handling 1,000-ton barges.



The upper level of the canal and inclined plane at Ronquieres, Belgium. *(Photo Hainaut-Tourisme)*

Will any new canals be built in Britain? Twenty years ago such a question would have been greeted with ridicule; it seemed that the only viable means of transport in the future would be the motor lorry. As the years have passed, however, there has been increasing public dissatisfaction with the ubiquitous motor vehicle in general and the big, noisy lorry in particular. The Civic Trust has led a campaign to control the more damaging aspects of lorry transport and its comprehensive report, "Heavy Lorries", is the first major publication to have placed the matter in perspective. It is generally accepted that the flexibility of the road vehicle is needed for the carriage of food and most of the products of light industry. However, there are literally hundreds of transport contracts in force at present that call for the conveyance of bulk materials such as coal, ores, steelworks slag and building products in a never-ending stream. In some areas coal for power stations is conveyed by 32-ton lorries running at ten-minute intervals night and day. Clearly, some rationalisation is needed. The old adage that time is money does not apply to all industries, for if it did we should have to find a much more rapid means of conveying water from the reservoir to the tap!

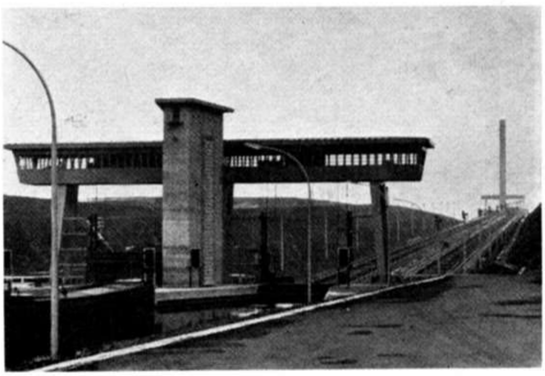
Britain's forthcoming entry to the European Economic Community has sparked off renewed interest in water transport. In general, the Community has adopted a balanced policy in which road vehicles are used for short-haul and perishable work, the railways provide an express goods service, and canal craft carrying bulky and heavy cargoes. The incompatibility of British and European transport policies has been highlighted by the pressure which has been brought to bear upon the Department of the Environment by continental shipping interests.

Since the turn of the century several potentially important canal development schemes have been suggested. In 1909 a Royal Commission recommended enlargement of "The Canals of the Cross" i.e. those connecting the Humber, Mersey, Severn and Thames. Similar recommendations were made by a Royal Commission of 1930. No action was taken as a direct result of either of these reports, but parts of the Trent have since been dredged and locks enlarged, so that the waterway now carries about 800,000 tons a year. In the mid-1930's certain locks were enlarged on the Grand Union Canal and many miles of bank were piled, but the dredging and bridge reconstruction works needed in order to accommodate 100-ton craft were never carried out. In 1958 the Bowes Committee advised improvement of the Grand Union to 90-ton standard, but again no action was taken. By this time the state of the canal that had once been Britain's busiest was such that pairs of narrowboats (see cover) capable of carrying 55-65 tons could only load to 48-50 tons. Now even this traffic has virtually disappeared.

The most notable plan for the future of British canals was that devised by the late Mr. J. F. Pownall. This was based upon researches indicating that if was possible to build a canal *on one level* to link most of the major industrial centres and ports of Britain. To eliminate the need for locks the bed would follow the 310-feet contour. Vertical lifts or inclined planes, similar to that subsequently built at Ronquieres, would be built where connections were made to existing river navigations and at certain ports. The Grand Contour Canal would carry 1350-ton barges and would also become the country's primary water distribution network, a water "grid" bringing supplies from the well-endowed North and West to the dry South and East. An abridged account of the plan appeared in "New Waterways", published by the Inland Waterways Association in 1965, at which time costs for the programme, to be executed in two phases, were estimated at £690 million. There is no doubt that such elaborate and imaginative schemes are completely at odds with present government thinking, but the Grand Contour Canal is by no means as crazy as it at first appears, for an even more ambitous scheme is being surveyed in the U.S.A. at this moment.

If inland waterways ever again assume an important role in British transport then the biggest stimulus will have been the new barge-carrying ships. New patterns in international trade rarely materialise quickly, but the LASH, BACAT and Seabee vessels have developed from artist's impressions to hardware with startling rapidity. The first BACAT (Barge Aboard Catamaran) vessel will enter service in 1973 and will carry eighteen 100-ton barges. 57 barges have been ordered and nine are already in service on the Yorkshire waterways. When unloaded from the mother ship up to nine of these barges can be push-towed simultaneously by a special tug.

Fifteen LASH (Lighter Aboard Ship) mother vessels will be operating by the end of 1972 and a further seven will be completed during 1973-4. Each of the vessels now operating carries 73 barges of 435 tons capacity each and a total of 2,300 barges are either in service or under construction. This American venture is already being operated succesfully by Central Gulf Lines Inc. on a fortnightly service between New Orleans and Rotterdam. LASH barges have traded on the Rhine to Basle and on the Dortmund-Ems Canal to Dortmund and there are small but regular shipments of woodpulp to paper mills



The Ronquieres plane from the lower level, with a peniche (left) preparing to ascend. *(Photo Hainault-Tourisme)*

on the Medway, for which the mother ships anchor at Sheerness.

The first of three Seabee ships, the *Doctor Lykes* was completed earlier this year to enter service at the end of May on the Gulf-Rhine rout . The vessel carries 38 barges of 850 tons capacity and in the U.K. these will be handled at the Victoria Deepwater Terminal in the Thames estuary. Initially, Seabee mother ships will call at 30-day intervals, but it is envisaged that the visits will eventually be at 10-day frequency.

The main benefit of the barge-carrying ship is that there is no requirement for port installation of any kind. Instead the barges are unloaded by cranes on board the mother ship and are then moved by tug along rivers and canals to their final destination. Given a regular service the barges are particularly suited to bulk cargoes, such as steel, timber, ores and wheat, which are to be supplied in a steady stream. However, their potential in Britain is limited at present because we have very few waterways big enough or in good enough condition to receive them. There will still be a costly and unnecessary transhipment to road or rail before the cargo reaches its destination.

The first major waterway development is likely to be the enlargement of the Sheffield and South Yorkshire Navigation. The original plans for this work were drawn up eight years ago and a detailed engineering feasibility study has been prepared by the British Waterways Board. The Board estimates that for £2 million the navigation works could be modified to enable 700-ton barges to travel from the Humber to Mexborough, near Doncaster, while 400-ton vessels could reach Rotherham. The waterway currently carries a million tons a year in 90-ton

Barges at an oil terminal on the River Severn above Diglis Locks, Worcester.

craft. The cost of thus improving over 35 miles of canal compares favourably with motorway construction at a minimum cost of £1 million per mile.

Mr. Harry Grafton, British Waterways' freight manager, has put forward a scheme for enlargement of the Grand Union Canal from the Thames at Brentford to either Watford or Berkhamsted. The estimated cost of £2½ million would include a container transhipment depot. The project would have immense social benefits as it could result in a drastic reduction in the amount of heavy road traffic through the greater London area, as many lorries proceeding from the M.1. would no longer need to enter the capital. As yet detailed plans have not been presented to the Department of the Environment, since the British Waterways Board is at present examining the commercial possibilities of the entire London canal system.

There are nearly 90 miles of canal in London, serving many of the main industrial areas. In particular the Paddington Branch of the Grand Union Canal, with its through connection via the Regent's Canal to the Thames at Limehouse, is very little used. The waterway has only twelve locks and is, by British standards, wide, clear and deep. There are literally hundreds of factories on its banks, many with their own private docks, and it forms a direct and unobstructed route for 100-ton barges conveying export cargoes to downriver docks. It could be greatly increased in capacity both simply and cheaply, the only significant obstacles being tunnels at Maida Hill and Islington. Long stretches of the canal could be improved without taking extra land, while the descent from Chalk Farm to Limehouse, along which most of the engineering work would be needed, is partly bounded by semi-derelict land which will soon be re-developed. The opportunity to make a sizeable dent in London's most intractable traffic problem– docks traffic– may soon disappear!

It has been suggested that the proposed new London docks on the Maplin Sands, at the mouth of the Thames, will make London a trading rival of the great Europoort of Rotterdam. However, the transport problems this will create appear to have received little consideration. Less than 10% of the goods passing through Rotterdam are conveyed by road and rail, but 250,000 barges a year visit the port. There are two alternatives open to the planners: either the industrial plants served by the ships will have to be concentrated around the dock area, duplicating the environmental wasteland that surrounds Rotterdam, or suitable arrangements will have to be made for onward transmission. If the latter course is adopted what transport method will be used? Not, one hopes, lorries!

A year ago a parliamentary question recieved the reply that the Goverment had no intention of spending large sums of money on waterway development. In March of this year a similar question elicited the guarded, but slightly more hopeful, reply that schemes that were justifiable economically might receive favourable consideration. However, the canals of Britain, wrested from the suffocating influence of the railways and united into a coherent system for a bare twenty years, are to be chopped up and divided between the ten Regional Water Authorities that will be set up when the water supply industry is nationalised in 1974. It is difficult to see that any benefit, either recreational or commercial, can result from this short-sighted butchery of an already weak network. The next two or three years will be critical.

A train of barges passing through London on the River Thames.

Mechanised Tree-Planting

1973 will be National Tree-planting year. Here is one way of planting big ones.

By A. P. Major

In the past, after a mature or old tree had to be felled, probably because it was diseased and dangerous or had grown too large, a young sapling was planted to replace it. But unavoidably time had to pass before the latter would become established and approach the size of the tree it replaced. If a tree was felled in a row of trees being used as a screen, this created an unsightly gap and the effect was spoiled. Similarly, if young trees were planted to hide an ugly view, a sewage works, an industrial works, etc., there was a time lag before the trees grew high enough for their branches and foliage to act as cover. Now, however, the wait for the trees to grow in size is unnecesary.

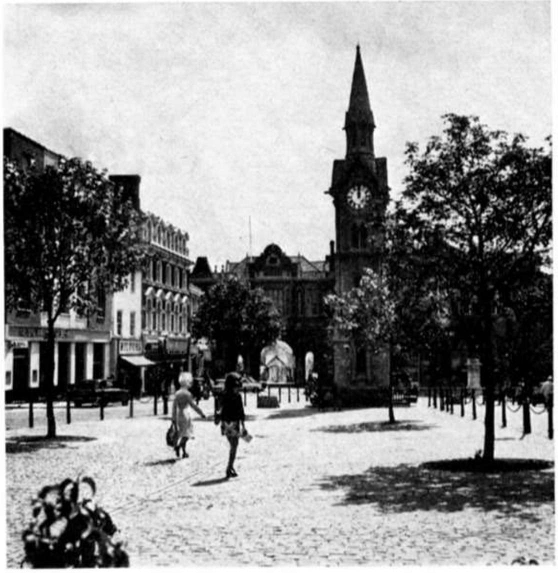
There are several firms that are in business to supply semi-mature trees for instant screens or for other purposes. They undertake anything from one tree for a private garden to hundreds of trees for landscaping new housing estates, city centres, motorways, shopping centres, power stations, airport approaches, reclaiming ex-industrial sites, etc. In addition to supplying trees from their own woodland reserves, some of the firms will move a tree from one site to another in a large garden or anywhere similar, such as a different area of an estate, if the tree is valuable but in the way of a building or other development, or just needed elsewhere. They also thin-out trees maturing in nurseries, woodlands, estates, parks and orchards. Instead of the trees having to be felled, as in the past, to create space, they can now be lifted out and redeployed elsewhere to reach complete maturity.

The customer requiring semi-mature trees for a particular site can visit one of the firms' regional reserves of selected and prepared trees and choose them. Species available include alder, ash, maple, larch, birch, beech, cherry, lime, holly, scots pine, plane, oak, willow, sycamore, to name a few. These may range in size from 12 feet to 40 feet in height, with a trunk diameter of 2½ to 14 inches. Alternatively, the firm's representative can call to visit the site and advise the most suitable tree species to plant considering the type of soil, exposed or sheltered site vantage, light, trunk diameter and foliage density trees can grow, and how many trees the site will adequately support.

To transplant larger trees over a considerable distance one firm, Civic Trees Ltd., use the Newman lifting frame and tree mover method. The soil is removed around the tree, according to the British Standards Institute recommendation B.S. 4043, so that a sufficient root-ball diameter has an undisturbed fibrous root-system. By this method a tree with a 7 foot root-ball can be transported.

The root-ball is wrapped in hessian, then bound with straps (car safety belting) which are part of the lifting frame. This frame has the advantage that downward pressure on the top surface of the root-ball is even and the straps produce an even upwards pull from the base chain, so the ball retains its density and shape and does not disintegrate. Even light soils, such as Bagshot sand,

Top, Aylesbury's market square, made a pedestrian precinct and planted with semi-mature Norway maples brought from Winchester by Civic Trees Ltd. An example of a town centre transformation in a matter of a few months. Right, 20 ft. beeches being removed by a tree spade machine; note the conical digging blades interlocked to hold the root-ball.

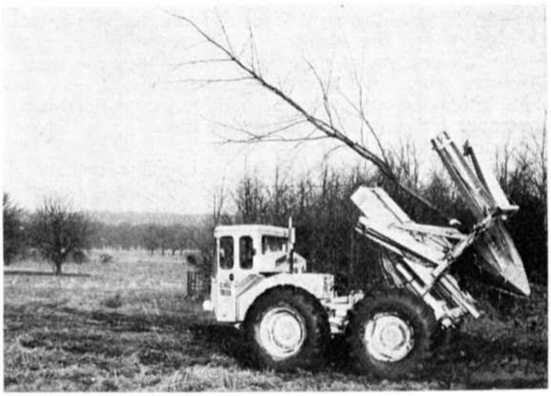


will travel 50 miles on conventional transport without rupture if wrapped and supported by this method.

One of the longest hauls for large trees was the taking of 35 foot trees from St. Albans to Huddersfield for a new hospital. Usually it is hoped to find the trees for transportation within 100 miles of their destination. Trees have been moved in excess of 50 feet in height and 7 tons in weight, using the largest Newman tree mover, the "Major". Two beech trees over 50 feet in height were transplanted in Hampstead and poplars over 60 feet in height were moved in Nottinghamshire recently.

When moving trees in large numbers over long distances is undertaken, the cost for transplanting can be as low as £2 per tree, which includes transportation and unloading at the site. Exceptions to this are where problems are met with lifting. These vary according to species. The deep rooted species, such as horse chestnut, acacia, oak and walnut, particularly on light soils, must be carefully wrapped and strapped in order to maintain the fragile root-ball.

In some instances where trees are transplanted into newly laid out areas, such as civic centres, market squares and similar ornamental sites on estates, underground guying is also done. Steel stakes are driven into either side of the hole to take the root-ball. From these straining wires are brought up and over boards placed on



A Newman Civic tree mover loading a 2-ton beech at Epping, showing the tree rising and the root-ball wrapped in the special frame. Power is provided by the winch of the towing truck. Right shows the same tree loaded, with the head tied for transportation to its chosen site.

the root-ball to stop the straining wires cutting into it. Tension is then applied over the boards by using a tightened turnbuckle.

For lifting and transporting trees over a shorter distance the hydraulic, fully mechanised, tractor-mounted tree spade was developed in the U.S.A. and has been introduced into Britain. Its main feature is the four digging blades that dig around the tree base, while the spade stands on one position, which also interlock to retain the entire conical root-ball of the tree to prevent this disintegrating. The trees can be root-pruned if they are eventually intended to be moved to a new site, but the tree spade will dig out and transplant trees with unpruned roots just as efficiently. The root-ball shape and condition when planted is photographed by one of tree planting gang and this is placed in the records of the tree's history kept by the firm. Using this method trees 20 feet high, 12 inches in trunk girth, with a root-ball 3½ feet in diameter and about 4 feet deep can be transported over short distances, up to half a mile, at a cost of about £6 per tree. The machine is also used to prepare the conical holes, prior to planting, into which, when placed therein, the tree's conical root-ball fits exactly. This is a big advantage because there is less disturbance of the tree's root system and this allows it to re-establish itself quicker on its new site. At present there is a 94% success rate.

As part of their service some firms also provide after-care maintenance and insurance of their trees from their own reserves against failure over one, two or three years. For a low extra charge the maintenance includes fortnightly visits to the trees to ensure they are not drying out, watering, mulching, superphosphate feeding and to check the guying and tensioning stakes for firmness and see that they are not causing any damage to the trees. If there is any risk of damage from deer, rabbits or sheep, when the trees are planted in parks or grazing areas, the trees are protected by wooden guards.

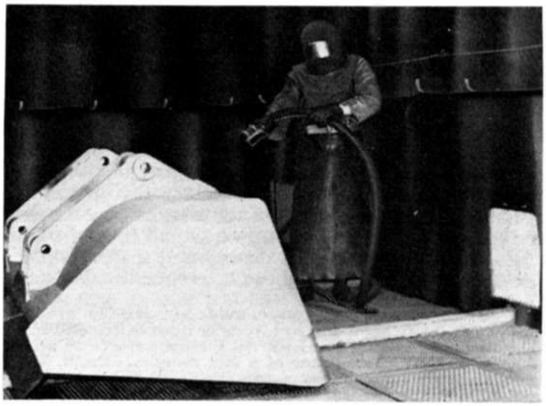
The author acknowledges with thanks the generous assistance of Mr. C. J. Newman of Civic Trees (Tree Movers) Ltd., Great Missenden, Bucks., for the provision of actual information and photographs for this article.

SAND (*continued from opposite page*)

The cleaning of large and historic buildings and monuments, started by councils and other public bodies, is now being done on an ever-increasing scale by individuals, property developers, and companies. This has given the blasting boys a great deal of encouragement and companies like Guysons and Vokes have seen the potential that this technique has that is still untapped. Every day new uses for the technique are discovered by the teams. They recently reported solving a very sticky problem—how to remove many unwanted white lines from tarred road surface that was going into a one-way system. Sand has since been used to remove old unwanted marks on car parks and concrete runways.

Farm buildings, particularly poultry sheds, have a perpetual disease problem. Sand blasting interior walls and posts etc. has proved to be an efficient way of controlling disease. Likewise the treatment improves the appearance of old asbestos roofs by taking out the green algae that gets into the cracks. Sand cleans up swimming pools, shifting seaweed or lichens as readily as it removes rust on giant girders which are due for painting. In fact the sand blasting not only removes rust, but the sand pits the metal ever so slightly to provide a 'key' for the paint to adhere to.

Whether it is to restore the ravages of time wrought on a veteran steam roller for museum display, to clean up earth-moving equipment, or pipes corroded by chemical action, one thing is sure—the sands of the blasters are turning the tide of our blackened public buildings. And finding many other profitable jobs to do at the same time.



Sand Turns the Tide

of time and grime. By Richard Lee

Right, one operator, one week to clean this Georgian hotel. Below, rust and corrosion is rapidly removed, asbestos roofing cleaned, and chemical deposits removed. Opposite, a tractor shovel in a cleaning room where grit is reclaimed and recirculated

ALTHOUGH spring is traditionally associated with those annual household clean-up jobs, last Spring heralded a big spurt in the bigger clean-up jobs, some of which have needed doing for decades—even centuries. And it's all thanks to sand! Plus the way that cleaning by sand blasting has gone portable, so that the technique can be operated by one man anywhere—out in the country, on top of a roof, or in the confined spaces of a room full of equipment.

Like so many good ideas, sand-blasting is essentially extremely simple. The operator simply directs a jet of air from a compressor on to the area that he wants to clean. At the same time the jet of air is supplied with a drip-feed of sand or grit particles. These particles, when blasted on to, say, a stone surface, scrape off centuries of smoke-grime in seconds.

The operator, of course, wears a safety helmet inside a sand-proof hood which has a safety-glass visor for him to see through. A fresh air supply is fed into his hood via a hose which is anchored to his belt; a regulator valve at this point keeps him fed with a constant volume of air at low pressure.

The force of the grit particles, borne on air jetting out under 100 psi pressure, will remove old rust scale from corroded machinery, paints and undercoats, and even barnacles off the bottom of ship's hulls.

The technical details of a sand blasting set are that the output, size of grit, and amount of air needed, all depend on the size of the nozzle used by the blaster. Nozzles vary from 3 mm. to 12 mm. in diameter and will use a graded sand or grit which is up to one quarter the diameter of the nozzle bore. Not only sand or grit are used as blasting media; many other materials give specialised finishes or have specialised blast cleaning functions. Typical of other media are glass beads, aluminium oxide, plumstones, walnut, iron grit, and so on.

Working at pressures from 50–100 psi, the above range of nozzle sizes need a compressed air supply which can provide 11 cfm to 338 cfm. The air demand rises sharply as the blasting bore gets bigger. One of the problems in nozzle manufacture was to make nozzles that wouldn't get worn away by the action of the sand spurting from them. So nozzle inserts of hard-wearing boron carbide are made which can be fitted in and easily replaced when they become too worn and oversized.

In the same way the sand consumption depends upon nozzle size and pressure used. A heavy ship-cleaning job uses sand at about five litres per minute. Where blasting takes place indoors, the sand can be reclaimed and used over and over again. Industry uses sand blasting processes in factories to remove 'flash' (excess material) from moulded plastics and cast metal components. Many polishing operations are done by blasting, including the cleaning of the moulds and dies as well as the parts of the manufactured article.

But the real blast-off for the blast cleaners has really come out of doors. Sand blasting has proved to be the best method of restoring and cleaning our public buildings that are now shining so splendidly in our Smokeless Zone cities. *(continued opposite)*

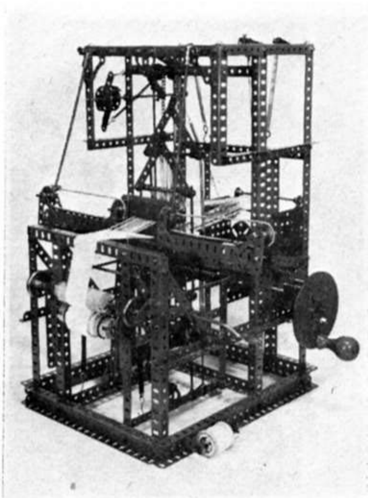
MECCANO EXHIBITION

Henley-on-Thames Town Hall

THIS WAS A SMASH HIT! It is probably true to say that in the entire 72 years of Meccano history there has never been such an ambitious and entertaining display of first-class Meccano models as that staged at Henley-on-Thames Town Hall on Saturday, September 2, last. The models, built by enthusiasts of all ages, covered most of the exhibition space in the upper main chamber of the Town Hall. Blessed by fine weather, enthusiasts merged from routes North, South, East and West of Henley to be greeted by a giant banner over the façade of the building leaving nobody in doubt that MECCANO was really on the map!

Although organised and sponsored by MW Models - Henley's Meccano-specialising model shop - and supported by Meccano (1971) Ltd., this was really a Meccanoman's show. No fewer than 3,000 members of the public, many of them making round trips of more than 200 miles, visited the exhibition. A modest entrance fee was charged to defray expenses of hiring the Town Hall for two days (one for extensive preparation), but any enthusiast turning up with a Meccano model was immediately given free admission and a welcome for his efforts.

Many well-known Meccano personalities were present representing both the "Mecca" of Binns Road, Liverpool and the now well-established Meccano Clubs of Southern and Midland counties. Members of the Midlands Meccano Guild were there in strength with their models and historical exhibits, together with the newly-centred Holy Trinity Meccano Club and its Secretary Tony Homden of Hildenborough, Kent. Dennis Higginson, Leader of the Stevenage Meccano Club, brought a minibus full of his young members complete with a marvellous range of eye-catching models built by the youngsters and some advanced constructions by Dennis himself. Long before mid-day, visitors were thronging the Town Hall, spell-bound by the fascinating range of models which served as a real eye-opener to many of them who were quite staggered by the sophistication and complexity of the models. By contrast, humorous and simplicity models caught the public's attention and the general atmosphere was one of great enthusiasm, delight and enquiry.



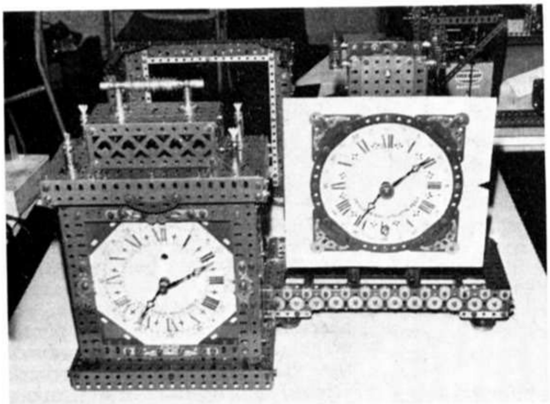
At 3 p.m. at the invitation of the organisers the official opening ceremony was performed by Mr. Bert Love, that well-known writer on Meccano topics and contributor to this magazine. He expressed his warm thanks to the public for their excellent support and the modellers in particular who had spent so much time and effort in preparing and transporting their models to make this the finest Meccano exhibition on record. It was quite obvious from the overwhelming enthusiasm of the visitors that their efforts were very much worthwhile. Bert then introduced Mr. Doug. McHard, Marketing Manager of Meccano (1971) Ltd., who welcomed the visitors and told them of the developments of Meccano products which were under constant review and drew attention to the No. 2 Clock Kit which was on display and constituted a weight-driven striking clock of very pleasing presentation. He also expressed his admiration for the outstanding quality of the enormous number of models on show – a sentiment which was echoed by all and not least by Mr. Geoff Wright, exhibition sponsor and owner of MW Models.

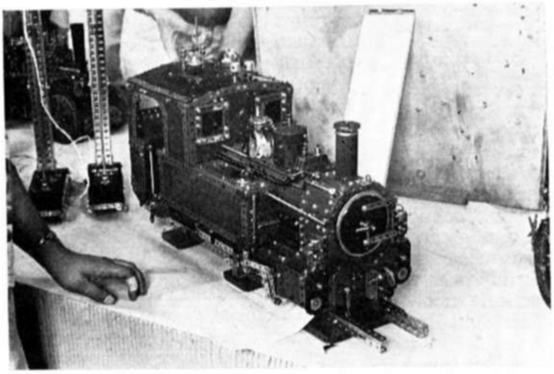
Any attempt to do full justice to the wonderful range of models on display would require a full volume of Meccano Magazines so it is only possible to make a brief mention of some of them in this report.

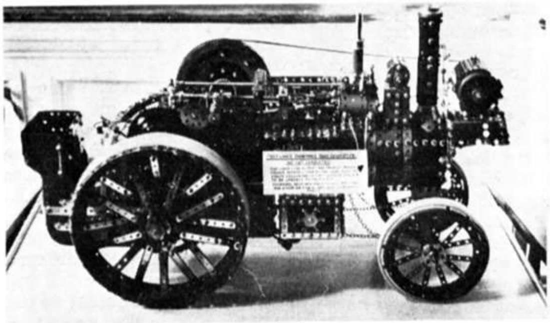
Large-scale locomotives, traction engines and cranes featured very strongly, including an advanced freelance design Block-setting Crane by Bert Love which functioned throughout the meeting as a centre-piece below the stage apron. This drew much attention and enquiry from the public and the local Press, but the same must be said for many of the other magnificent constructions in evidence. Nor was giant-size the yardstick for excellence, as many of the sophisticated models were of handy table-top proportions and included machine tools, made of standard parts, which were capable of producing precision components. One of these was a gear-cutting machine developed from a recent M.M. article and built by Michael Martin of Ilford. Tooth formation was excellent on the plastic blanks which the machine converted into gears in the twinkling of an eye. Tony Homden's mortising machine carved precision slots in polystyrene blocks to make ships' tackles.

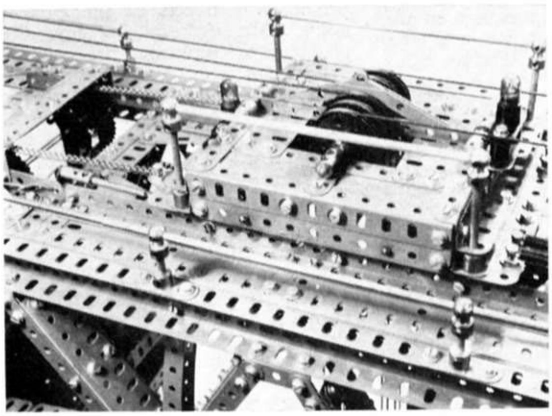
Tribute here should be paid to the rugged qualities of Meccano electric motors – standard items which powered both of the above models as well as the Giant Block-setter

Henley-on-Thames Town Hall (above) – no doubt what was taking place with that giant banner! Left, Super Model Leaflet Meccano Loom on show. Left-hand column opposite, top to bottom, two of Pat Briggs excellent clocks, outstanding narrow-gauge Tank locomotive by Heather Burton, a traction engine by Bert Halliday and the travelling crab with fore and aft over-run lights on Bert Love's crane.

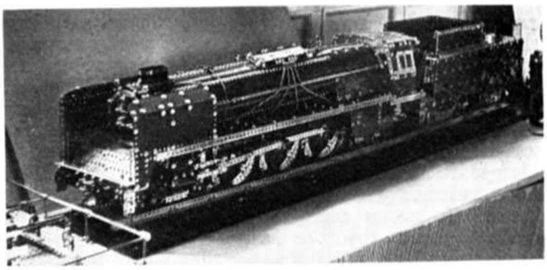


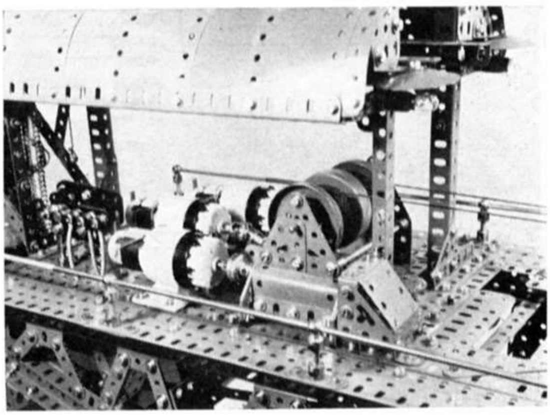


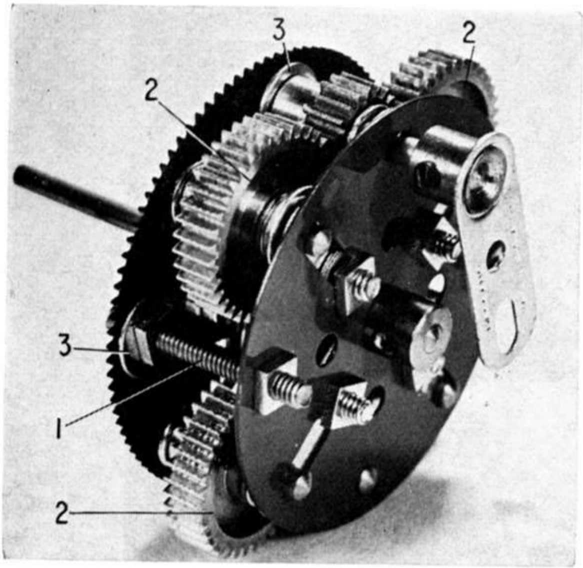




Some of the 3,000 visitors who attended during the day, seen from the stage. Some of Stevenage Meccano Club members; founder and leader is Dennis Higginson, with moustache. One of the giant locomotives on display (below), and bottom, the machinery house and wiring panel of Bert Love's free-lance Giant Block-setting Crane, showing hoisting drums and three motors for crab, slewing, and hoisting.

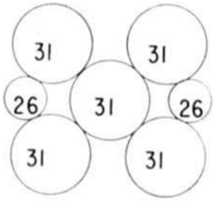






Among the Model-Builders

with 'Spanner'



A "Motion Converter" modified by Mr. Stan Evans of Bebington, Cheshire, from a design first published in the August 1972 M.M., with, above, a diagram showing the relative position of the gears.

ONE of the things we try to do in this column is to feature mechanisms and ideas which, although they are presented here as separate items unconnected with specific parent models, can be incorporated in models to achieve improved results.

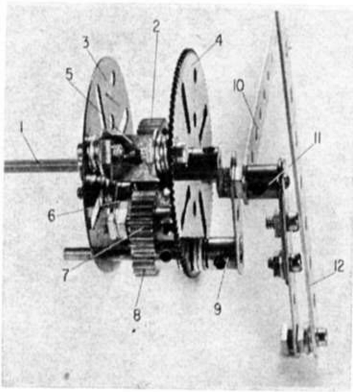
When we first receive details of a mechanism, however, it is often difficult for us to assess its true value, as frequently, that value is evident only to particular modellers who are, or have been, faced with a problem that could be overcome by the mechanism. If we haven't experienced the problem, then we might not know that the mechanism solves it—if you see what I mean!

Because of this, I am always pleased to hear from readers who have made use of ideas we have published. It makes our job worthwhile to know that the Magazine has been of help and I am sure the designers of the mechanisms are glad that their ideas have proved useful. Assuming the latter is true, then Mr. Colin Spence of Edinburgh will be interested to learn that his "Motion Converter", featured in the August M.M., has already been put to very good practical use—in modified form—by Mr. Stan Evans of Bebington, Cheshire.

Stan writes, "The mechanism . . . gave me the idea of adapting it to a Meccanograph. However, Mr. Spence's basic unit proved to be a little too flimsy for my particular requirements, so I stiffened it up by dispensing with the Double Brackets and using $1\frac{1}{8}$ in. Bolts (1) to separate the $2\frac{1}{2}$ in. Gear and the Face Plate. In place of the original $\frac{3}{4}$ in. Pinion, I used four 1 in. Gears (2) as idlers and added a second $\frac{1}{2}$ in. Pinion as shown in the accompanying diagram.

"Between the Gears and the Face Plate I added two $2\frac{1}{2}$ in. Strips (3) to provide added bearing surface on the slotted sections of the Plate, with the same arrangement on the other side. The whole unit was now very rigid and worked smoothly with a minimum of play and backlash.

"In operation, the central 1 in. Gear is fixed on the centre Rod and, in the Meccanograph, a second $2\frac{1}{2}$ in. Gear is fixed on the same Rod, this Gear engaging with a Worm which can be located on the Rod driving the turntable, or on a separate Rod that can be turned manually. In the first case, the stroke of the pen will automatically increase from roughly $\frac{1}{4}$ in. to 4 in. and back to $\frac{1}{4}$ in. in one revolution of the turntable, provided, of course, that the Gear ratios are the same. In the second case, using the manual control, the stroke may be varied as and when described."



The original "Motion Converter" by Mr. Colin Spence of Edinburgh, as it appeared in the August issue. Building instructions are obtainable from our Northern Office.

Stan's modified mechanism appears in the accompanying photograph and we have also reproduced the illustration of Mr. Spence's original unit featured in the August M.M. If, in addition, any reader requires a copy of the building instructions for the original unit, please drop me a line to Meccano Magazine, Northern Office, Binns Road, Liverpool L13 1DA.

PARTS REQUIRED

4—5	5—18b	5—31	22—38
*1—16b	2—26	14—37a	1—62
1—18a	1—27c	8—37b	1—109
			1—111d

*Dependent upon parent model

For New Zealand Modellers

Still on the subject of modifications to existing models, I have received an interesting piece of news from Mr. P. G. Askew of Christchurch, New Zealand relating to the Automatic Ticket Machine which we featured in the October 1971 M.M. Mr. Askew tells me that, when he built the model, he couldn't get the perforations in the ticket roll to coincide with "tear-off jaws" on the model—a situation which of course greatly reduced the value of the machine. He discovered, however, that the dimensions of standard ticket rolls in New Zealand differed from those used in our model and this was causing the problem as the machine was specifically geared to present our tickets at the correct point. Mr. Askew overcame the problem by replacing the original 2:1 Chain and Sprocket gearing with a 1:1 Sprocket drive, plus a gear drive consisting of two $\frac{1}{2}$ in. Pinions, a $\frac{3}{4}$ in. Pinion and a 60-teeth Gear. This system gives an accuracy of 98% for ticket rolls available in New Zealand.

Small-scale Suspension Units

On a different subject, now, regular readers will need no introduction to Mr. James Grady of Dundee, Scotland—the man I have already dubbed "Champion of the small-scale vehicle builders". James' passion (if he doesn't mind me putting it that way) is that he doesn't see why modellers with the equipment to build large-scale models should have all the fun. He believes, with some reason, that most of the effective motor chassis mechanisms generally featured are designed for larger models and, in fact, are too big to be included in small models using 1 in. Pulleys and Tyres as road wheels. This, he rightly claims, leaves the "small" man at a disadvantage and so he is always looking for ways to improve the situation.

We have featured several of James' compact mechanisms in the past and we now present another two offerings, both of which are workable front-wheel independent suspension units—fully operating. The first is the basic unit which consists of a 1½ in. Strip 1, representing the cross-member of the parent model. Secured through the second hole of this Strip by the same Bolt are a Double Bracket 2 and a Double Bent Strip 3, arranged as shown with the lugs of the Double Bent Strip parallel to the 1½ in. Strip. Journalled in the outer lug of the Double Bent Strip and in the end hole of the Strip is a Long Threaded Pin which carries a Compression Spring and a Collar 4, a Fishplate 5 and a Washer being tightly fixed to the lower end of the Pin. A free-running 1 in. Pulley without boss 6, fitted with a Motor Tyre, is lock-nutted on a ½ in. Bolt, a Washer spacing the Pulley from the bolthead, then the Bolt is tightly screwed into one threaded bore of Collar 4. In operation, of course, two identical units would be built and connected by a steering tie-bar lock-nutted between Fishplates 5.

PARTS REQUIRED			
1—6a	1—22a	2—38	1—111a
1—10	3—37a	1—45	1—115a
1—11	1—37b	1—59	1—120b
			1—142c

Working Brakes

The more complex of Mr. Grady's units incorporates a working braking system which makes use of one of his previously-published ideas. In this case, two Centre Forks 1, free to turn, are located in the end transverse bores of a Coupling 2, where they are held by Collars 3. Note that, when the forked ends of the Centre Forks are vertical, the "empty" threaded bores of the Collars must also be vertical. Screwed tightly into these threaded bores are two ½ in. Bolts 4, the rearmost of which is fitted with a Compression Spring and two Washers, while the forward example carries a Nut and two Washers. The brake cable will later be attached to the Bolts.

Secured to the underside of Coupling 2 by standard Bolts is a 1½ in. Strip 5, spaced from the Coupling by two Washers on each securing Bolt to ensure that the Bolts do not foul the Centre Forks.

A rather unorthodox, but nonetheless effective wheel arrangement is now built up from a 1 in. Pulley without boss (carrying a Motor Tyre) which is secured to the boss of a ¾ in. Flanged Wheel by a 2½ in. Driving Band threaded through the three holes in the face of the Pulley and located on Bolts each locked by a Nut in the transverse bores of the Flanged Wheel boss. The Bolts must not foul the centre bore of the Flanged Wheel. A 1⅛ in. Bolt, carrying a Washer, is passed through the Pulley and Flanged Wheel, after which it is fitted with two Nuts positioned one each side of a Washer and tightly screwed against the Washer to form a "stop", locked on the Bolt shank. If the Bolt is then screwed into the central threaded bore of Coupling 2, Flanged Wheel 5 should locate over the ends of Centre Forks 1, but the above "stop" should be so positioned that it prevents the inner face of the Flanged Wheel from making contact with the points of the Centre Forks. However, if the Forks are revolved slightly in their supporting Coupling, then their sides should make contact with the inner surface of the actual flange of Flange Wheel 6.

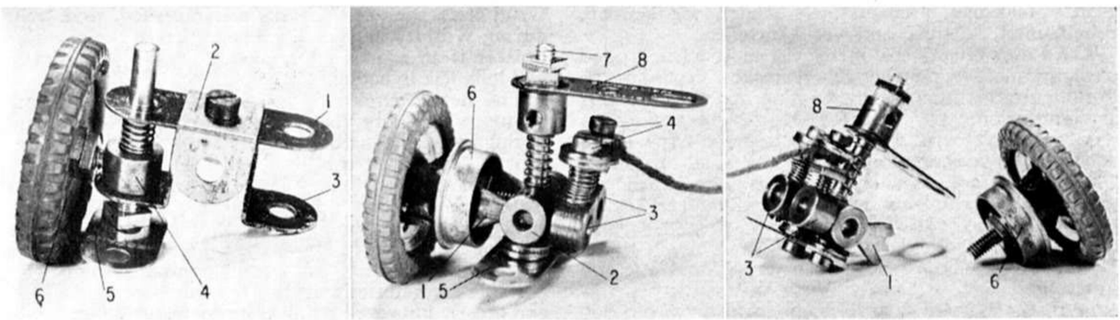
Once the correct positioning of the "stop" has been achieved, the 1⅛ in. Bolt should be removed from Coupling 2 and a Long Threaded Pin 7, carrying a Compression Spring and a Crank 8, should be inserted in the centre vertical smooth bore of the Coupling. The Bolt should then be replaced to hold the Threaded Pin inposition. Crank 8 represents the steering cross-member of the parent model, while the earlier-mentioned 1½ in. Strip 5 provides the anchoring point for the steering tie-bar.

Finally, we have the brake actuating cable. In the original unit illustrated, James used a length of Cord secured to front ½ in. Bolt 4 by being tied and trapped between the Washers on the Bolt by the Nut. From there, it is brought back and secured between the Washers on the rearmost Bolt, after which it would be taken to the control lever or pedal on the parent model. When the Cord is pulled, movement of Bolts 4 causes Centre Forks 1 to turn, the ends of the Forks thus making contact with the flange of Flanged Wheel 6 to provide the braking action. When the Cord is released, the Compression Spring on rear Bolt 4 disengages the Centre Forks.

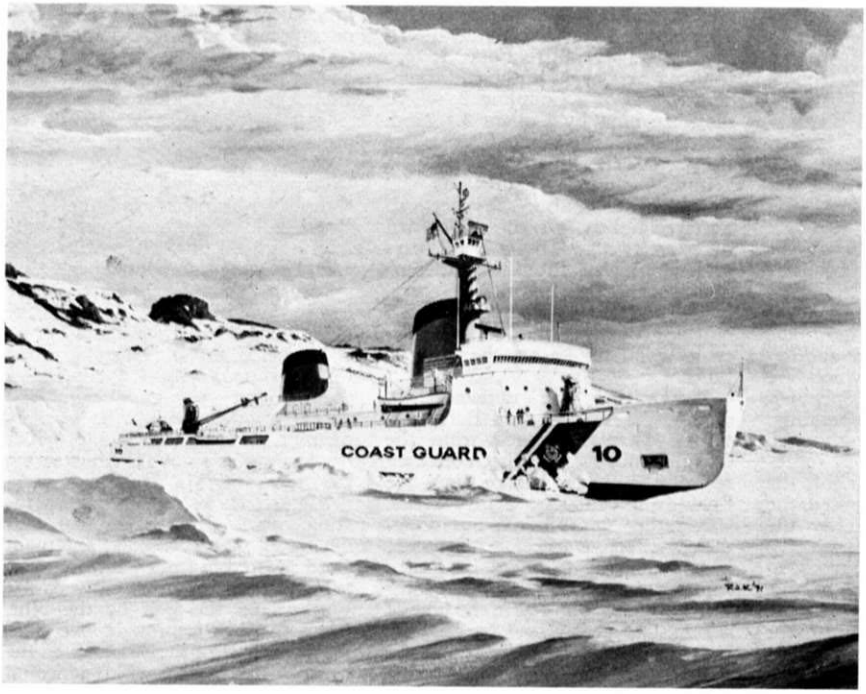
Having tested James' unit, I can confirm that his Cord actuating method works successfully, but I venture to suggest that, if a Narrow Strip were used to link Bolts 4, the result would be a little more positive.

PARTS REQUIRED			
1—6a	4—37b	1—62	1—111d
1—20b	10—38	1—63	1—115a
1—22a	1—40	2—65	2—120b
5—37a	2—59	2—111a	1—142c
			1—186

(*please turn to page* 560)



Three mechanisms from Mr. James Grady. Left, a simple front wheel independent suspension unit, centre, a more-advanced front wheel suspension unit incorporating a working braking system, and right, the latter in partially dismantled form to show the brake shoes and brake drum.



Left, an artist's impression of what this immensely powerful ship will look like in action. Opposite, the U.S. Coast Guard icebreaker *Burton Island*, of the Wind class, refuels a scientific station

(*U.S.C.G. official photo*)

E. R. Yarham describes a new vessel being built at Seattle.

World's Most Powerful Ice-Breaker

STRANGELY, the United States' oldest seagoing armed force is not a branch of the Navy or under the Department of Defense. It was traditionally a service of the Treasury until five years back; now it serves under the new Department of Transportation.

The personnel of this force, the United States Coast Guard, are both men of peace and men of war. As this account will show, their peace-time duties take them to the confines of polar ice both north and south. In World War I the Coast Guard lost more men overseas—in proportion to its number—than any other U.S. service.

In World War II the force made the first American naval capture and seized the first Nazi shore station. The Coast Guard took Marines into the invasion beaches, and it was in the vanguard of nearly all U.S. invasions. The 20th century peace-time Coast Guard is mostly a sailor and serviceman, but also in part life-guard, policeman, fireman, buoy tender, weatherman, aircraft pilot, scientist, and world traveller.

The Coast Guard has one of the most efficient, and certainly most widely-active icebreaker fleets in the world. At this moment it has nine major icebreakers in commission. Of these the *Mackinaw* confines its service to the Great Lakes, shared between Canada and the United States, and which are seas in all but name. They cover approximately 94,000 square miles, are subject to fierce storms, and every winter are heavily blocked by ice. Another icebreaker, *Storis*, operates only in Alaskan waters.

All the rest of the fleet have operated in Arctic and Antarctic waters, and in the north have made penetrations of the ice which have taken them to within 500 miles of the North Pole. These vessels are to be joined by the tenth ship of the fleet, now under construction and at present simply known as "WAGB 10". This will be the most powerful icebreaker yet built, with one and a half times the power of the Soviet *Lenin*. Up till now this has been the most formidable of its type afloat.

It is planned to have "WAGB 10" in service by 1974. The contract price for construction is 52.7 million dollars. Her length overall will be 400 ft., beam 83.5 ft., and she will have a displacement of 12,000 tons. The icebreaker is to be built at Seattle, in the Pacific State of Washington, and 600–700 workmen will be employed.

The "WAGB 10" will be the first addition to the Coast Guard icebreaker fleet since 1954, when a vessel famous for its service in the Antarctic, the *Glacier* (WAGB 4), was commissioned. The older vessels, the Wind class, such as *Westwind* and *Eastwind*, were bulit during World War II. The illustration of the new ice-breaker is an artist's impression of what "WAGB 10" will look like in action.

The new icebreaker's design came off the drawing boards after more than three years of research and testing. Coast Guard engineers say that new and improved features of this ship will affect virtually every aspect of its operations. These include: the diesel/gas turbine power plant, a novel hull shape, a stronger hull structure, a pilot-house with sliding glass doors, a conning station 49 ft. above the bridge with full engine and rudder control, an oceanographic system with portable laboratories and data transmission capabilities, and greatly improved living quarters featuring one, two, and four-man staterooms for the entire crew.

The "WAGB 10" will have three shafts in conformance with the latest icebreaking practice. This provides greatly improved steering control while breaking ice. The combined diesel-electric/gas turbine power plant consists of an 18,000 s.h.p. diesel-electric plant and a 60,000 s.h.p. gas turbine unit. Normal operations will use the diesel mode, while the gas turbines will be put on the line for limited periods when ice-breaking operations require more than 18,000 shaft horsepower.

The vessel will have a free running speed of about 17 knots and a continuous icebreaking capability estimated in new, hard sea ice of four feet in the diesel-electric mode and six feet in the gas turbine mode. In such conditions it will be able to maintain a steady three knots. It is reckoned that the vessel will be able to ram through ice 21 ft. thick. At 13 knots "WAGB 10" will have a cruising range of 28,275 miles, further than the distance round the equator.

Two forward engineering spaces contain a total of six main propulsion diesel generators and the three ship's service diesel generators. The main propulsion generators are alternating current machines. The alternating current is rectified to direct current and drives the main propulsion motors (electric) mounted on the shafts in the after engineering spaces. The shafts extend forward of the motors where they are connected to reduction gears through a clutch. The gears are powered by gas turbines installed in the space forward of the reduction gears.

The shafts and motors are non-reversing and manoeuvring control is provided by controllable pitch propellers. Coast Guard studies have shown that they will provide a marked advantage in that they can be kept continuously turning while in the ice. The most vulnerable time for an icebreaker's propeller is when it is stopped, such as when reversing direction. With controllable pitch propellers the necessity for reversing direction is avoided. As well, the pitch of the blades can be automatically reduced when the propeller strikes heavy ice, so reducing the load on them.

The shape of the hull is based partially on studies by Coast Guard Commander Roderick White, whose ideas were incorporated into the bow design of the ice-breaking supertanker *Manhattan* which succeeded in navigating the historic Northwest Passage along the Arctic shores of Alaska and Canada in 1969 and 1970.

Basically the bow stem is concave below the water-line in contrast to the relatively vertical stem of the Coast Guard's Wind class icebreakers which, as has been mentioned, are about a quarter of a century old. The concave shape will allow the breaker to ride up on to the ice and break through with the combined force of its forward motion and the downward pull of gravity. During the backwards and forwards ramming operation the shape of the hull will facilitate the extraction of the ship from the ice after each thrust. This manoeuvre has often been a problem in the past.

The hull structure is designed to withstand the crushing forces from ice which surrounds or traps the ship as well as the impact stresses of breaking ice. It is based on a grillage system which is more effective than the older truss system in registering impact type penetration and progressive failures of surrounding structure. The truss system used in the old Wind class ice breakers is similar to that of a bridge—if one truss collapses it could cause the collapse of others further down the line. The new grillage system places ice frames on 16-inch centres with ice-belt plating one and three-quarter inches thick at the ends of the vessel.

To elaborate slightly on some of the special features of the vessel. The conning station, 49 ft. above the bridge has been mentioned. The object of this is to assist navigation while breaking ice. Full rudder and engine controls and some limited navigational devices will be stationed there. Access will be by a ladder located inside the mast.

A great deal of space has been allocated to the laboratories. Two devoted to oceanography and a third to meteorology will be augmented by two portable vans, eight by fourteen feet, which will be fitted out with scientific equipment. These portable vans can be shipped to a scientist's laboratory where he can install his equipment prior to embarking on a cruise.

The laboratory would then be shipped back to the icebreaker when the ship's cargo cranes can hoist it on board and mount it on the deck. After the cruise the van can be shipped back to the scientist's laboratory for the completion of his experiments and the removal of the equipment.

An ocean data centre will house a computer which is the key to a system for rapid, automatic transmission of data ashore. This is a notable improvement over the old method of collecting data and having the ship's radio staff transmit it to land. This system was very slow and more vulnerable to greater human error.

A flight deck at the after-end of the ship will provide operating space for two helicopters to be used in conjunction with polar operations, particularly for scouting surveillance. Fixed hangar facilities are located forward of the operating area.

Finally, personnel and living quarters. Accommodation is being provided for 155 officers and crew along with ten scientists. The actual complement as planned is 123 officers and crew, not including the doctor and aviation personnel who are assigned separately for each major cruise. Compared with the 197 man crew of the much smaller Wind class icebreakers, the reduction in manning levels is apparent, and is due to automation and the use of low maintenance materials.

As touched upon earlier, single, double and four-man staterooms are provided for the entire crew. Duty on an icebreaker is long and sometimes arduous, so that a high standard of accommodation has been a prime goal in designing the "WAGB 10". Progressing through the ship one notes a brightening of colours as one moves down in rank and age. The designer indicated that he didn't want to "stimulate the older men with the brighter colours," but felt that the younger members of the crew would enjoy them!

KING of the CASTLES

By P. M. SMITH

FEW rulers have left such fantastic reminders of their reign as did King Ludwig II of Bavaria, or as some described him, "The Mad King", or "The Swan King". Today his extravagant passion for building pretentious palaces and castles earns his former kingdom huge amounts from tourists.

Born in 1845, he succeeded his father, King Maximillian II, when he was nineteen years old in 1864. Attractive and handsome, he was idolised by the young Bavarian girls in much the same way as pop-stars are today. However, the first thing he did on becoming King was to befriend the musician Richard Wagner and take him to the castle where he had spent so much of his childhood, Hohenschwangau.

This was known as the "Swan Castle", a place where almost everything was marked by the sign of the Swan. Even the Royal Coat of Arms above the main gateway was flanked by two Swans. Here, the two made plans for a great conservatoire of music as they walked or were driven through the surrounding forests.

Unfortunately, not all his citizens liked Ludwig's friendship with the musician, and before long unsavoury rumours began circulating as people showed their open objection to the fact that Wagner had been made a Bavarian citizen. Wagner was accused of having a bad influence on the King, and of interfering in politics, until eventually he was forced to leave Bavaria and seek refuge in Switzerland.

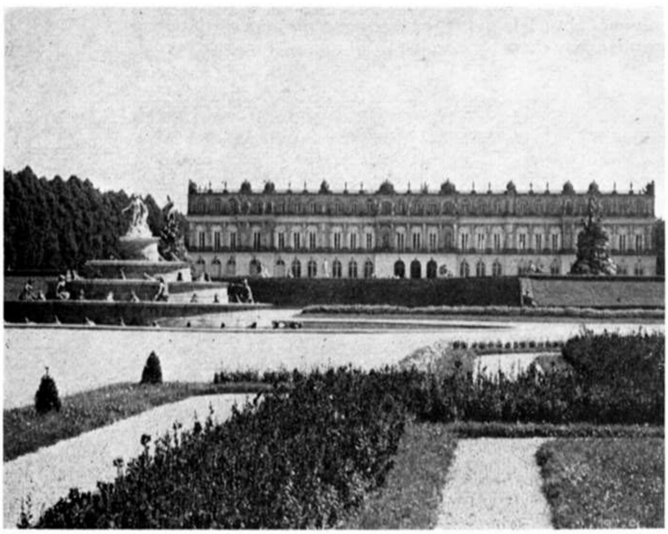
Top left, the Schloss Neuschwanstein, built in pale grey marble, has a fairy-tale air.

Top right, the famous Gallery of Mirrors of the Herrenchiemsee Palace, never fully completed.

Centre opposite, the Schloss Linderhof, in rococo style. A tourist party stands at the head of the centre steps.

Bottom right, beautiful paintings, carvings, mosaic work, chandeliers, and candelabra, but an overall bogus air in the "minstrels hall" at Neuschwanstein.

Bottom left, the imposing facade of the Herrenchiemsee. built on a beautiful island in the middle of Lake Chiemsee,



Without his friend, Ludwig was lonely and unhappy, but to everyone's amazement he not only returned to Court in 1867, but at the same time announced his engagement to the Duchess Sophie, sister of the Empress of Austria. His citizens now believed the King was going to lead a more normal life, especially as he made many appearances at banquets and balls with his fiancèe.

Then, without any warning, and in keeping with his old eccentric ways, Ludwig announced that the engagement was off, only a few weeks before the wedding was to have taken place.

He returned to Hohenschwangau, but even here, in his childhood palace, he was unhappy. At last he found a way of occupying his time. He was going to build himself a fantastic castle, high up on a mountain, where no one could interfere, and he could be left alone. This fairytale castle was to be Neuschwanstein.

Replacing the ruins of Vorderschwangau, this pale grey marble castle was perched on the top of a lofty summit in the beautiful alpine scenery of the Allgau. It was designed by Christian Jank, a theatrical painter, and built by Georg Dollmann, Julius Hofmann and Eduard Riedel between 1869-86. Ludwig wanted this to be a larger scale reproduction of Wartburg Castle and a place where he could honour his friend and companion, Wagner.

A visit takes about an hour, including the climb up 96 steps to the top of the 197 foot high main tower in which the Royal Apartments are situated. Here Ludwig's study was decorated with scenes from the Tannhauser saga, his bedchamber depicting the story of Tristan and Isolde, and the sitting room walls showing the Lohengrin legend. The "Sangersaal", almost ninety feet long, is an imitation of the minstrel's hall at Wartburg Castle.

It seemed that now the King had an obsession for rebuilding. Besides Neuschwanstein, the castles of Linderhof and Herrenchiemsee were built. The Linderhof Palace, frequently occupied by Ludwig, was built by Georg Dollman in French Rococo style, and the first floor contains a suite of ornate and sumptuous apartments.

Outside, the gardens were planned on English-Italian-French lines, and are cleverly adapted to fit in with their natural surroundings. Here also is a huge fountain which throws its jet of water over a hundred feet in the air. Close by is the ancient lime tree which gave its name to the first farmhouse which stood on this site, owned by the Linder family and which also, of course, gave the Palace its name. Behind the actual Palace is

the Grotto with its illuminated lake, which contains a picture of the Venusberg, a scene from Wagner's Tannhauser.

It was the New Palace of the Herrenchiemsee which finally brought about the King's downfall. The new palace on an island of the Chiemsee was to be a faithful imitation of the Palace of Versailles, the summer residence of King Louis XIV of France. Whilst neither the Palace nor the gardens were fully completed, it is still a most magnificent sight. The main front, itself 400 feet long, faces over the formal gardens with their fountains and statues.

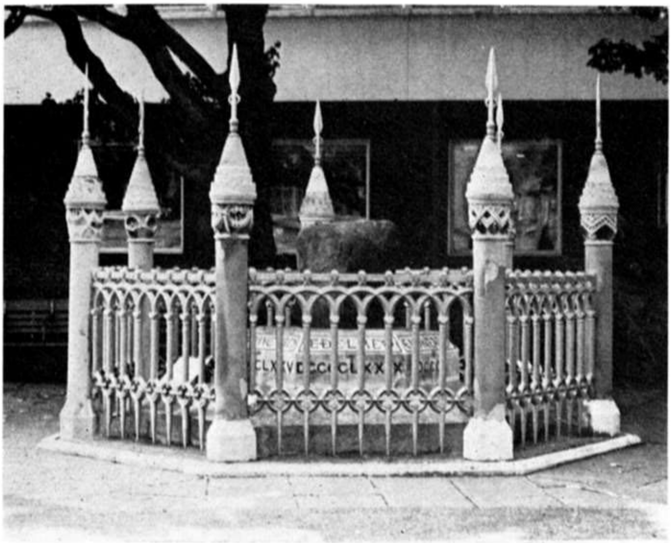
Inside are copies of busts and paintings, just as they are at Versailles itself, and there is also a bronze equestrian statue of Louis XIV. The state bedchamber is lavishly decorated in purple and gold, whilst in the King's dining room, the dining table ascends and descends through the floor. Nor is Richard Wagner forgotten either, for on the ground floor is a museum containing all details of his operas. Undoubtedly, the most wonderful room is the Hall of Mirrors, 246 feet long, with thirty three glass chandeliers holding 2,188 candles, which illuminate the Hall during the summer months, when special concerts are held.

It was whilst this second Versailles was being built that the Cabinet became so alarmed by his extravagances that they arranged for a doctor to certify him insane, and he was declared to be incapable of ruling the state.

Luckily a faithful old retainer told his master that the head of the Munich Asylum was on his way to collect him and Ludwig was able to make one last effort to save himself. He roused the local villagers to help him, and when his would-be jailers arrived, thay were captured and thrown into the Palace dungeons.

Unfortunately for the King, another group of capturers arrived shortly afterwards, and this time he was taken off to Castle Berg on the Lake Starnberg.

Then, on Whit Sunday 1886, Ludwig and his keeper friend Dr. Gudden went for a walk by the lake in the Castle grounds - but they never returned. The bodies of the King and his keeper friend were found two days later in the shallow waters of the lake, at a spot which is today marked by a simple white cross. To this day it is not known how Ludwig met his death.



Stones in Britain

—especially Travellers' Stones

By Edyth Harper

Picture shows the Kings' stone at Kingston-on-Thames, used for the coronation ceremonies of our early Saxon kings.

IN the days when our land was mainly bog and forest, travellers used stones to help them on their way. Fording rivers was always a problem, but at Ewenny in Wales, our ancestors solved this by laying down stepping stones across the river by the castle walls. These can still be seen at low tide and could only have been used then, for the river there is still tidal.

Wadeways, as these stone paths are often called, occur in many parts of our islands. At Langston, near Havant, there is an old Roman wadeway, now covered by mud, but at very low tide it is still possible to walk or wade where the old stones give a firm foothold between the mainland and Hayling Island.

Down in Devon, smaller rivers were just as difficult to cross. A clever way of crossing the water can be seen at Tarr steps. These are long flat stones, laid on built up pillars of stone, the whole forming a low bridge that has served travellers for centuries.

Signposts have largely replaced milestones but many of the old milestones can still be seen and are worth a search. Cornish milestones are often decorative and sometimes mis-spelt. One near Penzance directs to St. Ives with the S written backwards. At Crows-an Wra, Cornwall, an ancient Celtic stone cross stands by the decorated milestone and marks a spot connected with witchcraft. Another milestone near Aylesbury sets a puzzle as it directs people to the City, the county town and the University, leaving them to guess that London, Aylesbury and Oxford are indicated.

Stone circles can be seen all over Britain from North Scotland to Cornwall, but two of the most famous stand at Stonehenge on Salisbury Plain and at Avebury in Wiltshire. The circle at Avebury surrounds nearly 30 acres of land and is thought to have been set up by "Beaker" people over 5000 years ago. 1,200 feet across, it is the largest in the world.

Stonehenge is the most complicated stone circle in the world. It dates to 1800 B.C., possibly earlier, but during the 17th and 16th centuries B.C. 80 large 'blue stones' were dragged from the Prescelly Mountains in Wales to build an inner circle. Succeeding builders added to and reconstructed the stone circles, all of which were used for religious ceremonies. A grand avenue flanked by stones led to the circles.

Many theories claim that the stones were laid out to fit in with the solstices and full moon. Certainly the stones are so planned that the sunrise at the summer solstice is seen over one of the large stones. Stonehenge is *not* a purely Druid circle as many believe, but is the work of generations from Neolithic to Bronze Age times.

The Lanyon Quoit in Cornwall is thought to have formed part of a big stone circle at one time. Two upright stones support a large slab of stone across the top. Trevelling Quort near St. Cleer was also part of a stone circle. Some authorities say these quoits may have marked burial sites.

In Iona, near St. Columba's monastery (563 A.D.) a row of stones marked the graves of 48 early Scottish Kings, including Duncan, murdered by Macbeth. Eight Norwegian, two French, and four Irish Kings also had gravestones there. Stone rows are also found principally on Dartmoor and in N.E. Scotland. They are usually single or double, but at Challacombe on Exmoor, multiple rows still stand. Most probably they were ceremonial avenues leading to ancient temples.

At Kingston-on-Thames, down by the river, you can see a large boulder surrounded by ornamented iron railings. This is the stone which gave the town its name, for our early Saxon Kings sat on this throne to be crowned. The original stone is raised on a stone pedestal bearing the names of the Kings and the dates of their reigns.

The Coronation stone, called the Lia Fail or 'Stone of Destiny', was said to have been the stone that Jacob used for a pillow. Brought to Ireland long ago, it was taken from Tara to Scone in Scotland. In 1296 Edward I carried it south to London where it was built into the chair used for crowning English monarchs. Today it can be seen filling the space under the seat of the chair.

Many interesting stones in Britain attract little attention. People are so used to seeing them that they rarely bother to find out their history. One such boulder, brought to England over 100 years ago, can be seen at Southsea, on the sea front. An inscription on it reads:-

> "During the Russian War (1854) a landing party from H.M.S. "Hecla" was attacked by a large body of Cossacks and many would have fallen had it not been for the courage of two sailors who, taking cover behind this stone, kept the enemy at bay until the safety of the whole party was assured. Captain Hall had the boulder carried to his ship and transported to Portsmouth."

Today it makes a convenient resting place for those waiting for the Hovercraft.

In Yorkshire there is a fine example of Roman road running beside a modern roadway. The ruts of chariot wheels are still discernible while the track in between makes safe walking for pedestrians.

Every county has at least one stone that is unique, waiting to be re-discovered by those interested in our history. They are well worth searching out before 'progress' removes them.

Aspects of British Philately

by James A. Mackay

THE books and magazines which deal with British stamps as a whole are legion, but it is significant that within the past year or two there have appeared several dealing with specific aspects of British philately, and in particular have focused attention on what the Post Office term the regions of the United Kingdom. This has coincided with the rise of nationalism in various parts of the British Isles and has now been taken to its logical conclusion in *Seibant gyda'r Stampiau*—a book about Welsh stamps and Wales on stamps—written in Welsh!

Though they have not gone to that extreme in other parts of the British Isles, it is interesting to note that each country or region of the United Kingdom (except, curiously, Northern Ireland) can now boast a literature devoted to its own philately.

Scotland has been issuing its own regional stamps since 1958 and, allowing for changes in watermark and variations in phosphor bands, has produced about a score of different stamps in the past fourteen years. But there is much more to Scottish philately than that. The old railway companies of the pre-grouping era issued their own stamps in connection with the railway letter service, and in the 1930s the pioneer airlines produced attractive labels to advertise their services. Even to this day parcel stamps are issued by several bus companies as well as David MacBrayne Ltd., the famous steamship line. In addition, several of the remote islands off the Scottish coast have had the doubtful advantage of their own stamps. Theoretically these stamps have been provided to defray the cost of carrying mail to the mainland, but in actual fact these 'local carriage labels' seem to have been designed with the collector in mind. Regrettably there are few of these stamps which are truly Scottish in their subject. Many of them portray Churchill or Kennedy or celebrate the various Apollo moon shots, and thus have little or no relevance to the islands themselves.

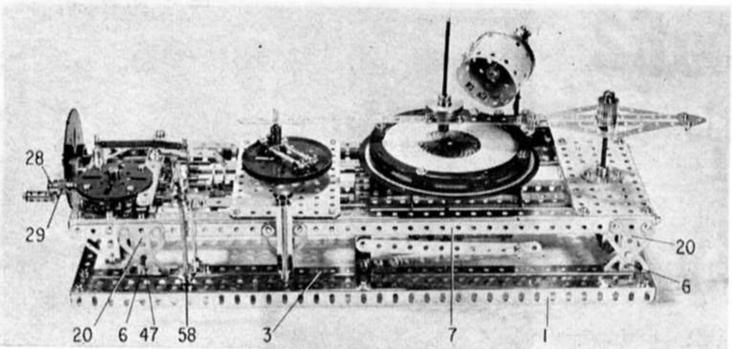
Conversely there are many stamps from all over the world which have a Scottish flavour and quite an interesting collection could be formed with the theme of Scotland on Stamps. Robert Burns had to wait until 1966 before he appeared on British stamps, but away back in the 1950s both Russia and Romania issued stamps in his honour. Robert Louis Stevenson has yet to be honoured in this way by his native country, but Samoa featured his portrait on a stamp of 1939, and showed his house and his tombstone on stamps of the 1935 definitive series. More recently the 75th anniversary of his death was marked by four stamps which portrayed him and characters from such famous works as *Treasure Island* and *Kidnapped*. Incidentally, the Virgin Islands, supposedly the scene of the action in *Treasure Island* also issued stamps on this occasion, and featured Long John Silver, Jim Hawkins and other characters from the book.

Scottish inventors have appeared on a surprising number of stamps. Alexander Graham Bell, the telephone pioneer, has been portrayed on stamps of Canada, Argentina and the United States, while Clerk Maxwell, who discovered radio waves, was portrayed on a recent stamp from Mexico. Soldiers of fortune include the Earl of Dundonald, shown on stamps of Chile and Peru, and Prince Barclay on a stamp of Russia. Clyde-built ships have sailed the seven seas, and turned up on stamps of Trinidad, New Zealand, Hungary and many other unlikely countries. Missionaries such as Robert Moffat and David Livingstone have appeared on stamps of Rhodesia.

In recent years several Commonwealth countries, such as Antigua, St. Helena and Gibraltar have issued stamps featuring military uniforms and among these the tartans of the Highland regiments have been prominent. Yet the credit for issuing the first stamp showing a Highland bag-piper must go to Monaco (1957). As long ago as 1860 New Brunswick issued a stamp showing the Prince of Wales (later King Edward VII) in Highland dress. Both King George V (Falkland Islands, 1933) and the Duke of Windsor (Canada, 1935) have appeared on stamps in Highland costume.

Two recent books have dealt with the subject of Scottish philately in detail. The outstanding work on this subject is *The Scottish Stamp and Label Catalogue* by Stanley Hunter (available from the author at £2.20, 34 Gray Street, Glasgow C3). It runs to seven volumes, four of which cover aspects of the Scottish theme: Scotland — her stamps and history, Scots on stamps, Scotland at home and overseas and Scottish craftsmanship. Two volumes deal with the local stamps and labels respectively, while the seventh volume provides an index to the whole work. Mr. Hunter is the secretary of the Alba Stamp Group which publishes *Scottish Stamp News*, a monthly magazine free to members.

Scotland in Stamps by C. W. Hill (Impulse Books, Aberdeen, £2.25) is designed as an introduction to the subject, but covers a much wider field. More than half the book is devoted to the postal history of Scotland from the seventeenth century to the present day, and the distinctive postmarks, from the Edinburgh Bishop mark and the postmarks of Peter Williamson's private Penny Post to the pictorial slogan cancellations of today, are discussed at length. Mr. Hill also draws the reader's attention to the enormous fascination of picture postcards.



Mecca

Hungarian reade

This outstanding Meccanograph is the brainchild of Hungarian reader Andreas Konkoly of Budapest—probably the world's leading exponent of Meccano-built designing machines. Mr. Konkoly has entitled the model "the Meccano Guilloche Machine"

PERHAPS the most captivating of all Meccano models ever built are those fascinating mechanical pattern-drawing machines we have long-since nicknamed "Meccanographs". Every Meccano modeller worth his salt has at some time built —or plans to build—a Meccanograph and I doubt if a single one of us has ever been, or will be, disappointed with the results. Our attempts aside, though, the world's leading exponent of this type of model is almost certainly Mr. Andreas Konkoly of Budapest, Hungary. Andreas is a true Meccanograph expert. He has designed and built various examples over the years and each one of them has been outstanding for its effective operation and amazing compactness. We have featured at least two of his machines in the M.M. in the past, the first being a straight-forward Meccanograph drawing traditional patterns and the second being a "Spiralograph" which drew a fine pattern that gradually spiralled in to the centre of the paper. Now we feature Andreas' latest and most intricate model—his Meccano Guilloche Machine, the end result of two years' continued experimenting.

I must admit that the title meant nothing to me when I first received the constructional details. I had never heard the word "Guilloche" before! However, thanks to the dictionary, I discovered that a Guilloche was a pattern made by interlacing curved lines and Andreas himself amplified this description by explaining that it was a complicated rosette, or similar type of pattern often used on banknotes and other bond-print to provide a safeguard against forgery because of the difficulty involved in copying. It was, in other words, an excellent description for the model, which does produce complicated interwoven designs, symmetrically ordered on both the outside and inside edges.

As with all Andreas' models, the Guilloche Machine is a fine example of careful design work. Compact mechanisms are housed in a strong framework which hinges open to allow easy access to the internal gearing. It will produce hundreds of different patterns and it even incorporates a small lamp for illuminating the revolving table. It is, beyond doubt, a magnificent piece of Meccano equipment.

The model illustrated is reproduced from Andreas' original instructions which we have tried to follow as closely as possible. We have, of necessity, slightly altered the method of securing the arms which hold the frame open, but any other slight differences which might be included are unintentional. I can say that our model worked successfully and this, after all, is the main requirement.

Framework

Construction begins with the framework which must be very rigidly assembled. Two 18½ in. Angle Girders 1 are joined at the ends by two 7½ in. Angle Girders 2, another two 18½ in. Girders 3 being secured between Girders 2, three holes from each end. The round holes of the Girders are used in all cases. Girders 1 and 3 are then connected together through their centre holes by a 7½ in. Strip 4, centrally overlaid by a 5½ × ½ in. Double Angle Strip 5, spaced from the Strip by a Washer on each securing bolt. Four Trunnions 6 are bolted, two to each Girder 3, in the positions shown, a spacing Washer on the inner securing Bolts in the end Trunnions and on both securing Bolts of the other Trunnions.

Two 18½ in. U-section Girders 7, each built up from two 18½ in. Angle Girders, are next connected together at the ends by two 5½ in. U-section Girders 8, the securing Bolts at one end helping to hold two 1½ in. Corner Brackets in position and, at the other end, a 5½ × 2½ in. Flat Plate 9. The inner Bolts securing this Plate also fix a 5½ in. Angle Girder 10 between girders 7, while a similar Girder 11 is bolted between girders 7 five holes in from their other ends. Note that the inner corner of one of the above Corner Brackets is fixed to its girder 8, not by a Nut and Bolt, but by a Bolt screwed into an Adaptor for Screwed Rod 12. U-section girders 7 are further connected through their eleventh and seventeenth holes by two more 5½ in. Angle Girders 13 and 14, the securing Bolts also fixing a 5½ × 3½ in. Flat Plate 15 in place, this being spaced from girders 7 by a Washer on each bolt. An 8-hole Bush Wheel is bolted to the centre top of this Plate, a similar Bush Wheel being bolted to the centre of Flat Plate 9.

Two 1 × ½ in. Reversed Angle Brackets, their lower lugs joined by a 4½ in. strip, are now bolted through the third holes in the lower flanges of girders 7 in such a position that the centre hole of the Strip lines up with the centre hole of Plate 9. Similarly the centre hole of Plate 15 lines up with the centre hole of a 5½ in. Strip 16 attached by 1 × ½ in. Angle Brackets to two Flat Trunnions 17 bolted to the sides of girders 7. Girders 7 are further connected by a 5½ × ½ in. Double Angle Strip 18 and a 5½ in. Strip 19, Strip 18 being bolted direct to the centre of the lower flanges of the girders and Strip 19 being attached by Angle Brackets to the lower corners of two 1½ in. Corner Brackets bolted to the sides of the girders in the position shown. Also bolted, two to the side of each girder, are four Flat Trunnions 20 which will later be connected to Trunnions 6 in the lower frame. A Double Bent Strip 21 is bolted to the underside of Strip 19, its centre hole coinciding with the fourth hole in the Double Angle Strip, while a 2½ in. Strip 22 is bolted between the fourth holes of Angle Girder 11 and nearby U-section girder 8.

no Guilloche Machine

's intricate designing machine described by 'Spanner'

Table-Support

We come next to the sliding table-support which consists of a 3½ × 2½ in. Flanged Plate 23, to each flange of which a 3½ in. Strip overlaid by a 2½ in. Triangular Plate 24 is bolted. The lower corners of Plates 24 are joined by a 3½ in. Strip, attached by Angle Brackets, a Double Arm Crank 25 being bolted to the underside of this Strip with its boss coinciding with the third hole of the Strip. An 8-hole Bush Wheel is also bolted to the top of the Flanged Plate, its boss coinciding with the corresponding hole in the Plate. The boss of this Bush Wheel and that of the Double Arm Crank serve as the bearings for a 3½ in. Rod on which the revolving table will be fixed. A 57-teeth Gear 26 is mounted on the Rod.

The table slides on two 8 in. Rods 27, passed through the end holes in the 3½ in. Strips bolted to Plate 23 and held by Collars in the third holes from each end of the Angle Girders 10 and 13.

Driving Systems

As drive not only for that table-support, but also for all movements originates from one point, it is advisable to complete the drive systems at this stage. A handle is supplied by a Washer and a Coupling mounted, free, on a 1½ in. Bolt locked by Nuts to the arm of a Crank 28 fixed on the end of a 6½ in. Rod held by Collars in the centre holes of Girders 8, 11 and 14. Also mounted on the Rod is a ½ in. Pinion 29, outside girder 8, a Worm 30, between Girders 8 and 11, and in order between Girders 11 and 14, a Collar, a 50-teeth Gear 31, another Collar and a 57-teeth Gear 32. Only one of these two Gears will be secured on the Rod at any one time and the Collars are therefore needed to hold them in place when unsecured.

In constant mesh with Gears 31 and 32 are, respectively, a ¾ in. Pinion 33 and a ½ in. Pinion 34, both fixed on a 6½ in. Rod held by Collars in the fourth holes of Girders 11, 13 and 14. Also fixed on the Rod midway between Girders 13 and 14 is a ½in. Helical Gear which meshes with a 1½ in. Helical Gear 35 on a vertical 3 in. Rod journalled in the centre hole of Strip 16 and in the boss of the Bush Wheel bolted to the centre of Flat Plate 15. Fixed on the upper end of this Rod is the pen arm actuator which is built up from a 3 in. Pulley 36, to the face or which two Couplings 37 are secured by a ⅜ in. Bolt passed through the centre transverse smooth bore of the Coupling, fitted with a Washer, passed through an outer round hole in the Pulley and secured in place with a Nut. Fixed in the end transverse bores of the Couplings are two 2½ in. Rods on which a third Coupling is mounted, a vertical 1½ in Rod 38 being tightly held in the central transverse bore of this Coupling. A loose Collar is carried on this Rod, as also is the pen arm when fitted.

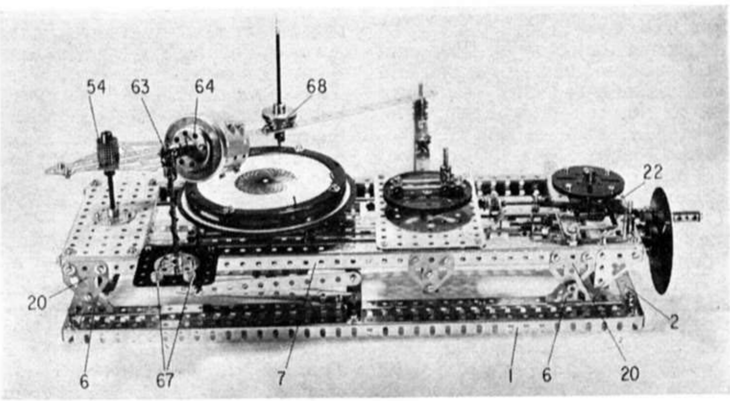
Worm 30 meshes with a 57-teeth Gear 39 on a vertical 3½ in. Rod journalled in Strips 22 and 19 and Double Bent Strip 21. Mounted on the upper end of the Rod is the table-support slide-motion cam 40, built up from a ½ in. Pulley without boss sandwiched between two Face Plates in the faces of which four ⅜ in. Bolts are carried. Varying the positions of these Bolts will of course alter the shape of the pattern.

The cam acts on a 5½ in. strip 41, pivotally attached to the fifth hole of appropriate U-section girder 7 by a Pivot Bolt, but spaced from the Girder by a free Collar. Lock-nutted through the fourth hole of the Strip is a 12½ in. Strip 42 which is cranked as shown, inserted through the space between Flat Plate 15 and Girders 13 and 14, and then bolted to the edge of Flanged Plate 23 in the table-support. Fixed through the third hole (cranked end) of this Strip is a Threaded Pin, a Tension Spring 43 being stretched between this Pin and Adaptor for Screwed Rod 12.

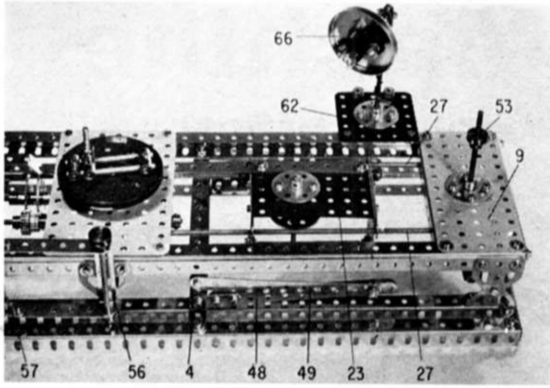
Pinion 29 is now meshed with a 3½ in. Gear Wheel fixed on a 4 in. Rod held by a Collar in the second holes of Girders 8 and 11. Also secured on this Rod outside girder 8 is a 1 in. Gear 44 which meshes with a second 1 in. Gear on a 3½ in. Rod journalled in the fourth holes of Girders 8 and 11 and held in place by the Gear and a 1 in. electrical Bush Wheel 45. Two Long Threaded Pins are locked in opposite holes in the face of this Bush Wheel, the shanks of the Pins engaging in corresponding holes in the face of a second 1 in. Bush Wheel 46 on an 11½ in. Rod journalled in the fourth holes of Girders 13 and 14. The Rod also passes through the end holes in the flanges of Plate 23 in the table support, where it is held by two Collars, one each side of the Plate. A Worm on the Rod meshes with Gear Wheel 26.

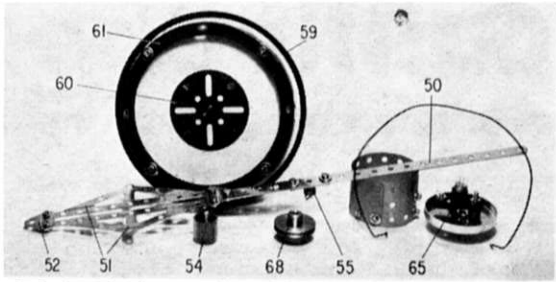
Frame Connection

At this stage, the two sections of the framework can be mated. As already mentioned, Mr. Konkoly designed the framework to open and this is achieved by lock-nutting the apexes of the end pair of Flat



A general view of the Guilloche Machine with the pen arm located on its "holding" support.





Left, in this close-up view of the model, the design table has been removed to show the sliding table-support. Above, a collective view, removed from the model, showing the revolving design table, the pen arm, the pressure weights (54 and 68), the lamp and lampshade and the wire circlip. The circlip has been bent into shallow waves to provide increased grip on the drawing paper.

Trunnions 20 to the apexes of corresponding Trunnions 6. The remaining Trunnions 6 and 20 are not bolted, but are connected by a 6½ in. Rod 47, passed through their apex holes and held in place by Collars. This Rod can of course be removed when desired.

Two collapsible supports are each provided by a 5½ in. Angle Girder 48, extended one hole at one end by a 1½ in. Strip. Lock-nutted to the Girder through its second hole from the outer end is a 5½ in. Strip 49, the other end of this Strip being in turn lock-nutted to the lug of Double Angle Strip 18. The 1½ in. Strip is lock-nutted to the lug of Double Angle Strip 5. When the frame is hinged open, the Girder and Strip 49 straighten, at which point Rod 47 (removed from Trunnions 6 and 20), or a Bolt or Threaded Pin is simply inserted through the appropriate hole in the Strip and the end hole in the Girder to lock them in place. (In his original model, Mr Konkoly actually had Strip 49 positioned inside the flange of the Girder which prevented the Strip from hingeing past the straight point, but none of our Strips would fit inside the Girder flange in our model.)

Pen Arm

Leaving the revolving table until later, we come next to the pen arm which is built up from a 9½ in. Strip 50, to the end of which a 1 in. Triangular Plate is bolted. Two Girder Frames 51 are in turn bolted to the remaining holes in this Triangular Plate, a second similar Triangular Plate 52 being secured to the opposite ends of the Girder Frames. A space of approximately ⅜ in. remains between the Frames and located in this space is a 5 in. Rod held in the boss of the Bush Wheel bolted to Flat Plate 9 and in a Double Arm Crank bolted to the underside of the 4½ in. Strip beneath it. A ½ in. Pulley 53 is fixed on the Rod, its face forming a platform on which the Girder Frames can slide, while a loose ¾ × ¾ in. Pinion 54 is added above the Frames to serve as a weight to prevent the pen arm from rising. A Double Arm Crank 55 is secured to the underside of Strip 50, its boss coinciding with the sixth hole of the Strip and acting as the pen-holder. In operation, Rod 38 is located in one of the holes towards the other end of the Strip.

A novel "extra" built onto the model is a movable support for the pen arm when not located for drive. A 2½ × ½ in. Double Angle Strip 56 is bolted to right-hand Flat Trunnion 17, then pivotally attached to the lugs of this Double Angle Strip by a 3½ in. Rod are two 3 in. Strips, connected at their outer ends by a second 2½ × ½ in. Double Angle Strip 57. The Rod is held in place by a ½ in. Pulley and a Collar. A third 2½ × ½ in. Double Angle Strip is bolted back-to-back to Double-Angle-Strip 57 and in its lugs is journalled a 4½ in. Rod held in place by two Collars, each Collar being spaced from its lug by a ½ in. Pulley without boss 58. A ½ in. Pulley with boss is fixed towards the upper end of the Rod. The pen arm is slipped over the Rod when not engaged on Rod 38. Note that the lower end of the Rod projects very slightly beneath the securing Collar. Thus, when the support is not in use, it is hinged back to the frame, where the projecting end of the Rod is engaged in the space between Girders 1 to hold the support in place.

Revolving Table

We now come to the revolving table, with which care should be taken if good results are desired. The simplest table would of course be a wooden disc fixed to a Face Plate or Bush Wheel, but it is doubtful if this would give the results obtained from Andreas' carefully designed unit. This consists of a 6 in. Circular Plate 59 (covered with a paper disc), to each side of which a Face Plate 60 is bolted. A 2 mm. (approx. 1/12 in.) thick glass disc of 121 mm. (approx. 4 25/32 in.) diameter is obtained and positioned inside a 5½ in. Circular Girder 61, then the Girder, with the glass disc is secured to the Circular Plate, using four ¾ in. Bolts. Each Bolt is first fitted with a Washer, then is inserted into the Circular Girder and secured with a Nut. The glass disc is added, followed by a second Nut which is screwed up until the glass is tightly held between the two Nuts, care being taken not to break the glass by over-tightening the Nuts. (Although Andreas does not call for it, it might be an advantage to fit Washers between the glass and Nuts, here.) The four Bolts are then passed through the Circular Plate and finally secured by further Nuts.

It will be seen that a space equal to one Nut thickness remains between the glass disc and the lip of the Circular Girders. Into this goes the paper discs on which the patterns are drawn. These discs are ingeniously held in place by a "circlip" in the form of a length of steel wire curved round to an open and incomplete circle, with the ends of the wire bent up at right-angles. The length of the wire should be such that, when the open ends are closed to form a complete circle, the circle will fit inside the Circular Girder. Then, when the ends of the wire are released, the "spring" in the wire should cause the circle to open against the Girder and thus effectively clamp the paper disc. Andreas recommends wire with a diameter of about 2.2 mm. and we found 13½ in. to be a suitable length. Using Face Plates 60, the completed table is fixed on the upper end of the 3½ in. Rod carrying Gear 26 in the table support.

Lamp

Although not an essential component the lamp illuminating the design table makes a novel luxury feature. This is built up from a 2½ × 2½ in. Insulating Flat Plate 62, to the centre of which an 8-hole Bush Wheel is fixed. Secured in the boss of the Bush Wheel is a 3½ in. Rod carrying a universal Coupling 63 on its upper end, this Coupling in turn carrying a 1 in. Rod, to which a 1½ in. Contrate Wheel 64 is secured.

A Lamp Holder 65 with clear Lamp is now fixed *by one lug only* to the inside of a Wheel Flange 66, but is spaced from the Wheel Flange by a Collar on the securing ½ in. Bolt. Using its two opposite free holes, the Wheel Flange is then bolted to Contrate Wheel 64. A length of insulated wire is threaded through the Contrate and Wheel Flange and is connected to the free lug of the Lamp Holder, care being taken to ensure that the connection remains isolated from any other metal part of the construction. The other end of the wire is connected to one of two Contact Studs 67 secured to Insulating Flat Plate 62. The remaining Stud is connected to one of the Bolts fixing the Bush Wheel to the Insulating Plate, then the Plate itself is bolted to left-hand U-section Girder 7. A suitable power source is connected to Studs 67. A shade for the lamp is supplied by a 5½ × 1½ in. and a 2½ × 1½ in. Flexible Plate bolted together in a thirteen hole circle and wedged inside the flange of Wheel Flange 66.

Operation

To set up for operation, a suitable drawing instrument, or pen, such as a free-running ball-point pen refill, is fixed in Crank 55 on the pen arm. A Cone Pulley 68 is slipped over the pen to serve as a weight to keep it in reasonably firm contact with the drawing paper disc, then the pen arm is located by one of its holes on Rod 38. Either Gear 31 or Gear 32 (never both) is tightened on its Rod and the machine is then ready to go. Pattern variations can be achieved in a number of ways, the most obvious being changing Rod 30 to a different hole in the pen arm. Also, however, the position on its supporting Rods of the Coupling carrying Rod 38 can be altered; the number and layout of the Bolts in slide-motion cam 40 can be changed; 57-teeth Gear 26 can be replaced by a 60-teeth Gear as also can be Gear Wheel 39, and, the pattern will differ between Gear Wheels 31 and 32, depending on which is fixed in place. The permutations of all these variables are almost countless.

"Photographic Plate"

Before finishing, I must mention a very interesting experiment successfully performed by Andreas with his original model. He de-greased the glass design plate with weak hydrochloric acid and then sprayed the plate with a thin coat of drawing ink dissolved in spirit. He mounted a gramophone stylus in the pen arm and then, in effect, engraved a pattern onto the glass plate which he subsequently used as a photographic plate from which he could produce perfect photographic prints, greatly enlarged if desired. An excellent idea!

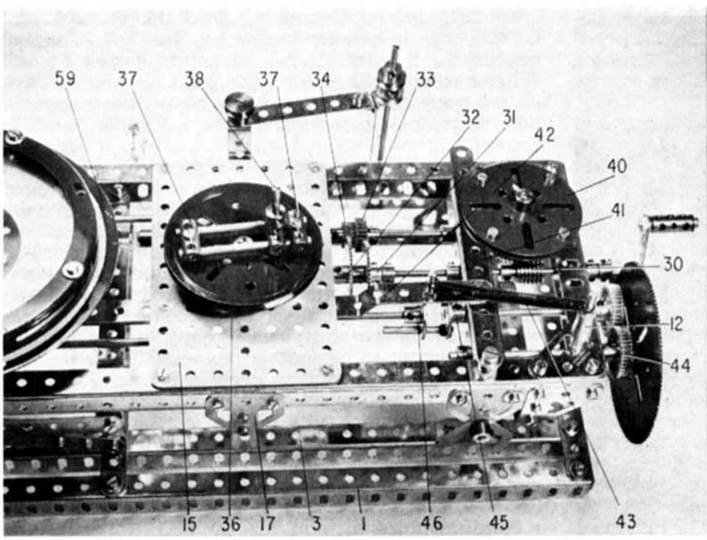
PARTS REQUIRED

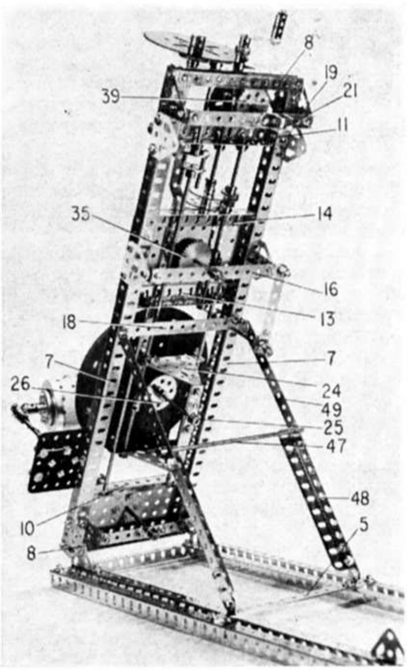
1—1	1—16b	1—45	1—123
1—1a	1—18a	3—48a	2—124
1—1b	1—19b	2—48d	4—126
5—2	3—23a	1—52a	6—126a
1—2a	3—23b	1—53	4—133
7—3	3—24	21—59	1—143
2—4	2—25	1—62	1—146
3—5	1—25b	1—62a	1—147b
4—6a	5—26	2—62b	1—173a
8—7a	2—27	4—63	1—211a
2—8b	2—27a	1—70	1—211b
10—9	1—27b	2—76	2—518
2—12	1—27c	2—77	1 flat
4—12b	2—27d	4—109	glass
1—13	2—31	6—111	disc,
2—13a	2—32	9—111a	121 mm
4—14	163—37a	1—111c	dia.
2—15a	127—37b	1—111d	1 length
1—15b	77—38	2—113	Piano
4—16	9—38d	1—115	Wire,
2—16a	1—43	2—115a	13½ in.

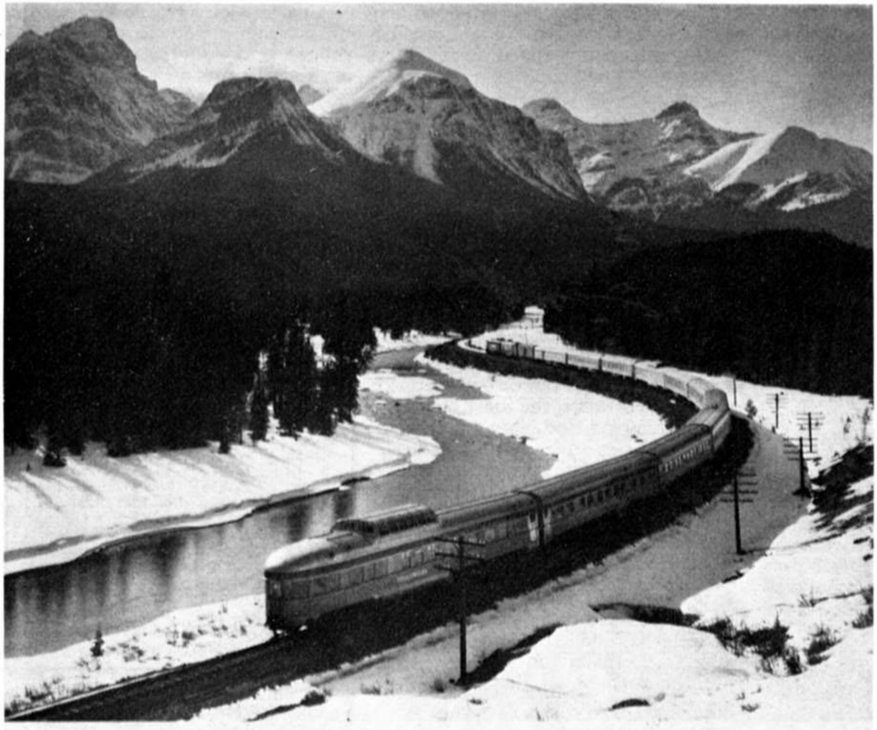
ADDITIONAL PARTS FOR LAMP

1—16	1—59	1—188	4—542
1—24	2—111	1—189	2—544
1—28	2—111c	1—511	Con-
13—37a	1—137	1—539	necting
9—37b	1—140	1—540c	Wire.

Right, the Guilloche Machine hinged open to show the general layout of the upper frame and drives. Note Rod 47 inserted in the hinge to lock it in place. Below, another close-up view of the model showing the pen arm movement actuator and the table-support movement cam.







The Canadian, crack stainless steel stream-lined train, approaches Lake Louise, in some of the rugged beauty of the route. Note that the the train is travelling away from the camera; the rear coach is one of those fitted with the famous observation "domes".

The story of one of the world's great railway lines

By John Ruffles

Canadian Pacific

THE Canadian Pacific Railway Company is Canada's biggest private business enterprise. It operates ocean-going ships, river steamers, an international airline, a chain of hotels and a complete telecommunications network. But to most people of course, Canadian Pacific means the railway, 21,400 miles of it, spanning the breadth of a continent through some of the world's most awe-inspiring country.

Like all great railways, the Canadian Pacific combines spectacle with romance. The courage and spirit of adventure needed to drive the railway across three thousand miles of wide lakes, vast plains and forests and huge mountains, gives the Canadian Pacific a unique place in the history of railway building.

The C.P.R. was founded in 1880, but more than twenty years before work had already begun to find a route for a line linking the Atlantic and Pacific Oceans. The great mass of the Rocky Mountains presented by far the biggest problem. An exploration party under Captain Palliser spent four years of hardship searching for a way through the wall of rock. One section of the party, led by Dr. James Hector, discovered one pass which they christened the Kicking Horse Pass, because it was there that Dr. Hector was kicked severely by his pack horse. Beyond that pass lay more ranges and for each a route had to be found. Walter Moberley discovered one by chance in the Gold Range. Catching sight of an eagle nest in a tree, he shot at it. The two eagles flew off and following their flight, Moberley saw what appeared to be a way through the mountains—it was and, naturally, he named it the Eagle Pass.

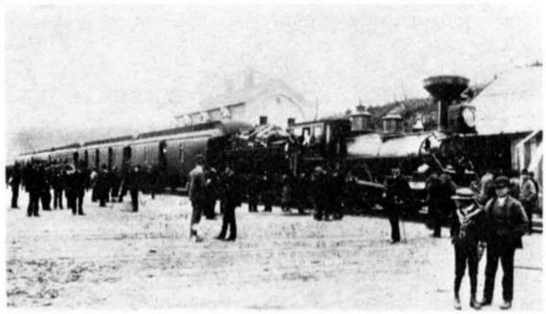
In 1871 British Columbia joined the Dominion of Canada and it became imperative that both east and west of the Rockies, Canada should be linked by rail. When a rebellion broke out in British Columbia in 1869, it took troops from the east 95 days to reach the rebels. So, the work of surveying and laying a line began in earnest.

Sandford Fleming, the chief engineer, and his men set out to find the shortest and best route. They forged through the dense, unmapped forests and across the vast, empty prairies. And here the Canadian railway is probably unique, for rather than joining established settlements, it was the railway which founded the towns. Then came the 500 miles wide mountain mass. From the western side of the Rockies, thirteen separate routes were tested, most of them converging on the Yellowhead Pass, but it was to be another ten years before the line could be completed by the Canadian Pacific.

In 1881 Major Rogers discovered a pass through the Selkirk range which was named after him, and this was the missing link. It was the route through the Kicking Horse, Rogers and Eagle Passes that were to be the ultimate bridge across the Rockies for the Canadian Pacific Railway.

Sandford Fleming and his engineers followed this

Driving the last spike in Eagle Pass to link the railway's two ends, in November 1885. It was *not* a gold one—just an ordinary iron spike. Second picture shows the first C.P.R. through train as it arrived at Port Moody in July 1886. Engine No. 371, a 4-4-0, was built in the Company's shops at Montreal.



route in 1883. Across glacial rivers, through forest fires, over precipitous mountain tracks, they surveyed the railway line. At one point, they walked for six miles along a trail only ten to fifteen inches wide, 500 to 800 feet above a turbulent river, with only the bare rock to cling to. Some of their journey could be covered by canoe, but for the most part they went on foot, using pack horses where they could, and Indian bearers where they could not.

One section of the line, alongside Lake Superior, was described as 200 miles of engineering impossibilities, through an area of forest, rock and swamp. This stretch took four years to build and of the twelve million dollars spent, two million was used for explosives. Twelve steamers, 2,000 teams of horses and 12,000 men were needed. In contrast, the 700 miles across the open Prairies were laid in fifteen months, and the chief difficulty here was from hostile Indians.

Across the Rockies, at Burrard Inlet on the Pacific coast, 7,000 men, mostly Chinese, hacked their way east for 200 miles to Kamloops, "the meeting place of the waters". At the Rockies the engineering problems multiplied. At one point in the railway there are thirteen tunnels in nineteen miles, and bridges often span gorges hundreds of feet deep. Sometimes the foundations of the line had to be carved out in solid rock. Men had to be lowered hundreds of feet on ropes to blast footholds in the mountain side.

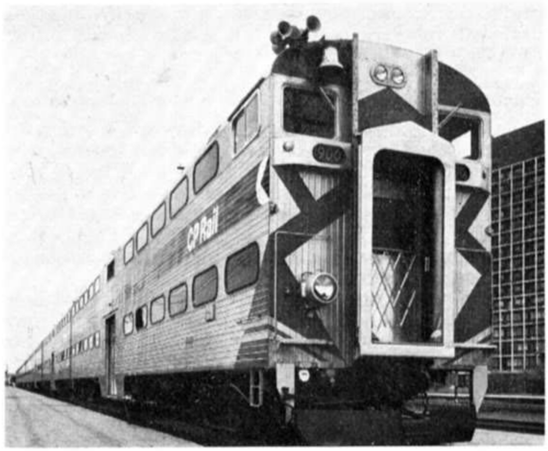
On November 7th 1885, at Craigellachie, 28 miles east of Eagle Pass, the last spike was driven The first through train left Montreal on June 26th 1886 and reached Port Moody, then the Pacific terminus of the line, on July 4th. Through trains have run daily ever since. Today the stainless steel streamlined train *The Canadian* crosses the country in just over 70 hours.

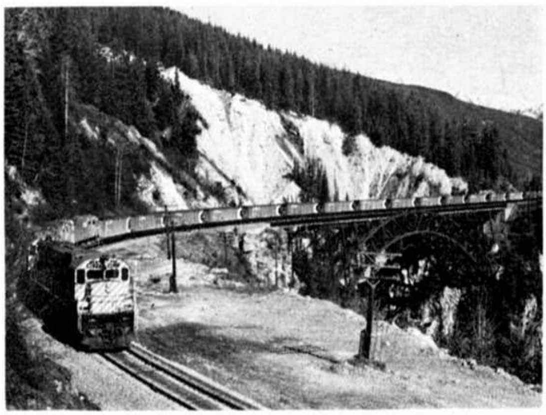
The completion of Canada's first trans-continental rail line was a monumental achievement, but the C.P.R. did not rest on its laurels. The first train carried neither passengers nor goods. The railway pioneers had to create their own traffic.

In 1887 ships were chartered to bring tea and silk from the Orient to Canada's west coast, where the freight trains could carry them eastwards. The C.P.R. Company brought settlers from Europe to people the empty prairies. The company supervised irrigation schemes to encourage cultivation. They provided telegraph services to link the tiny communities. The Canadian Pacific always looked to the future.

In 1943 they began the change from steam to diesel. In 1955 they introduced the stainless steel coaches with their famous observation domes. Today, C.P. is the largest investor-owned railway in the world and one of the most modern. Its use of integrated data processing (IDP) is more extensive than any other railway. Data can be collected from widely separated places and transmitted to a central place where it is speedily processed by the most powerful commercial computer in the world.

The Canadian Pacific has a romantic past, and a very bright future.





Third picture from top is one of the double-decker stainless steel commuter trains introduced by the C.P.R. Bottom, a Coal Unit Train on Stoney Creek Bridge in British Columbia.
All photos courtesy of Canadian Pacific.

Design and Construction of BRIDGES

Part Ten—Movable Bridges

By Terence Wise

All bridges may be divided into two distinct classes:-
1) fixed bridges, which includes the arch, cantilever and suspension forms, simple or continuous span.
2) opening or moving bridges which are used for maintaining a flow of traffic where two lines of communication cross. For example, a bridge which carries a road or railway over a navigable channel at low level will have to be opened occasionally for the passage of shipping, while in the case of the Manchester Ship Canal a movable bridge carries one canal over another. This month we deal with the various forms this second class of bridge can take.

Bascule Bridges

Bascule means simply a kind of drawbridge (from the French *bacule* meaning see-saw) raised and lowered with a counterpoise, and this type will be familiar to everyone from the most famous example-London's Tower Bridge. Built in 1894, this is one of the largest bascule bridges ever built, with a central span of 200 feet. The footway between the tops of the Gothic towers (now closed) is 142 feet above high water level.

Basically bascule bridges may be said to be those which rotate upon a horizontal axis and they may have one or two counterpoised leaves. The leaves rotate through 75 to 90 degrees and, with the supporting piers being at each side of the waterway, a clear channel for shipping can be made very quickly. This is the main advantage of this type. One disadvantage is that the weight of the leaves is concentrated on the pivots or trunnions, and this can be a problem in large spans. To a great extent the problem is overcome by enlarging the pivots until they are in effect wheels, or by a method such as that used for the Dry Pool Bridge over the River Hull, shown in the accompanying photographs.

FIG1.

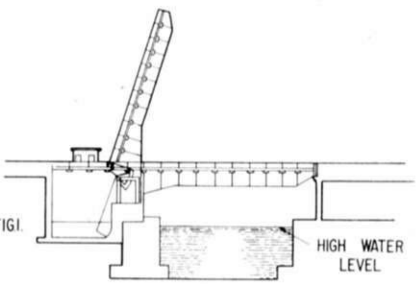


FIG 2.

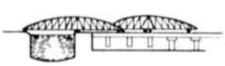


*Fig.*1 is a cross section of the Michaelson bascule bridge at Barrow-in-Furness docks, showing the single leaf span in both raised and lowered positions. Carrying the A590 across Barrow docks, this bridge replaced an old wrought iron one of 1886. Including the approach spans, the new bridge has an overall length of 900 feet and a width of 60 feet. The span over the waterway gives an opening of 79 feet six inches and opens 75 degrees to allow for the passage of ocean-going shipping. The leaf span is steel, and the approach spans are precast prestressed concrete beams supported on reinforced concrete portal frames.

Rolling Bridges

Rolling Bridges are those where the moving span is carried upon wheels or rollers and travels in a straight line across the waterway. In general the weight of the moving span is supported upon fixed portions of the construction. Not many of this type are built and one of the few examples in Britain may be seen in Newport docks. *Fig.* 2 shows the moving girder of this bridge in closed and open positions. The span is 72 feet and the girder is moved by hydraulic power.

The caissons which are used to close the entrances to graving docks (a dry dock where ships are cleaned and repaired) are sometimes made to travel on rollers across the floor of the dock when they carry a road on their tops and these may be included under the heading of rolling bridges.

Swing Bridges

This type is normally used for small openings and a typical small swing is illustrated in *Fig.* 3. The movable span rotates on a vertical axis, the weight of the span being carried upon a turntable, and balance is the secret of success here. The ring of the turntable contains a number of conical steel rollers which turn upon radial axles and travel round a circular roller path. An upper inverted roller path travels in the same way upon these rollers and this carries the main girders of the swing span.

In a few examples the navigable channel is spanned by two swinging cantilevers which meet in the middle, or by a single arm which rotates upon a turntable placed to one side of the opening, the swing arm being counterbalanced at the rear. Where a very wide channel has to be bridged the moving span may be divided into two openings, spanned by a double-armed swing bridge upon a central pier. In this case the girder becomes a balanced cantilever with two equal arms, supported upon the central turntable. When the bridge is closed the girder is made so that it fits on to the abutments and is therefore converted into a continuous beam of two spans. The form of girder is thus changed from that of a drooping cantilever to that of a continuous beam with a point of contrary flexure in each span.

In some other examples the weight of the swinging cantilever is carried on the head of a hydraulic ram, which becomes the central pivot of the turntable, and the whole load is supported by the pressure of the fluid on which the ram rests and turns. An up-to-date example of this type is that in the Cumberland Basin, Bristol. The Ashton Swing Bridge is a 270 foot six inches long balanced cantilever swing bridge, carrying dual 24 foot carriageways with ten foot cantilevered footways. Of the controversial box girder construction, and therefore

FIG. 3.

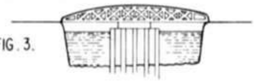


FIG. 4.

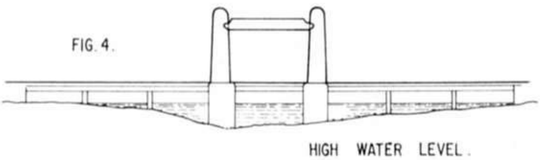
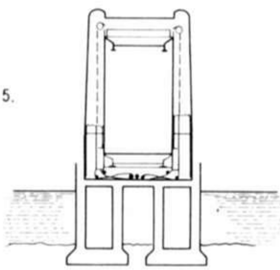


FIG. 5.

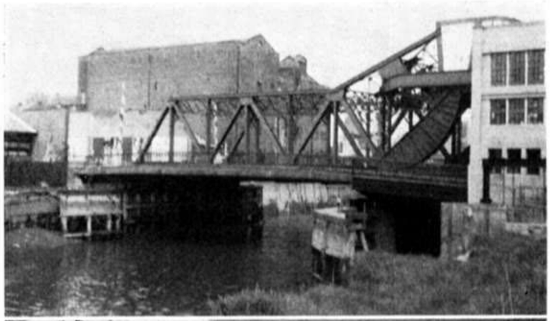


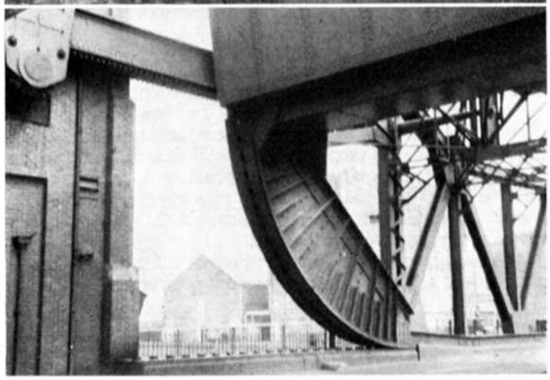
under restricted use at present, the thin plates are 14 feet six inches in depth at the centre and five feet at the ends. The moving weight of 865 tons is carried on a centre bearing of the roller variety which, together with a balance wheel rack and turning rack, is mounted on a reinforced concrete piled foundation. The bridge is electro-hydraulically operated by variable speed gearing driven by motors inside the structure. The usual objection to this type of bridge is that the supporting pier occupies too much space.

Vertical Lift Bridges

Lifting bridges are a less common form of movable bridge, although they do have many advantages and quite a few have been built in America. The weight of the moving span is taken by cables which pass over pulleys at the top of tall towers and are then attached to counter weights. The height of the lifting towers determines the clearance above water level. The moving span is raised in the same manner as a lift with the counter weights doing most of the lifting, and power is

(*continued on page* 556)





This column, top, Dry Pool Bridge, Hull. An example of the single leaf bascule. Above, the main pivot for the leaf of Dry Pool Bridge. Below, a single arm bridge at Cumberland Basin, Bristol, which rotates on a turntable placed to one side of the opening. Bottom, the Ashton Swing Bridge, Bristol, pivoted at the centre. The elevated control cabin to the left gives the bridge master a clear view of road and river traffic. This is an example of the cantilever double leaf swing bridge. Opposite page, the high level Tasman bridge in Tasmania during construction (1964). One of the world's longest bridges built in prestressed concrete, it replaced the floating arch bridge, a form of vertical lift bridge, which may be seen in the centre of the picture, with the span raised to allow a ship to pass through. *(Australian Information Bureau photo).*

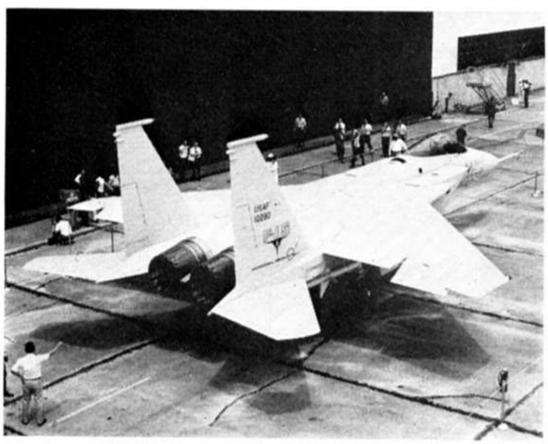
Air News

By John W. R. Taylor

Twin-tail Eagle

When Russia first unveiled its MiG-23 twin-jet fighter at the 1967 Societ Aviation Day display, America's Air Force leaders knew that they had no combat aeroplane in service, or even under development, that could match the MiG's performance. Within a few months it showed its paces with a speed record of 1,852.61 m.p.h. around a 500-km. (310-mile) circular course. This suggested a maximum speed of around 2,000 m.p.h., or three times the speed of sound.

NATO coined the name "Foxbat" for the MiG-23 and waited anxiously for signs that it might be entering service. By the Spring of 1971 there was no longer any doubt. A squadron of the new fighters had been airlifted to Egypt by huge Antonov An-22 freighters, and when they began making reconnaissance flights over Israeli-occupied territory, the American-built Phantoms flown by the Israelis failed miserably in their attempts to intercept the fast, high-flying MiGs.



Meanwhile the USAF had begun its quest for a new air superiority fighter, capable of undertaking fighter sweep, escort and combat air patrol duties. It had to be able to track down, identify, engage and destroy not only aircraft as good as the MiG-23 but *any* kind of combat aircraft, in service or projected, in friendly or enemy skies, and however much enemy electronic countermeasures might try to jam or interfere with its search and missile control radar.

It was not easy. Since the USAF had first encountered Soviet jet-fighters over Korea in the early 'fifties, the MiGs had generally been more manoeuvrable and demonstrated better acceleration than their American counterparts. On the other hand, US fighters were usually superior in range, firepower, electronics and military load. This was not good enough. In the USAF's own words, its new air superiority fighter had to "out-climb, out-manoeuvre and out-accelerate a MiG-21, a MiG-23 or any other kind of MiG you might find in the next decade, wherever air-to-air combat takes place".

Fairchild Hiller, McDonnell Douglas and North American Rockwell all put their best project design teams on to the task of evolving a fighter to meet the urgent demands of the Air Force. After studying their proposals for six months, the USAF selected McDonnell Douglas as leader of the industry team that would develop and produce the new aircraft, which was allocated the designation F-15. It was by then December 1969.

To cover the cost of the 20 F-15s that would be used for development testing, the Air Force asked for, and received, nearly £480 million. Pratt & Whitney got a fair share of this immense sum to finance production of the F100-PW-101 afterburning turbofan engine. Each has two F100-PW-101s, and their total of around 58,000 lb. of thrust is greater than the maximum loaded weight of the fighter. As a result, the F-15 will be able to accelerate while climbing vertically to supersonic speeds, and will have great manoeuvrability in combat.

After another design competition, Philco-Ford Corporation received the contract to develop a new 25 mm. cannon for the F-15. Hughes Aircraft Corporation won the contract for a new radar able to lock on to

The McDonnell Douglas F15 Eagle is quite a lot of aeroplane for a single seater. From the pictures it looks as if the ailerons can be drooped for additional flap effect.

targets at long range, direct the launching of medium- and short-range missiles, and provide range, steering and firing data for the gun.

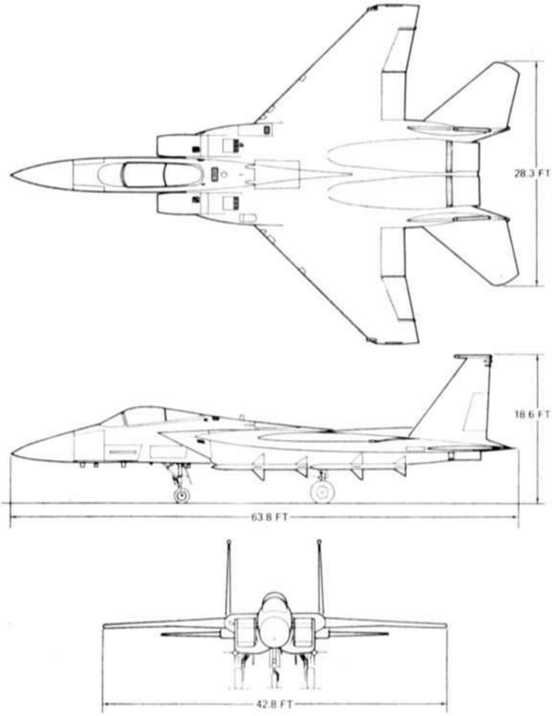
As the design took shape at St. Louis, the F-15 emerged as a single-seater no less than 63 ft. 9¾ in. long, with sweptback wings which spanned 42 ft. 9¾ in. and were very similar in shape to those of its predecessor, the Phantom. Unlike the US Navy's new F-14 Tomcat, the F-15 does not have variable-geometry "swing-wings". It does share the box-like air-intake trunks and twin tail-fins of both the F-14 and the MiG-23.

Immense efforts were made to ensure that it would be right from the start. McDonnell Douglas spent 16,000 hours on fatigue tests of the stabilators alone. These are the separate all-moving horizontal tail surfaces that replace "old-fashioned" tailplane and elevators; static tests showed that they could withstand twice the loading for which they had been designed, without failure.

Progress was so rapid that the prototype F-15 was ready for official roll-out on 22 June 1972, when it received the name "Eagle" at an impressive ceremony. It flew for the first time just over one month later, on 27 July.

Initial reports suggest that it is every bit as good an aeroplane as one would expect from the company that designed the Phantom. Top speed is well above twice the speed of sound and manoeuvrability already looks good. Some critics point out that the F-15 is not nearly so fast as the MiG-23, which has been in service for some years. In reply, the USAF contends that air battles seldom take place at extremely high altitudes, and that high-flying, fast machines like the MiG-23 must usually descend and engage in combat at lower altitudes to be effective. They add that a large, relatively unmanoeuvrable aircraft designed for high-speed and high-altitude flying cannot compete with the F-15 when the latter's maneouvrability is taken into account.

Who is right, the Russians or the Americans? We can only pray that the answer will never be demonstrated in war.



'copter Crook

Bell Helicopter Company's Australian consultant, Frank Sharpe, tells the story of a youthful chef who pocketed about £3,000 at a Perth hotel and hot-footed it to the local airport for a get-away. Having no success in trying to start the engine of a Cessna lightplane, he decided to use a Bell helicopter owned by Australian Helicopters Pty of Adelaide. Although not a licensed "chopper" pilot, he managed to become airborne but crashed it into a BP refuelling shed.

Suffering only minor injuries, the chef limped two miles to the nearest main road. There he hid the money and was picked up by a passing motorist, who took him to hospital. The police were waiting.

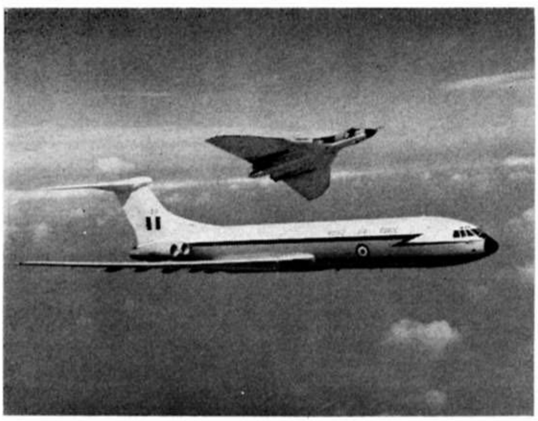
Meanwhile, local Aborigines found one cache of the money and went on a wild spending spree, purchasing a small town's complete stock of bicycles, sweets and chocolates. The other cache was discovered later by the police.

Four Into One Have Gone

Back in 1968 the Royal Air Force had four operational Commands in the United Kingdom—Fighter, Bomber, Coastal and Transport. Since 1 September this year the RAF at home has deployed just one Command. On that date Air Support Command disbanded and its remaining elements became No. 46 Group of Strike Command, which now controls five Groups and has administrative responsibility for the Military Air Traffic Operations organisation and Royal Observer Corps.

The decision to merge Strike and Air Support Commands followed the withdrawal of British forces from the Middle and Far East and the current emphasis on defending Western Europe. Strike Command is now committed primarily to operations within NATO, and its aircraft are assigned to both SACEUR and SACLANT (Supreme Allied Commanders Europe and Atlantic) for this purpose.

It controls a total of some 50,000 personnel and more than 800 aircraft, in an area stretching from Saxa Vord in the Shetlands to St. Mawgan in Cornwall, and from Coltishall in the East to Bishops Court in the West. Units vary from large, busy flying stations to small support establishments. Strike Command's inventory



Together for the first time in the same command, a VC10 strategic transport and a Vulcan bomber.

of "hardware" ranges from supersonic Lightnings and Phantoms to tiny Basset communications aircraft, including Vulcan bombers, Victor tankers, giant VC10 and Belfast transports, the vertical take-off Harrier strike fighter, a fleet of Puma helicopters, maritime Nimrods and "workhorse" Hercules transports.

Super-Jumbo

All 213 of the Boeing 747 "Jumbo jets" ordered so far by 31 airlines are scheduled to have Pratt & Whitney JT9D turbofan engines. However, Boeing has agreed to develop and flight test a prototype 747 powered by four General Electric CF6-50 turbofans of the kind fitted in the Series 30 long-range version of the McDonnell Douglas DC-10 tri-jet airliner. First flight is planned for July 1973, with testing to be completed by the end of the year.

The Aerospatiale SA 360 helicopter photographed on its maiden flight in June this year.

Some US airline experts consider this to be bad news for the makers of the Concorde supersonic transport. They believe that a CF6-engined 747 will be able to fly over routes like London to Sydney, Australia, with only one stop, perhaps with below-deck sleeper cabins for passengers willing to make the long haul. By cutting out other en-route stops, the 747 could offset the present 11-hour advantage which the Concorde offers over standard "Jumbos".

New French Helicopter

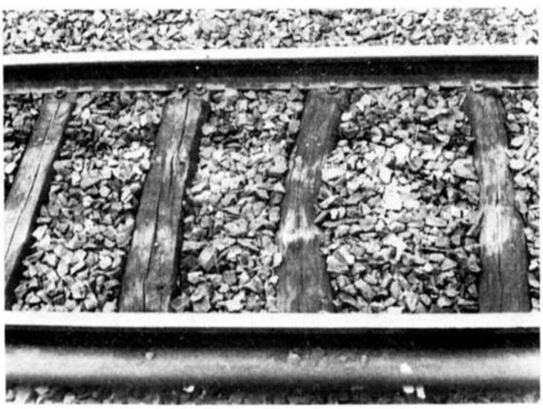
The last picture on this page shows the prototype of Aerospatiale's new SA 360 helicopter, which flew for the first time at Marignane, in the South of France, on 2 June this year. It is a little larger than the well-known Alouette III, with ten seats arranged in three rows. Power plant is a 980 h.p. Turboméca Astazou XVI turboshaft, driving a four-blade rotor of the kind fitted to the Aérospatiale/Westland Gazelle, with plastics blades. The tail rotor is also of the shrouded "fenestron" type used on the Gazelle.

Good streamlining and the lightweight power of turboshaft engines give modern helicopters a performance that makes their predecessors look like tortoises. After less than ten hours of flight testing, the SA 360 had already clocked a level speed of 162 m.p.h. at its maximum loaded weight of 5,500 lb.

BRIDGES *(continued from page 553)*

only needed to overcome the initial inertia and any friction between the guides fixed to the towers which keep the moving span in line. The first vertical lifting bridge was built in 1894 by J. A. L. Waddell at South Halsted Street, Chicago, with a span of 130 feet. The world's longest lift span is over Cape Cod Canal, completed in1935 with a span of 544 feet.

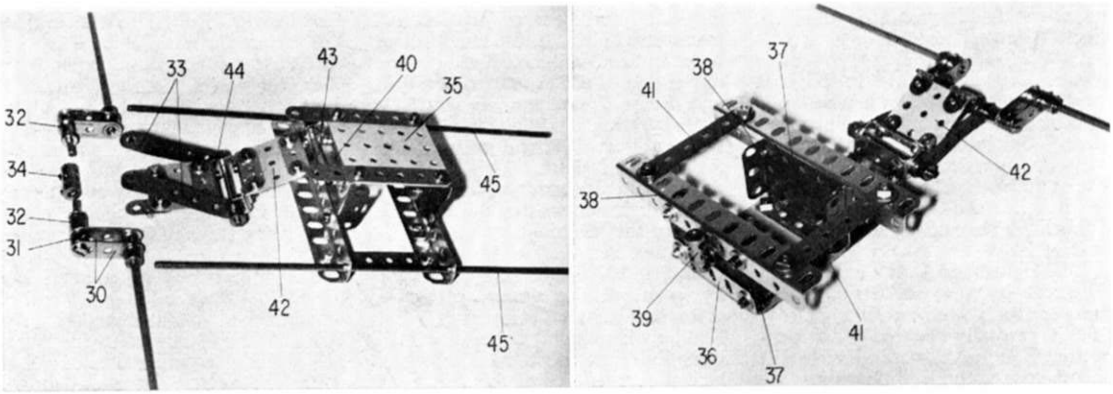
One of the most modern lifting bridges is that built over the River Swale at Kingsferry, carrying the A249 to the Isle of Sheppey. It cost £1.2 million and has a lifting span of 90 feet with a vertical clearance of 95 feet. An important feature of this bridge is the lifting mechanism which is located in the piers at each end of the lifting span with the winch motors synchronised electrically. There is no mechanical linkage. This is a revolutionary step forward (lifting bridges normally have machinery on the lifting span itself)which enabled the engineers to save a great deal of weight in the bridge and tower construction, and consequently to reduce the size of the towers and piers. *Fig.* 4 shows the bridge and approach viaducts: *Fig.* 5 a cross section of one of the towers and the lifting span.



Transporter Bridges

Another form of lifting bridge, this type is best described by the alternative term—aerial ferry. The design consists of an overhead bridge supported by tall towers with a moving cradle slung from the bridge. A platform is then slung from the cradle so that it is aligned with the sides of the opening to be spanned and the loaded platform is then conveyed across the gap by the movable cradle. This style of bridge is mostly used to cross wide or very busy rivers or harbours where any other form of bridge might obstruct the traffic, or where the cost of other forms of bridge, with long approach viaducts, makes the cost prohibitive. The first bridge of this type in Europe was built at Rouen in France with a span of 466 feet: there is another at Marseilles with a span of 541 feet. In Britain there are examples over the Mersey and the Manchester Ship Canal, both with spans of a 1000 feet, and at Middlesborough. The latter was built in 1911 and was a great engineering marvel in its time. Carrying 10 vehicles and 600 people it is still one of the largest of its kind in the world.

The piece of railway track at the left was photographed by John Coulson while on a visit to Northern France. This example of French permanent way between Calais and Lille startles the British eye used to ruler-straight wood or concrete sleepers at home. These sleepers at Hazebrouck are little more than squared off branches with the rails bolted down in an almost casual fashion. Despite this, all the French lines the Editor has travelled on have been notably smooth.



Automatic Rivet-making Machine

Above, top and underside views respectively of the ram, toggle links and crankshaft in "exploded" form.

Part three of an advanced model requiring relatively few parts By P. Blythe

Punch and Extract Mechanism

In the case of the punch and extract mechanism, this section is operated by a cam, built up from a Fishplate (forming the lobe) bolted by its round hole to a Bush Wheel 95. The lift should be approximately ¼ in. The Fishplate is trailing when the crankshaft is rotated in the correct direction, i.e. clockwise when the shaft is viewed from the left-hand end. A Grub Screw locks the Bush Wheel to the shaft, the boss being spaced by a Washer from the left-hand bearing housing.

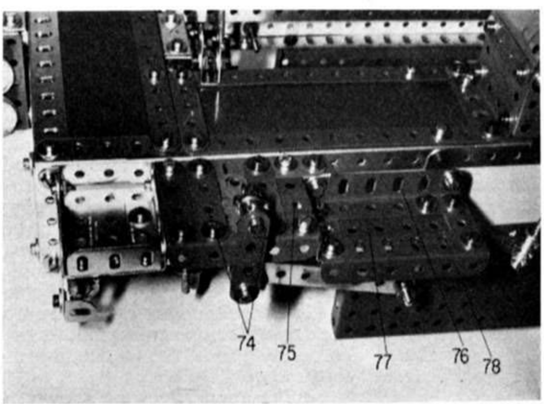
The cam follower and "rocker" are made up from a pair of 3 in. Strips 96 secured together by five ½ in. Bolts, the Strips being spaced by lock-nuts. A ½ in. Pulley rotates freely on the upper Bolt, while the lower Bolt carries a pivoting Rod and Strip Connector. The centre pair of Bolts retain two forward-facing 1 in. Corner Brackets 97 and the remaining Bolt forms an anchor for a rearward-facing Tension Spring 98, the opposite end of which is secured to the rear of the body by a 1⅛ in. Bolt.

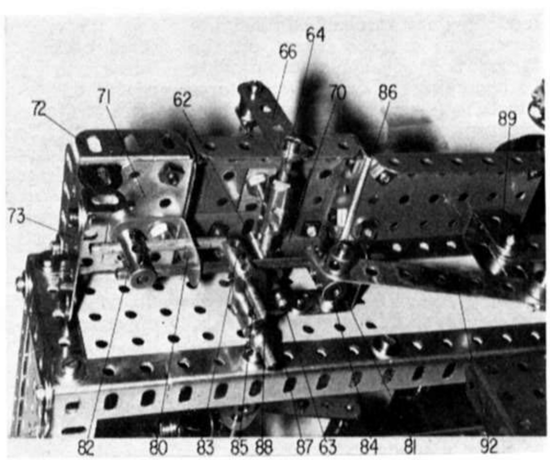
The rocker pivots upon a 3½ in. Rod, journalled in the left-hand bearing housing and retained by a pair of Collars. Lock-nutted together are a pair of Rod and Strip Connectors 99, one of them being fitted with a 2 in. Rod and the other, with a 8½ in. Rod. This latter Rod is pushed into the Rod and Strip Connector on the cam follower, while the shorter Rod is slid into Double Bent Strip 18 with its end pushing against the front horizontal rocker inside the feed roller assembly at the front of the body. This front rocker is held against the end of the Rod by a rubber band slipped over one arm and hooked on to a Bolt 100 within the frame.

Rivet Ejection Mechanism

Having been formed (in real life) the rivets are ejected and in the model the simulated ejection mechanism is supplied by a pair of Trunnions 101 bolted to the top of the left-hand side of the body. Journalled in these Trunnions is a 3 in. Rod, on each end of which a Crank is fixed, the left-hand Crank facing rearwards and the right-hand Crank forwards. The former Crank is extended by a 3 in. Strip 102, to the rear end of which two 1 in. Triangular Plates, separated by lock-

Below, the cutter slide housing and tool tray, viewed from above. Right, an underside view of the tool tray and cutter slide housing, with the cutter slide equipment.





nuts, are fixed by a pair of ½ in. Bolts. A third Bolt retains a freely-rotating ½ in. Pulley, acting as a roller. Actuating this roller is a cam comprised of a Bush Wheel 103 to which is bolted a Paxolin or metal disc 1¾ in. in diameter which has a "dwell" approximately ⅝ in. long, the radius of this portion being 11/16 in., i.e. the same as the Bush Wheel. The cam is secured by a pair of Bolts.

The right hand Crank is extended forwards by a 3½ in. Strip, to the free end of which an End Bearing 104 is pivotally secured by a lock-nutted Bolt. A 2 in. Rod is carried in the boss of the End Bearing.

Now journalled in Double Bent Strip 14 fixed below the die block is a 2½ in. Rod, retained by two Collars. The forward end of this Rod carries a further Collar secured by a 1⅛ in. Bolt projecting horizontally towards the right-hand side of the machine. Under the head of this Bolt a ½ in. Pulley 105 is secured to serve as a counterweight to keep the cam roller in contact with the cam. Adjacent to the rear Collar of the 2½ in. Rod is mounted a Coupling arranged vertically and secured by its end transverse hole. In the longitudinal bore is fixed a 1 in. Rod, on the upper end of which is carried a Rod and Strip Connector, to which is bolted by its "middle" hole a Pawl without Boss 106, the pointed end facing to the right. This serves as the "knock off arm" which gives a quick flick across the die at each cycle of the machine.

It now remains to fit a further Coupling 107 on the rear end of the 2½ in. Rod, the upper transverse plain hole of this carrying a 1 in. Rod upon which pivots a Small Fork Piece, in the boss of which is held the lower end of the 2 in. Rod projecting down from End Bearing 104. The timing of the cam must be adjusted so that the arm quickly whips across the die and returns while the Ram is at the back of its stroke—thus avoiding a collision!

Wire Feed Mechanism

The mechanism which actually feeds the wire to the forming and cutting units is built up from an Eccentric 108, mounted boss outwards on the left-hand side of the Crankshaft. Bolted to the arm of this Eccentric is a 9½ in. Strip extended a further three holes by a 3 in. Strip 109. A Pawl carrier is supplied by a 3 in. Strip 110, to one end of which is fixed a Threaded Pin. One hole down from the opposite end is a Pawl with boss 111 (boss outward) pivotally attached by a Pivot Bolt, the Threaded Pin and Pawl being situated on opposite sides of the Strip.

The upper feed roller shaft is a 5½ in. Rod, to the left-hand end of which is fixed a 1 in. Gear 112. The right-hand end carries a 1 in. Pulley 113 representing a feed roller. The shaft is, of course, journalled in the Flat Girder and Flanged Plate at each end of the feed roller housing.

The lower Rod is 6½ in. long and similarly journalled and also carries a 1 in. Gear and Pulley. Fixed on the left-hand end of this lower Rod, next to the Gear, are three Washers, the Pawl carrier assembly (Pawl outwards) and a Ratchet Wheel, also mounted boss outwards. Finally, Strip 110 is secured to the Threaded Pin on the bottom of the pawl carrier by a Collar. *(to be concluded)*

Meccano Parts and How to Use Them

PART II — SOME MISCELLANEOUS PARTS

By B. N. Love

ALTHOUGH competitors of the Meccano system have been numerous over the years, the majority of them have failed for one simple reason: they could never compete with the wide range of additional parts which the Meccano system offers.

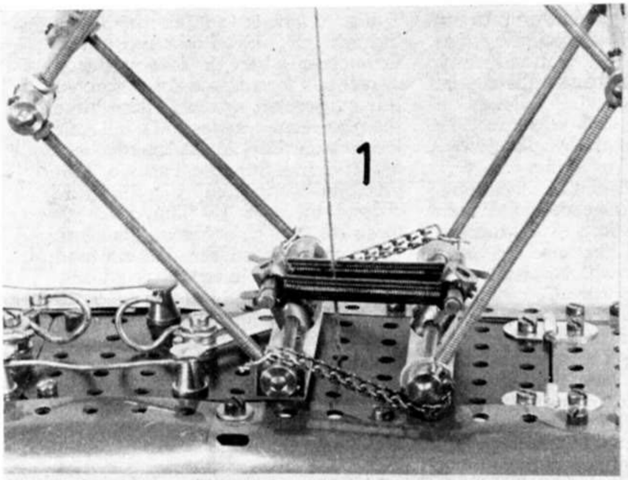
Once the basic construction of a model has been completed, detailed modelling and mechanical reliability depend to a large extent on the "brassware" available to provide both working and decorative features Meccano is rich in brassware, but, because of the very wide range available, it is only possible to feature here a few of the more popular and perhaps most useful of the miscellaneous parts.

Every serious constructor is familiar with the Collar, Part No. 59, as being a basic holding device for keeping Axle Rods in place. It is very much more versatile than this, however, and some additional applications are shown in Figs 1 and 2. In Fig. 1, a working pantograph is shown which will pick up current from a bare conductor wire overhead to drive a model train or tramcar. Although this particular design is well known to older readers, the introduction of the Meccano electrical parts of the 1960's enables an insulated fibre baseplate to be used for the pantograph anchorage, effectively insulating it from the metal framework of the electric locomotive. The use of a pair of Hinges, Part No. 114, can be seen in Fig. 1 and this allows the pantograph to be tilted back for wiring connections below. Collars are used extensively in this design and in their simplest form at the base of the pantograph, where they locate the two 2½ in. Axle Rods forming the lower pivots for the Screwed Rod framework. Again, we see an unorthodox use for another part – Sprocket Chain, short lengths of which are attached to the Screwed Rods entered into the Collar bosses as shown. Note that the two lengths of chain are rigged in opposite slope on the two sides of the loco roof and this ensures that, as the whole framework of the pantograph moves in concertina fashion to keep its tension against the overhead conductor, it does not topple fore and aft.

The middle joints of the pantograph can just be seen in the illustration of Fig. 1 and these require six Collars on each Axle Rod. The outside Collars are locked in place by their Screwed Rods and a lock-nut, but the Collars immediately inboard are free to turn on the Axle Rod, the second set of Screwed Rods being entered into the tapped hole of the Collars sufficient to make a firm hold, but not enough to bind against the Axle Rod. Finally, the inside Collars are locked to the Axle Rod to keep the middle free-turning Collars in place.

A development of the Collar is Part No. 63, the Coupling, and this also appears in Fig. 1. A pair of Couplings are locked to the lower Axle Rods of the pantograph as shown and linked by Tension Springs, Part No. 43, the Springs being held in place by 1 in. Axle Rods and Spring Clips. This ensures that the pantograph maintains an upper thrust towards the overhead conductor. The top of the pantograph is a 2½ in. Double Angle Strip, joined by an Axle Rod and more Collars to the upper set of Screwed Rods. A length of Meccano Cord, attached to the centre of the Double Angle Strip and passing down into the driver's compartment, allows the pantograph to be drawn downwards for stowage.

Similar applications are shown in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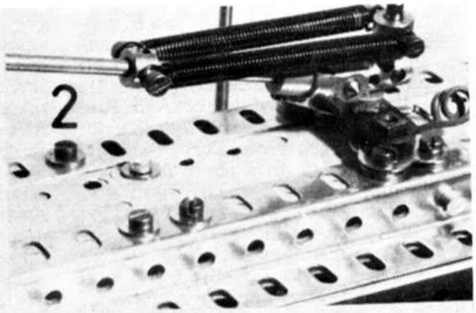
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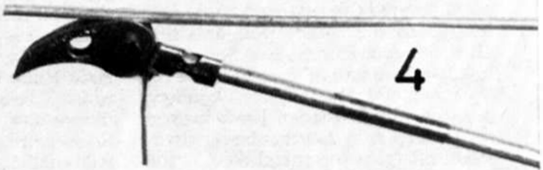
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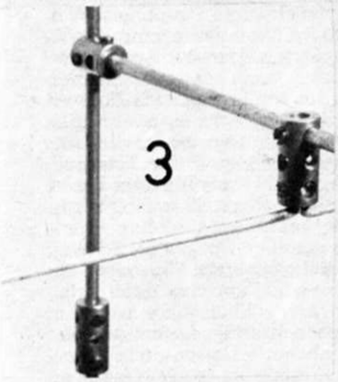
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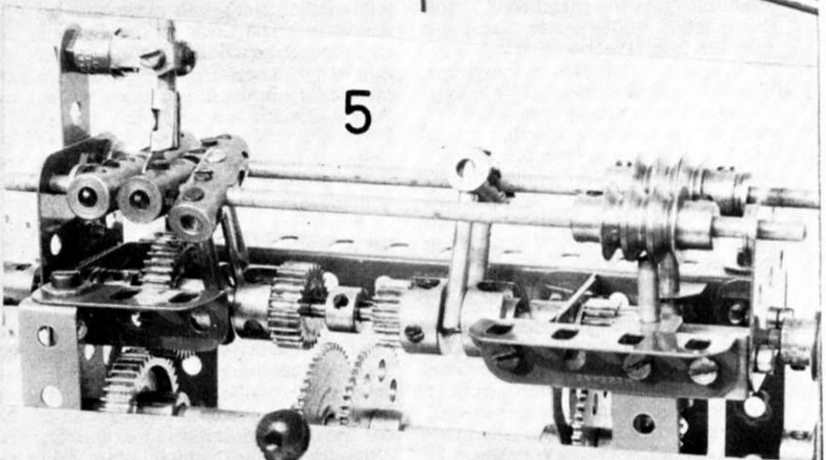
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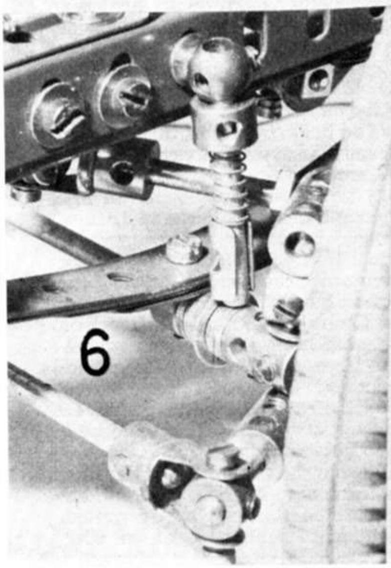
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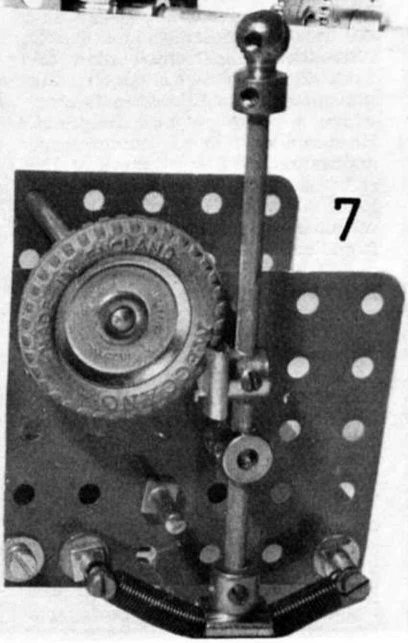
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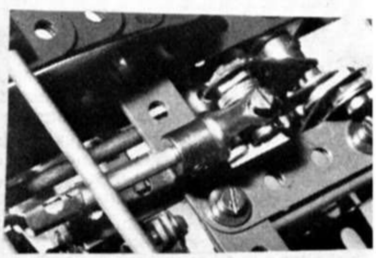
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Fig. 2 with much the same miscellaneous items. This time, tension is required on a trolley pole for an electric tramcar and this is achieved by pivoting the Axle Rod forming the trolley pole by means of a Small Fork Piece, Part No. 116a, which pivots on a short Axle Rod mounted in the rear cross-bore of a Coupling. A Threaded Pin, Part No. 115, is mounted vertically in the front tapped bore of the Coupling and this carries a Collar fitted with two Set Screws which trap a pair of Tension Springs. A second Collar is set on the trolley pole at a critical point to give the required angle and tension to the trolley pole and this also carries a pair of Set Screws to hold the rear end of the two Tension Springs. By pivoting the Coupling on a second Threaded Pin which is secured to a 1½ in. Insulating Strip stood off from the metal roof of the tram, the trolley pole becomes isolated from the metal framework of the tram and can be used for direct overhead pick-up.

Fig. 4 shows the upper end of the trolley pole where further miscellaneous parts are employed. A Rod Connector, Part No. 213, can just be seen under the numeral 4 and this allows various lengths of Axle Rods to be used to extend the trolley pole to critical length, as required. A Rod and Strip Connector, Part No. 212, is attached to the end of the trolley pole and this carries a pair of Pawls without boss, Part No. 147c, bolted in place, but separated by two or three Washers to permit entry of the bare wire acting as the overhead conductor. This is quite adequate for "straight line" track running. If a fairly stout copper wire is chosen, then it may be mounted as shown in Fig. 3, where the Coupling comes into its own again as the joints of the tramway standard. If the standards are used on wooden boards, no further insulation is required.

Somewhat larger than the standard Coupling is the Socket Coupling, Part No. 171, and two of these are shown in a sliding gearbox in Fig. 5. Something like dumb-bell in shape, the Socket Coupling has cylindrical recesses at each end which will accommodate the standard ⅜ in. diameter boss of the majority of Meccano gears and wheels. The centre portion of the Socket Coupling is waisted to recieve a fork arrangement intended to slide along. As this particular gearbox has been described elsewhere in Meccano literature, only the use of miscellaneous parts will be dealt with here. The versatile Coupling in this case provides a four-position "gate" for the gearbox and the use of the Rod and Strip Connector is again also seen, this time acting as a selector for either the near or farside Axle Rods forming the gear-change rods. Two of the Couplings are mounted at an angle on the sliding Rods so that a pair of 1½ in. Axle Rods which they both carry engage the waisted portions of the Socket Couplings, thus allowing them to be moved by the gear lever. Although not clear from the illustrations, these Socket Couplings are fitted with Key Bolts, Part No. 231, which allow them to be driven by the Keyway Rod on which they are mounted, but which permit the Socket Couplings to be slid along the Rod to engage the different gears, as required.

Notice the gear lever in Fig. 5 is mounted in a Swivel Bearing, Part No. 165, and this is really a Small Fork Piece attached to a special "Collar" having four tapped holes. Two of the holes are available for locking the "Collar" or "Spider", as it is sometimes called, to a shaft, but the two larger screws are special "Shoulder Bolts" which allow the Fork Piece to swivel freely, but prevent an Axle Rod from binding where a free pivot is required. Readers will note an unusual application of ½ in. Pulleys at the right-hand end of the gear-change Rods. These bear against the tips of short Axle Rods, spring-loaded from below, and give a positive register of the gear-change Rods in neutral or active gear.

Fig. 6 shows yet another application of the Rod and Strip Connector where it is used as a swivel end for a shock absorber on a leaf suspension system. This time the Connector carries a 1½ in. Axle Rod which slides in the smooth bore of a Handrail Support, Part No. 136, pivotally connected to the side chassis member by lock-nuts. A loose Collar below the Handrail Support takes up the distance and acts as a thrust ring for the Compression Spring. Further uses of the Coupling and Swivel Bearing are also illustrated in Fig. 6 where they form pivot joints in the steering linkage. Similar uses are shown in Fig. 8 where the drop arm from the steering column gearing, in the form of a Crank, is connected to the drag link.

Neighbour of the Handrail Support is the Handrail Coupling shown at the top of the brake lever in Fig. 7. Although the Handrail parts are commonly used, as their names suggest, in supporting Axle Rods as handrails, they are also versatile parts in their own right. In the application of Fig. 7 the Handrail Coupling simply acts as a lever knob.

The Slide Piece, Part No. 50, is normally used as a sliding component running along a Perforated Strip, but the brake illustrated in Fig. 7 uses it somewhat differently. In one case, a Slide Piece acts as a brake shoe bearing against a 1 in. Tyre, while the lower Slide Piece acts as a restricting and holding shoe as it bears against the Tension Spring, as shown. The Coupling on which the brake lever pivots permits adjustment of the Axle Rod to vary the pressure of the lower Slide Piece against the Tension Spring, while the upper Slide Piece may be set above or below the Tyre centre to vary the effective direction of the brake.

The final chapter of this series of 12 articles will appear in the December edition of the Magazine and will deal with some of the Meccano Electrical Parts.

MODEL-BUILDERS (*from page* 539)

1972 Report

Last, but by no means least this month, I give below a brief outline of the activities so far this year of the Stevenage Meccano Club, taken from a report submitted by Club Secretary Mr. Dennis Higginson, 7, Buckthorn Avenue, Stevenage, Herts.

The year got off to a good start with a visit in January to the Model Engineer Exhibition in London. This was enjoyed by all and prompted plans for further outings in the future. On May 13, the Club exhibited at the Pin Green School Fete, Stevenage, where a very large collection of models was shown—too large to list here, in fact. The builders involved included Peter Walton, Peter Brown, Paul Bourbousson, Geoff Long, Chris Buckland, Keith Langdon, Steven Hodges, Stephen Kuc, Peter Phillipson, Bernard Dunkley, Simon Baker and Dennis Higginson combined, and Peter Neville. Peter Neville has not been mentioned in these pages before, but he has been a member of the Club since 1970. Mr. Higginson tells me he is a very keen model-builder with a first-class attendance record at Club meetings. Several models designed by Mr. Roger Le Rolland of Stoke-of-Trent and built by Club members were also exhibited at the Fete. I was delighted to learn that Mr. Le Rolland has been offered, and has accepted, Honorary Membership of the Club—an excellent gesture, I feel, and a tribute to Mr. Le Rolland's many appealing models. Most of the models shown at Pin Green were also exhibited at a Fete at the Girls' Grammar School, Stevenage, on May 20. This was another successful showing which aroused a good deal of interest.

The Club continues to grow with new adult members including Bernard Dunkley of London, Paul Blythe of Aylesbury, V. Whitehead of Stevenage and G. Katlan of Hoddesdon. New younger members include Chris Buckland, Keith Langdon and Ian Chantley, all of Stevenage.

Anybody else interested in joining the Club should contact the Secretary at the above address. He will be delighted to hear from you.

EXHIBITION *(from page 536)*
previously mentioned. This weighed three-quarters of a hundredweight with its ballast and was traversed along its entire track length by a single Motor with Gearbox, although five other similar Motors were used to drive various other motions. Power for all the Motors was provided by a 12 volt car battery which allowed all the movements to operate at the same time.

Some splendid vehicles were on show including a Saracen Armoured Car complete with replica complex steering geometry, suspension and transmission of the prototype. Beautifully modelled by Paul Blythe of Aylesbury, this was a fine example of vehicle engineering in Meccano parts and was complete with scale gun turret. David Guillaume of Alcester also had a fine demonstration vehicle chassis on display. Fitted in a "glass" (perspex) case, the stripped-down chassis was end-mounted on rotating gymbals, driven in slow sequence to rotate the chassis through 360 deg.longitudinally with sequential operation of the transmission and differential gear inside the chassis. This enabled the public to examine vehicle mechanics literally from every angle. Presented in the latest Meccano colours of Blue, Yellow and Silver, David's chassis would be a credit to any engineering exhibition.

Colour-schemes, in fact, took full advantage of the various hues and shades which have cropped up from time to time in the paint shop of the Meccano factory in Binns Road over the past forty years and more, while even the original nickel-plated parts featured in early model replicas by Jim Gamble of Nottingham. Apart from these genuine early Meccano parts, Jim also brought sufficient of his Nottingham Meccano Collection of historical Meccano products and Hornby Trains to cover the entire width of the Town Hall rear display area – a miniature "Mecca" itself for the enthusiastic historian! A second mini-exhibition was put on by Pat Briggs, also of Nottingham, who displayed the finest range of accurate Meccano time-pieces and striking and chiming mechanisms which have ever been assembled by one builder. Pat is well-known for his specialisation in getting the last dyne of energy out of a standard Meccano Clockwork Motor – 24 hour runs being a piece of cake for Pat's low-friction designs.

Large-scale Showman's Road Locomotives were shown by Bert Halliday, Ernie Chandler and at least one more which obviously came from the Brian Rowe stable (probably built by him some ten years ago in red and green parts). Brian was a pioneer in large-scale traction engines from Meccano parts and although not at the Exhibition, he will probably recall his work. Of the large-scale locomotives on display, the pre-war Super Model L.N.E.R. 1,000 was shown by two enthusiasts, one modelled in original green parts and another in modern zinc-finished parts – both were excellent. Nor was the fair sex out of the running. Heather Burton brought her nicely-scaled narrow-gauge Tank Locomotive, the smoke-box and brass done features being outstanding in the neat way in which Heather had modelled them.

Simplicity models also had their place and were well admired by the public. A special class for youngsters was opened for competition on a "Space Age" theme sponsored by MW Models and these were judged by Bert Love. The task, he tells us, was not an easy one as the youngsters had shown much ingenuity, often with a handful of well-worn Meccano parts. Eventually, the first prize was awarded to 14 year-old Martin Brown for a remotely-controlled Moon Rover vehicle fitted with front wheel drive and steering and a rubber suspension system of novel form. Bert Love presented the prize – a No. 5 Meccano Set – to Martin, but commented on the excellent range of other competitors' models. By courtesy of MW Models, all other entrants received a Pocket Meccano Set as a consolation prize.

Time, like the proverbial wind, flew like magic and there just wasn't time to see and review all of the exhibits. We therefore beg the indulgence of those modellers who did not receive a mention in this report, and hope we have an opportunity of meeting many of them again at a future exhibition.

MODEL RAILWAY EXHIBITS

An additional attraction at the Henley Exhibition was a fine display of model railways organised by Mr. Vic Anger who, in combination with John Dalton, presented a giant OO-gauge layout in the Main Hall as a contrast to the Meccano exhibits. The Lower Hall, however, was given over exclusively to model railways and included the excellent scratch-built, 4 mm. scale layout "Dalcross" by Mr. W. Butler of Swindon which represented a 19th Century iron works complex. The Astolat Railway Circle of Guildford exhibited the "Wanborough Docks Railway", a detailed N-gauge OO layout which we understand is one of three permanent layouts normally mounted in the Circle's club rooms at Guildford. Another very fine N-gauge layout was presented by Mr. R. Perrett of Marlow, while Mr. Barker of Reading showed the very much larger layout "Cymru Lein Bach – The Gowen Valley Light Railway". This also was N-gauge, but, unlike the other OO scale layouts, it was produced to 7 mm., or "O" scale. Further fine layouts were exhibited by Messrs. John Owen and P. Hunt.

From the Meccano historian's point of view, perhaps the most interesting presentation on the railway side was a large layout of obsolete Hornby Clockwork Trains exhibited by Mr. Brian Wright. Although many of these trains could boast a considerable age, they all operated extremely well throughout the entire Exhibition and, after all this time, it was a joy to see them charging round the extensive track system. It brought back happy memories, not only for ourselves, but, judging by the crowds always surrounding the layout, for the vast majority of visitors as well.

Last, but not least, we must mention a final attraction presented by the courtesy of British Rail in the shape of regular film shows which were screened by B.R. at intervals throughout the day. Among other things, these dealt with various aspects of full-size railway manufacture and operation and they certainly made a very interesting "extra" in a day-long Exhibition which we do not hesitate to class as outstanding.

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

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

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Junior: Participants, either sex, under the age of 16 at time of entry. Within this group no heat or flame technique for moulding may be used, but any other form of adhesion may be utilized.
Senior: Participants, either sex, over 16. Within this group, any form of adhesion is accepted. Heat to bend or shape the pens may be used.

3 Entries for the competition must be accompanied by the official entry form below.

4 Any number of BIC Ballpen barrels may be used. All models must be constructed utilising any part of BIC Crystal Fine (Yellow) and Medium (Transparent) ballpens.

5 BIC Crystal barrels may be cut to shape or size, but each barrel must clearly show the Registered trade name BIC (as imprinted on the barrel). Where models are moulded by heat, there must be at least 10 parts where the BIC Registered trade mark is clearly shown.

6 Accessories other than BIC parts may be used *only* to make the model functional or to infer final design, i.e., wheels, transfers, cotton, string, paper, etc.

PRIZES

7 Prizes will be awarded to competitors who, in the opinion of the panel of judges, produce the most creative, unusual or skilful entry for each quarterly competition.

8 **Quarterly prizes will be awarded as follows:**
Senior section—first prize £25.
second prize £15.
third prize £10.
10 consolation prizes of £5 each.
Junior section—first prize £15.
second prize £10.
third prize £5.
10 consolation prizes of £2 each.

9 Models winning any of the three prizes in either Junior or Senior levels of any of the quarterly competitions will automatically be entered in the BIC National Championship Competition and the individual competitor whose model is selected by the judges to be of greatest merit will receive an additional cash prize of £250 together with the 1972 BIC Model-Making Trophy.

10 **Entrants should send their models to:**
The BIC Model-Making Competition,
c/o Montague House, 23 Woodside Road,
Amersham, Bucks.
Should a model be considered delicate for conventional postage, then a photograph (colour or black and white) may be despatched beforehand. This will be used for preliminary judgement. Entry forms should be clearly attached to each model or photograph entered.

11 No responsibility can be taken for the damage in transportation of any model received. Judges will, however, take into account such unfortunate circumstances and the model will still be eligible for participation within the contest.

12 Should participants require a model returned, then return postage must be included by way of enclosing the appropriate stamps.

RESULTS

13 The 1972 competition will be held during 3-monthly periods and results will be announced during August 1972, November 1972, February 1973.

14 Participants should ensure that their models are despatched to arrive by 1st June (for August judging), 1st September (for November judging) and 1st December (for February judging).

15 Any model received after this date will not be eligible for the relevant Quarter but will qualify for the next Quarter's competition.

16 Any prize winning model will become the property of Biro-Bic Ltd., and may be used in any way they think fit.

17 Employees, relatives or direct associates of Biro-Bic Ltd., Model and Allied Publications Ltd., as well as their advertising agents will not be eligible for this competition.

18 The decision of the Judges is final and no correspondence can be entered into in relation to prizes awarded or decisions made.

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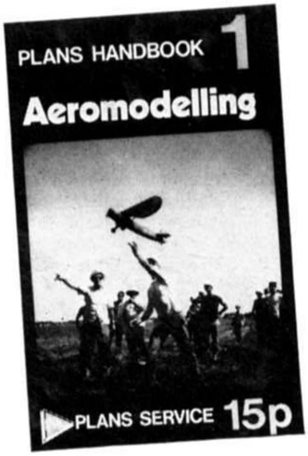

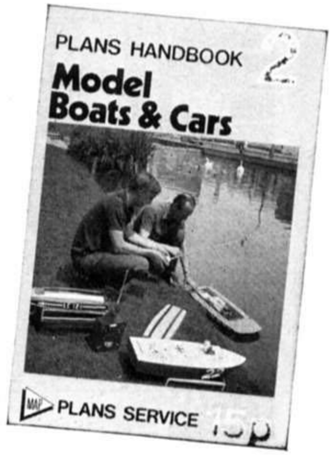

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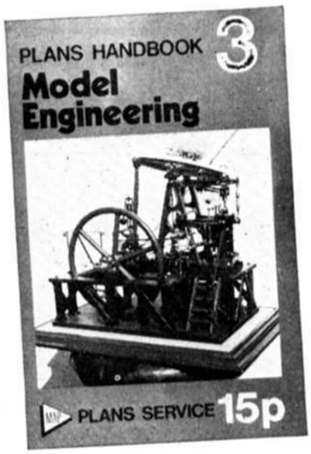

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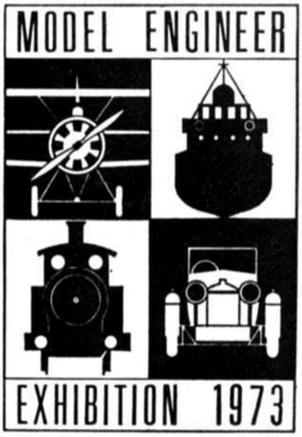

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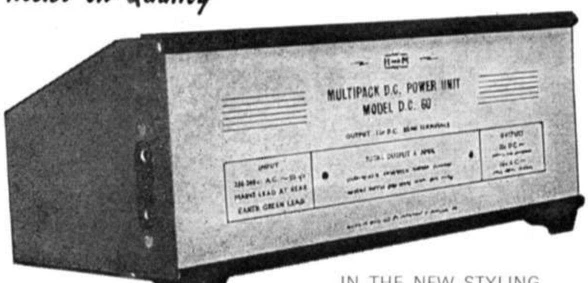

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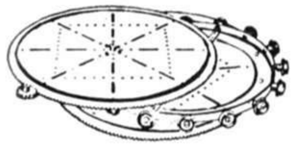

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