MECCANO® Magazine

MARCH 1970

★ STORY OF GOLD ★
★ MECCANO MODELS ★
★ AIR RIFLES REVIEWED ★

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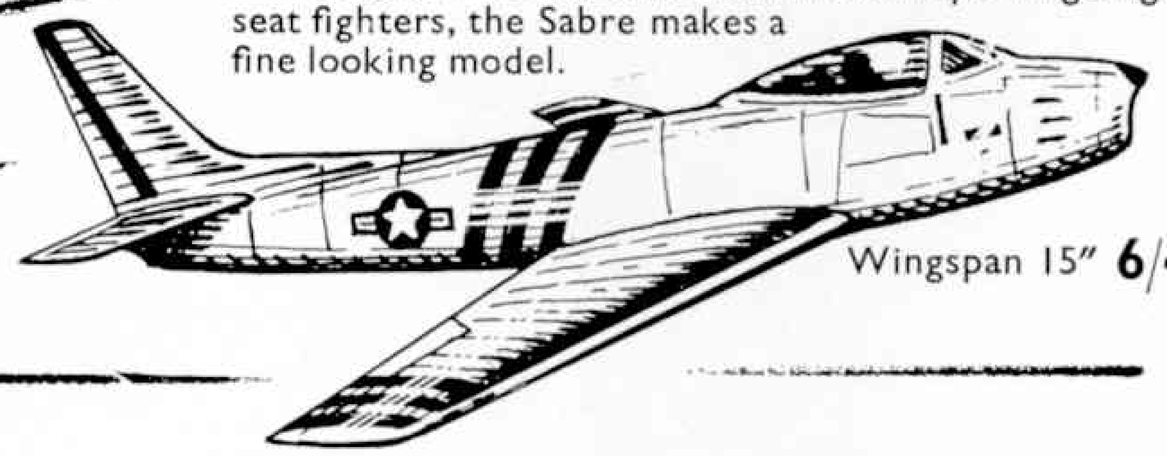
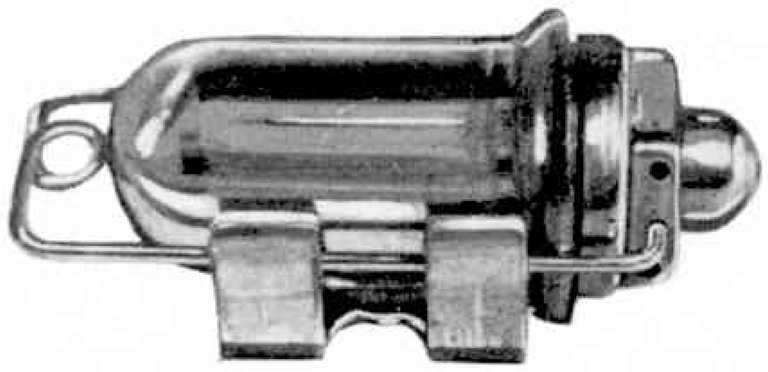
SABRE

Veteran of the Korean War, the F86 Sabre achieved air superiority over its chief adversary the Russian MIG 15. One of the first swept wing single seat fighters, the Sabre makes a fine looking model.

Wingspan 15" **6/4**



JETEX 50



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8/6

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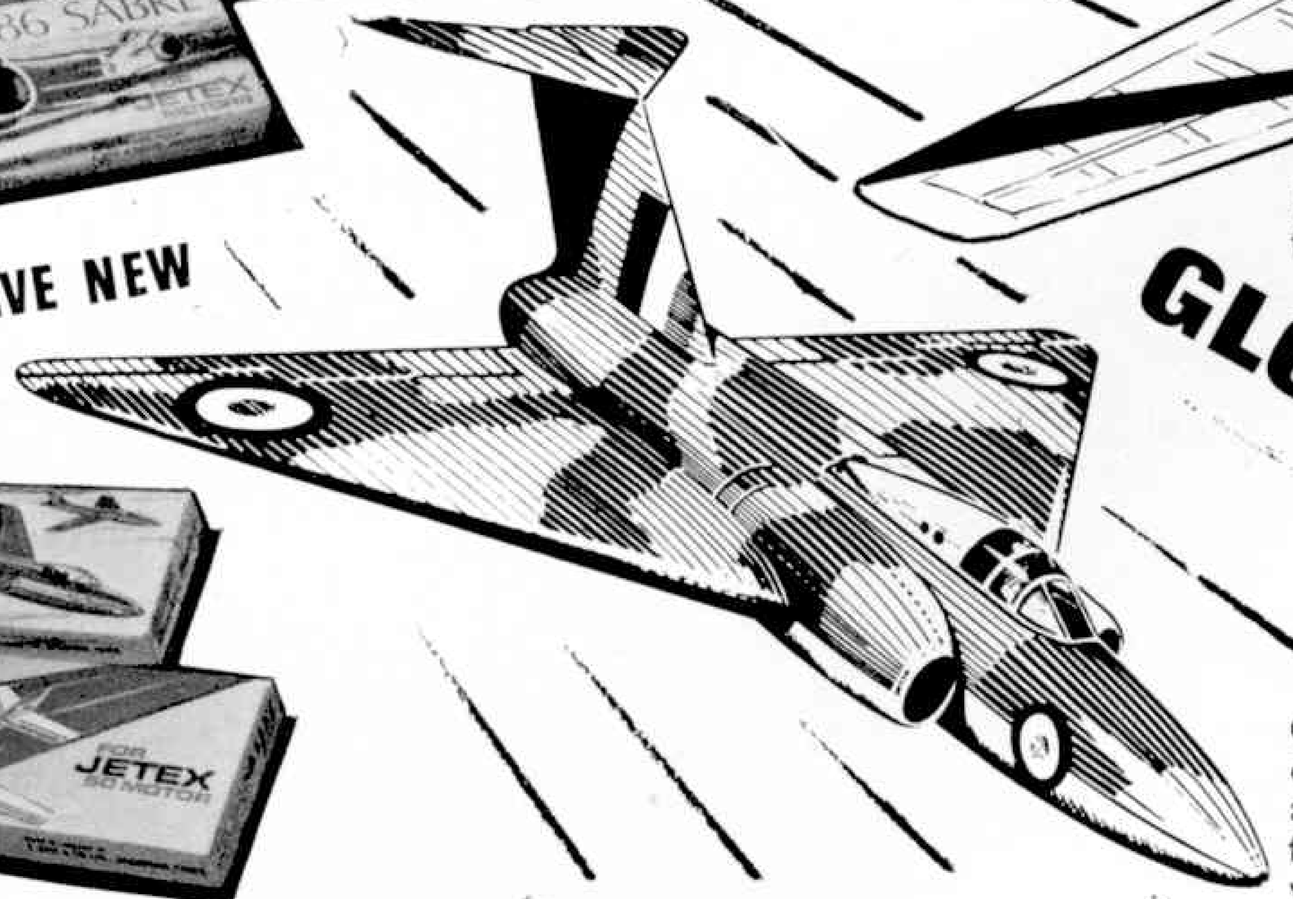
Wingspan 18"

6/11

GLOSTER JAVELIN



Of unconventional design, the Javelin is a two-seat all-weather fighter bomber with delta wing and tailplane. This unusual configuration makes up into a very sturdy model. Wingspan 15" **6/4**

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MECCANO® Magazine

MARCH 1970 VOLUME 55 NUMBER 3

Meccano Magazine, founded 1916.

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MAP **HOBBY MAGAZINE**

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FRONT COVER

North German Fishing Trawler built by the Editor from a Graupner kit, distributed by Ripmax. Vacuum formed hull is 26½ in. long (1/36th scale); power unit a Monoperm Super; single channel McGregor radio control with both steering and engine speed control. Turning circle was just a little large to perform on our r/c pond at the Model Engineer Exhibition. This picture was taken in the Water Gardens at Hemel Hempstead.

NEXT MONTH

Full Model Engineer Exhibition Report, first news of the Toy Fairs, Stardust Fortunes from the Orient, Robot Taxi Train, Dinosaurs and other Ancient Creatures, Old-time Machinery, Mills, and Beam Engines. Further 'On Two Wheels' Report: Yamaha. Plus a fine selection of Meccano models; more from Bert Love on Constructors' Guide, Dinky Toy News, Air News and other regular features. A great spring feast for everybody.

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RN ROYAL NAVY

A yachting cover recalls the warmth of the 1969 regatta season; inside is a new Marblehead design of considerable potential. Philip Connolly on electric motor switching, a Gannet-powered Veron Vosper FPB, and a holiday cruiser are among the power boat articles. For ship-lovers generally there are notes on "billy-boys," the fleet auxiliary *Celerol*, Russian warships including the helicopter carrier *Moskva*, Thames Colliers and Coasters, the cargo-liner *Rangitiki* and other features, including the ever-popular "Model Miscellany."

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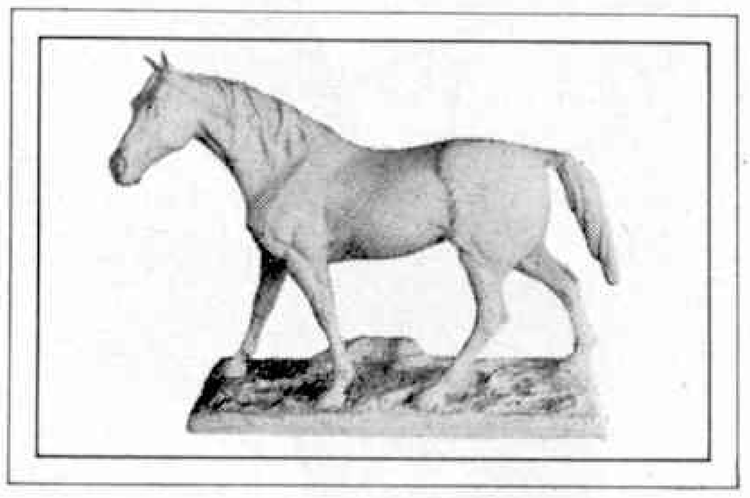

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NEW MECCANO NEWS

LOOK WHAT YOU GET WITH THE NEW 4EL SET-

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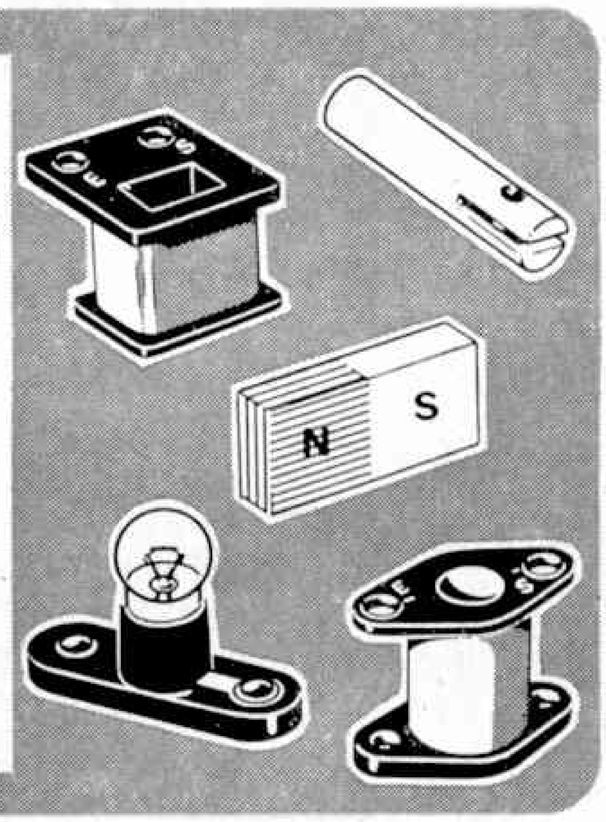
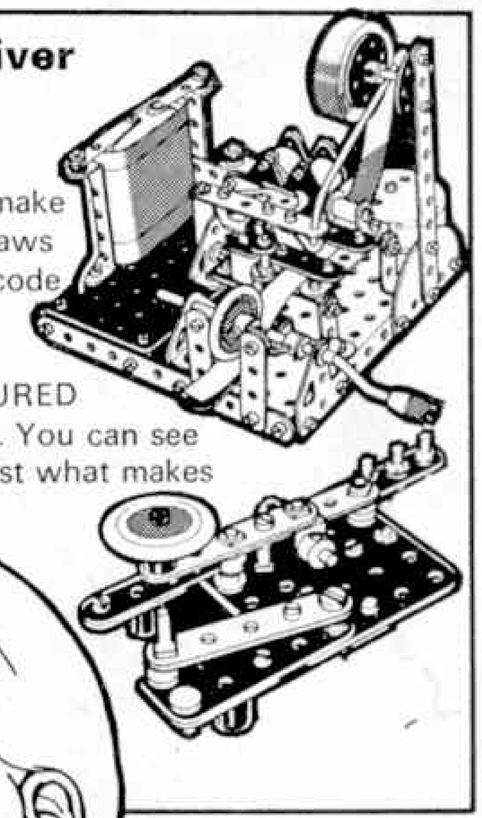
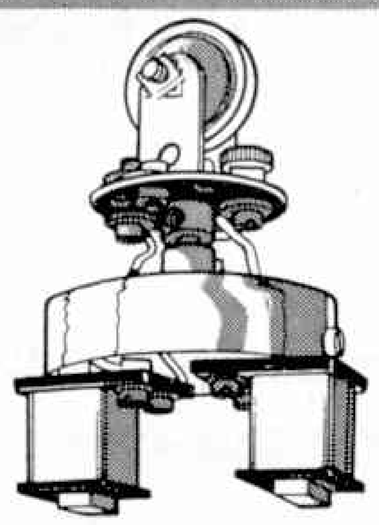
Meccano 4EL makes models with authentic electrical circuits to operate them. Models that work through the power of electricity and magnetism, with specially developed Meccano electrical parts; rectangular coils, magnet holder, lamp holder, flat commutator, cylindrical coils, P.V.C. sleeving, coil of connecting wire, and lots more to make exciting NEW models:-



Telegraph Receiver with Bell and Morse Key

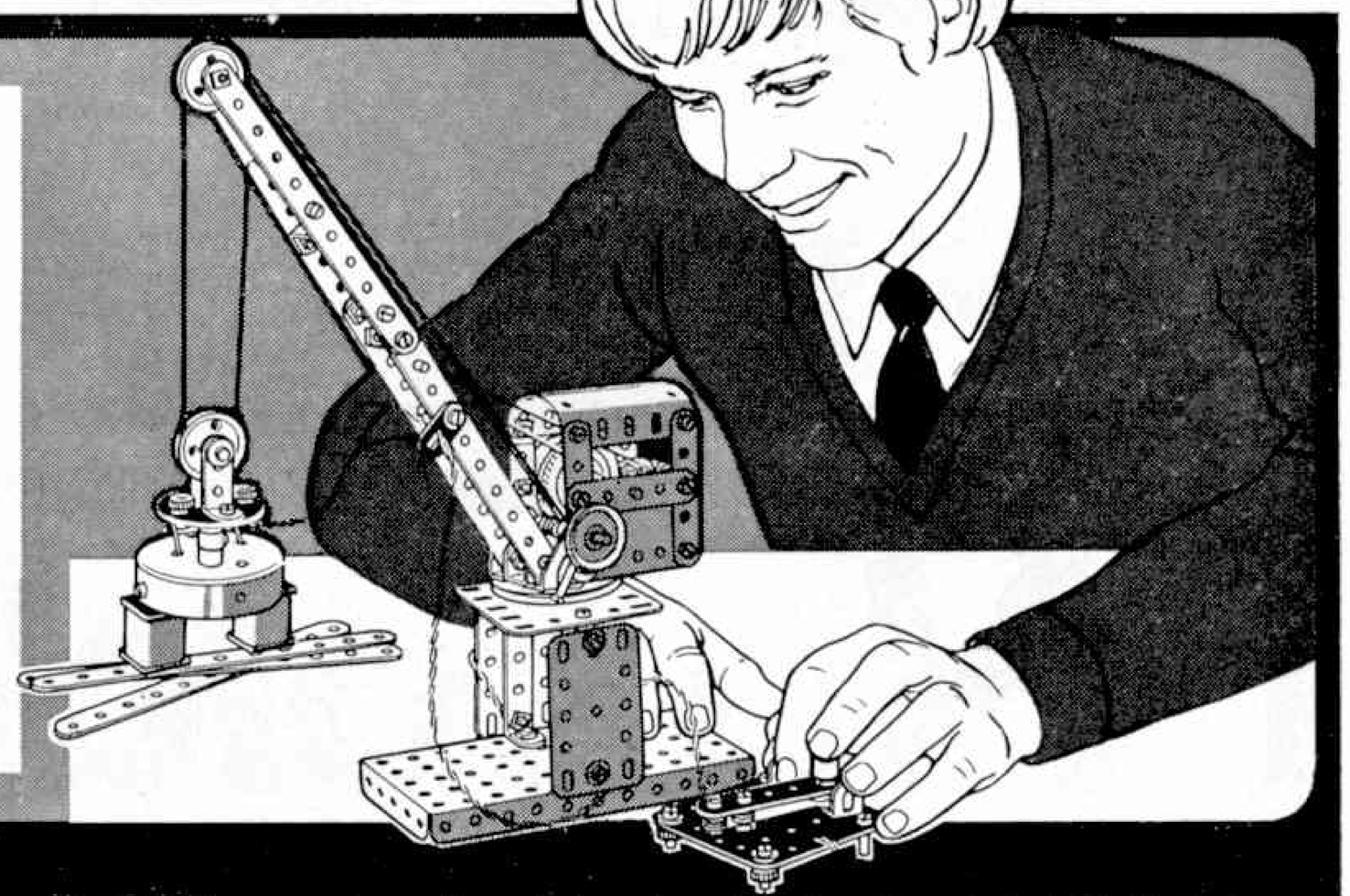
Everything you need to make this morse tapper that draws out messages in morse code is in the Set—and it's simple to make if you follow the NEW COLOURED WORKING DRAWINGS. You can see more easily, in colour, just what makes Meccano models work.





Electro-Magnet

Really powerful and efficient—and you control it by a switch that can also be made with this Set.



See how Meccano electrical components make real-action models - like this crane with electro-magnetic grab

Lower the grab over the load to be lifted and switch on the current through the Meccano-made hand switch. A magnetic field is set up in the grab and the load is picked up.
Lift the load clear of the ground, swing the crane around and lower. To release the load, simply switch off the current.
Meccano 4EL gives you 275 parts, including a complete No. 4 Meccano Set and a variety of Meccano-tested electrical parts to make lots more fascinating electrical models; packed in a special two-tier pack—electrical components in one tray, Meccano parts in the lower tray.

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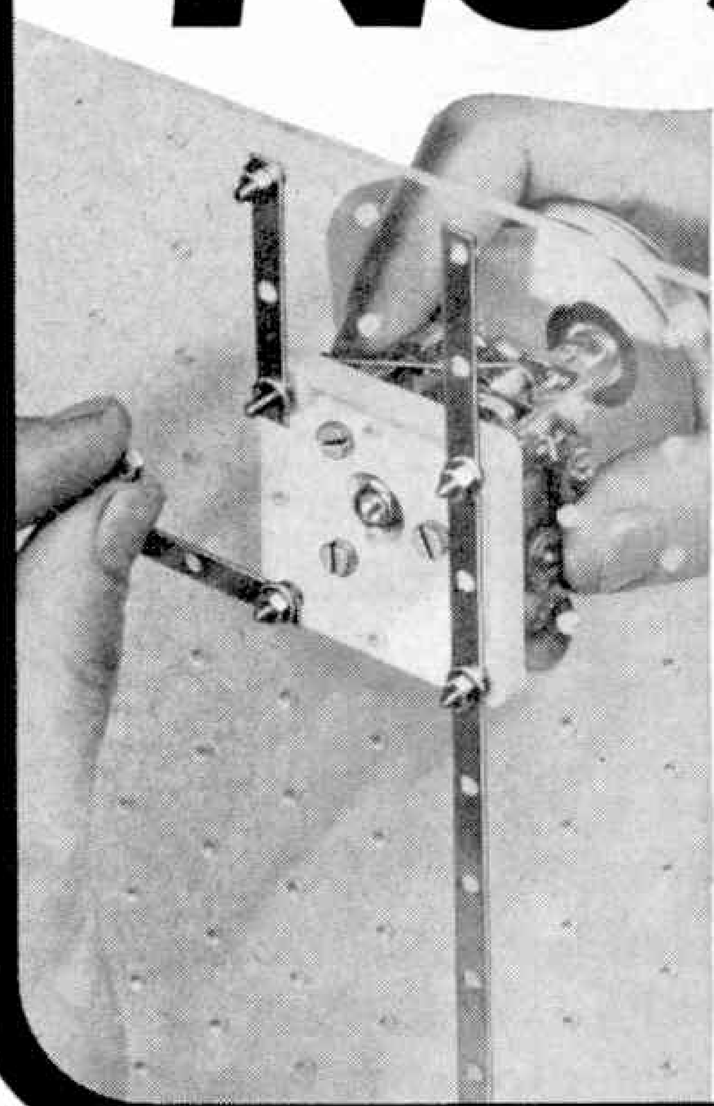

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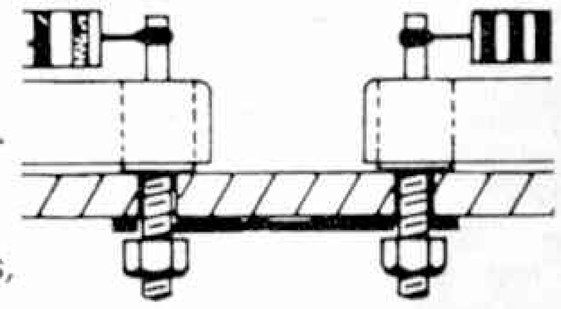

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ON THE EDITOR'S DESK

Model Engineer Exhibition

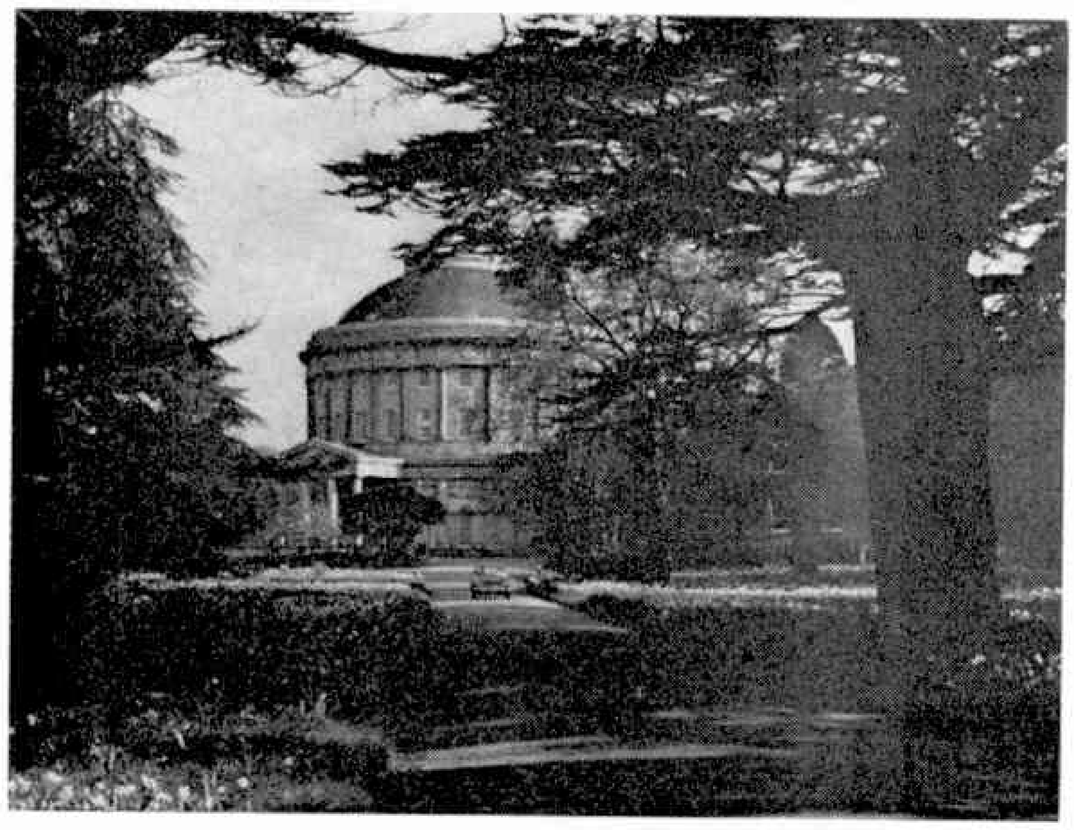
As we go to press we are just clearing up after our exhibition in Seymour Hall, where in spite of weather, flu and transport problems some 33,000 people visited us. The Radio 4-2 projects were on display and demonstration so that dozens of beginners had an opportunity of handling radio control for the first time and were pleasantly surprised to find how easy a boat or a car is to steer. We also enjoyed an hour-long television feature so that many readers who did not manage to attend in person will have seen modelling activities interpreted in a thoroughly adult manner by Bob Service of Thames Television.

Meccano Cup, presented by Meccano Ltd., was won by H. J. Halliday of London S.E.15 for his small showman's traction engine, enclosed in a "glass" case also made from standard Meccano parts. Pictures and an exhibition report will follow next issue.

Astounding Price Reductions

When we started our "On Two Wheels" series in the September issue with the Lambretta *Vega* and *Cometa* we were conscious that, delightful as these machines undoubtedly were, they might be a bit outside the price range of our readers. We are delighted therefore to reprint a picture of the *Vega* and advise everybody that the manufacturers have reduced the price from its original £142 (including tax) to £99 19s. 6d. (including tax)—thus breaking the "ton" barrier. Sister machine *Cometa* which sold at £152 10s. 0s. is now down to £109 19s. 6d.

With spring weather shortly on the way—we hope! —there are still a few weeks to work some magic and acquire the necessary funds . . . most of our young friends nowadays seem to have fund-raising activities well under way to finance their sometimes quite expensive activities from new fishing rods and tackle to dinghies and of course motorcycles and mo-peds. We should always be delighted to hear of any new money making activities indulged in by readers.



New Model Car Racing Circuit Series

We shall shortly be publishing a new series of articles on the construction and operation of a model car racing circuit. This will be organised in conjunction with Minimodels whose Scalextric is so very well known. We shall endeavour to provide a compromise between the simple "assemble on the floor" basic Scalextric set approach and the more sophisticated scratch-built layout which involves the builder in some constructional skill. Using readily available parts we hope to build up a "semi-permanent" layout with interesting scenic features and opportunities of fast racing. Some attention will also be paid to "hotting-up" in a moderate way some of the standard Scalextric power units.

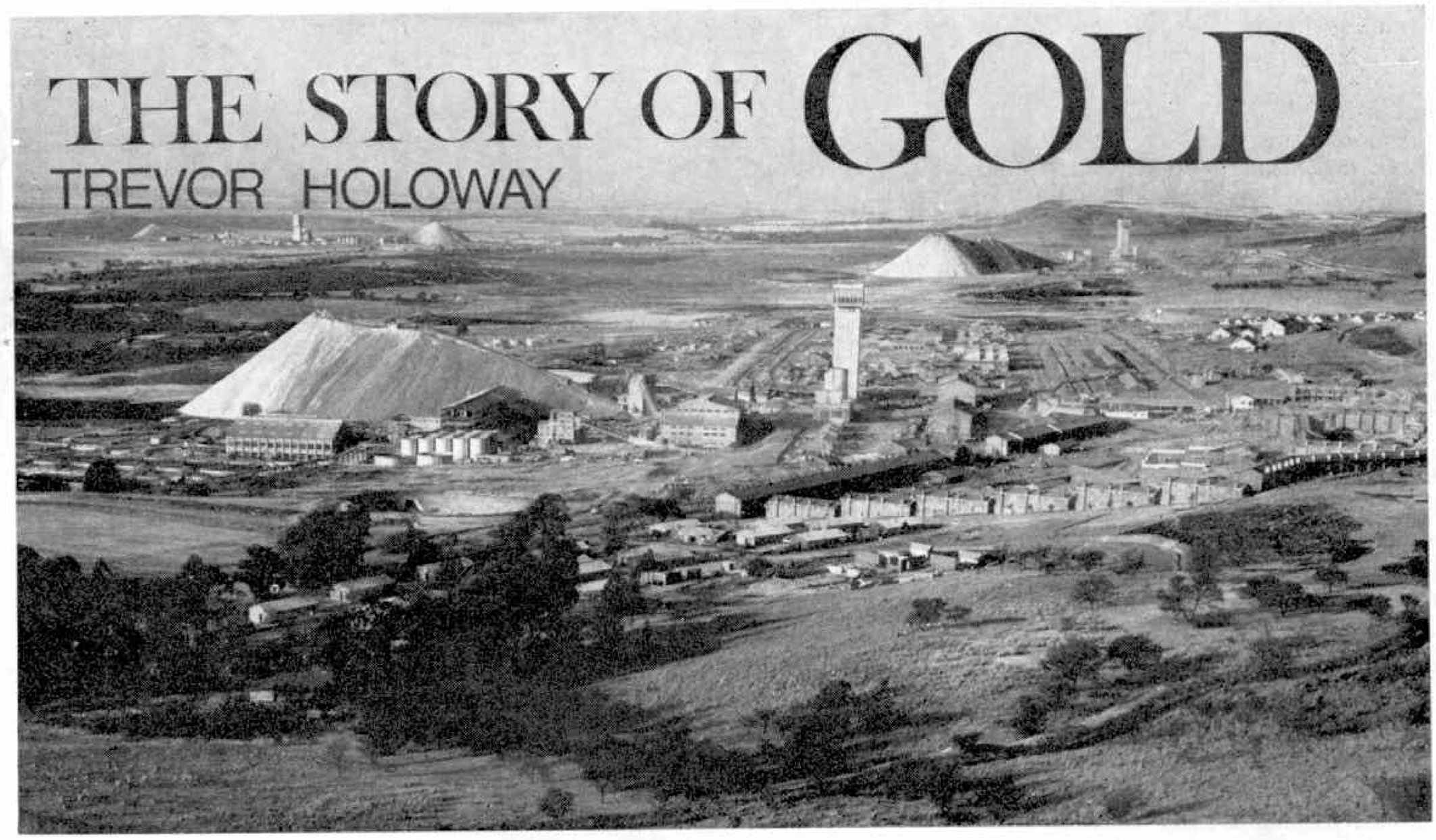
Development engineers of Minimodels have promised their full co-operation in this series, but we should also like to hear from any readers who believe they have found answers to Scalextric problems on their own circuits. It should be emphasised that our new series will be aimed at the home operator, rather than the club user—where larger spaces are usually available. What we aim at is the ultimate "*multum in parvo*" of circuits as the keener Latin scholars (if any) amongst us will appreciate!

COMPETITION WINNER

This month's Photographic Competition has been won by D. Backler of Haverhill, Suffolk, who receives £2 2s. 0d. for his impression of Ickworth House, Nr. Bury St. Edmunds. This fine National Trust property was built during the years 1794 to 1830 to the design of the 4th Earl of Bristol, and consists of an elliptical rotunda connected by two curved corridors to flanking wings.

THE STORY OF GOLD

TREVOR HOLOWAY



FOR GOLD men have toiled and died; wars have been waged for it; the "pot of gold at the end of the rainbow" has been the reward for which men have braved the terrors of unknown lands, and the prospector has blazed the trail for the settler to follow.

The Spaniards who conquered Mexico and South America were seeking gold; and the first important start of Australia towards greatness followed the discovery of gold in 1851. Similarly, the discoveries of gold in Alaska and South Africa were great factors in the development of those countries.

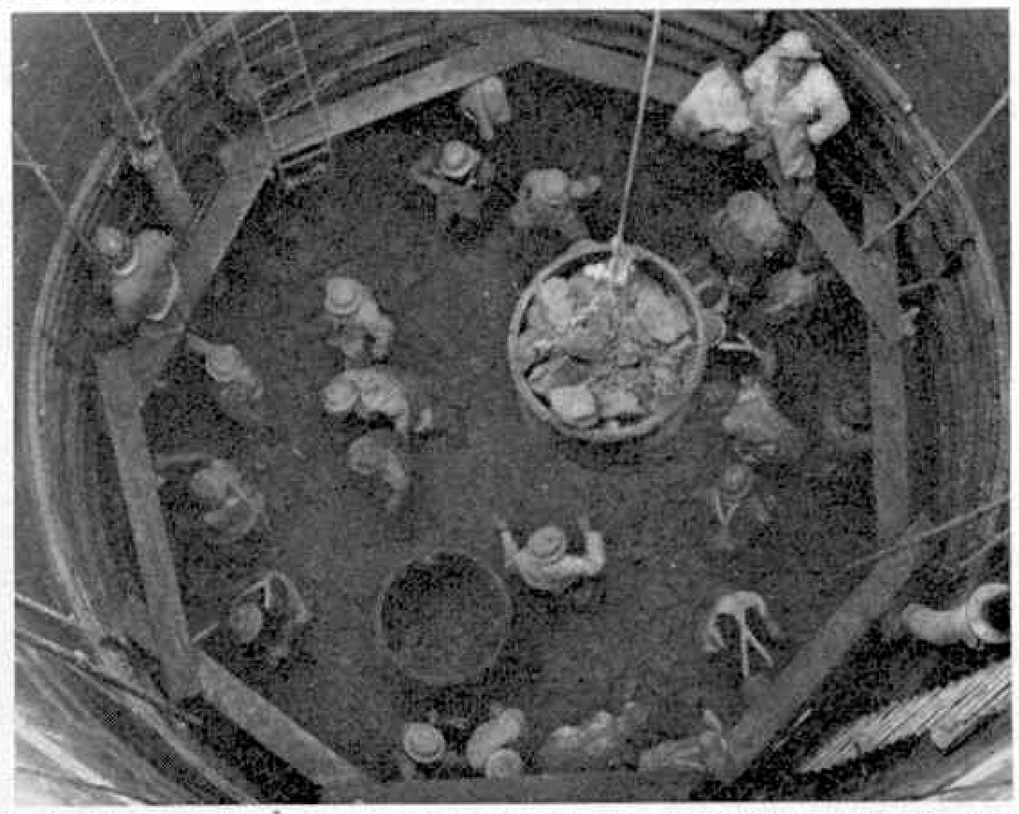
Down the ages, craftsmen have chosen gold for their finest work. The palaces of kings, the temples of Old Testament times, were beautified with gold in the form of ornaments and as overlay to furnishings and parts of the structure.

Today, whether minted in coins or poured into refined bars, it is the only form of money accepted by all nations in international trade. It serves as a measure of value, as a store of wealth and, most important of all, as a medium of exchange.

Gold is precious because it occurs mostly in small quantities and is both difficult and costly to extract. There are enormous quantities in the sea, too, but here again the cost of extracting it would be greater than the value of the gold itself. It is only in a few places that it exists in sufficient quanitiy to make its extraction profitable.

Today, South Africa is the world's largest producer, supplying over half the total mined (in a recent year South African mines produced over 25 million fine ounces). The United States, Canada, Australia and

Here, Mike Doyle, an underground timberman and an expert all-round miner, makes the workings in a gold mine at Kirkland Lake in northern Ontario.



A shaft goes down on a new mine in South Africa. The faster the six shafts go down, the sooner do the investors get a return on the money they have laid out. The record for rapid shaft-sinking is held by Buffelsfontein, where 1,251 feet were sunk in March 1962.

Right: Drilling holes with jackhammers. The jackhammer is a light, hand-held drilling machine operated by compressed air. The holes it drills are filled with explosives which blast the rock face into broken ore which is then taken to the surface for crushing if it contains gold traces, or for disposal on a dump if it does not.

Below right: Once the geologists and other experts believe that they have found a goldfield, boreholes are sunk into the earth for thousands of feet until they strike the gold bearing conglomerates. Here a bore hole drill is seen at work, cutting a neat hole into the earth. It is a great moment when the drilling bit finally proves that a gold reef does exist.

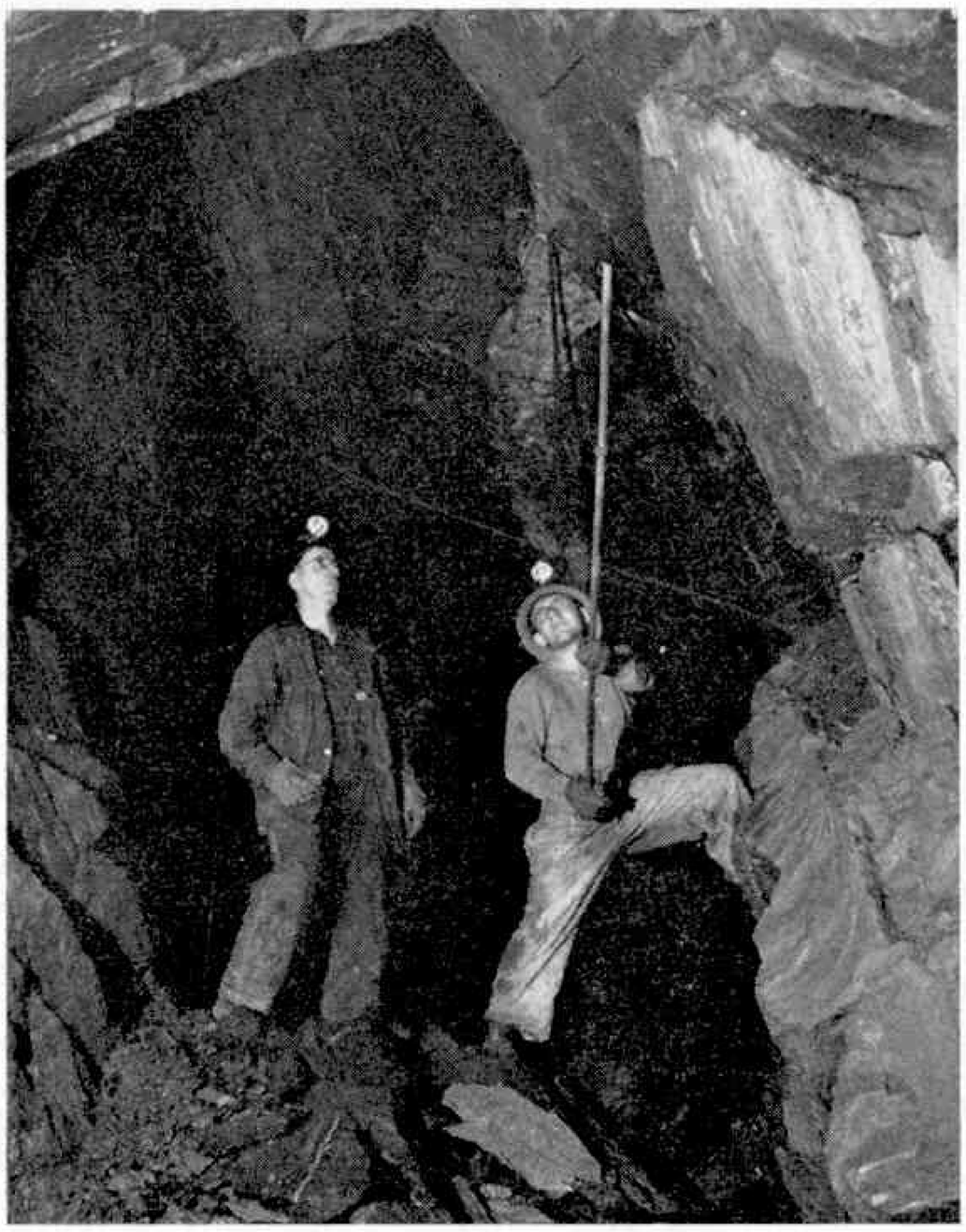
Below left: Canada's gold mines have provided employment for many hundreds of Europeans whose countries were over-run during World War II. Before they started work they were given a course in modern mining methods and equipment. Here you see a mine foreman instructing a young miner at the Hollinger Mine, Timmins.

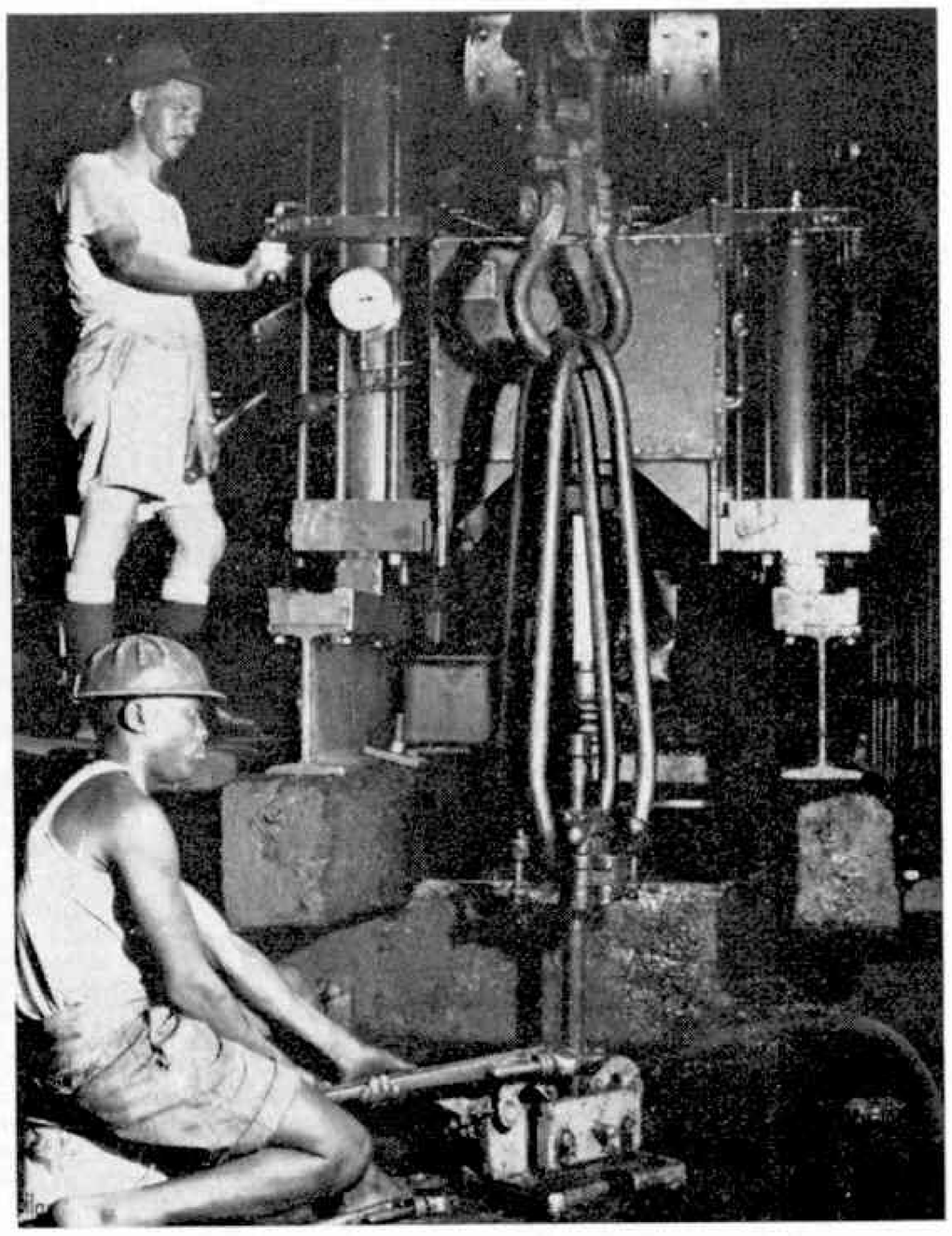
India are also important producers.

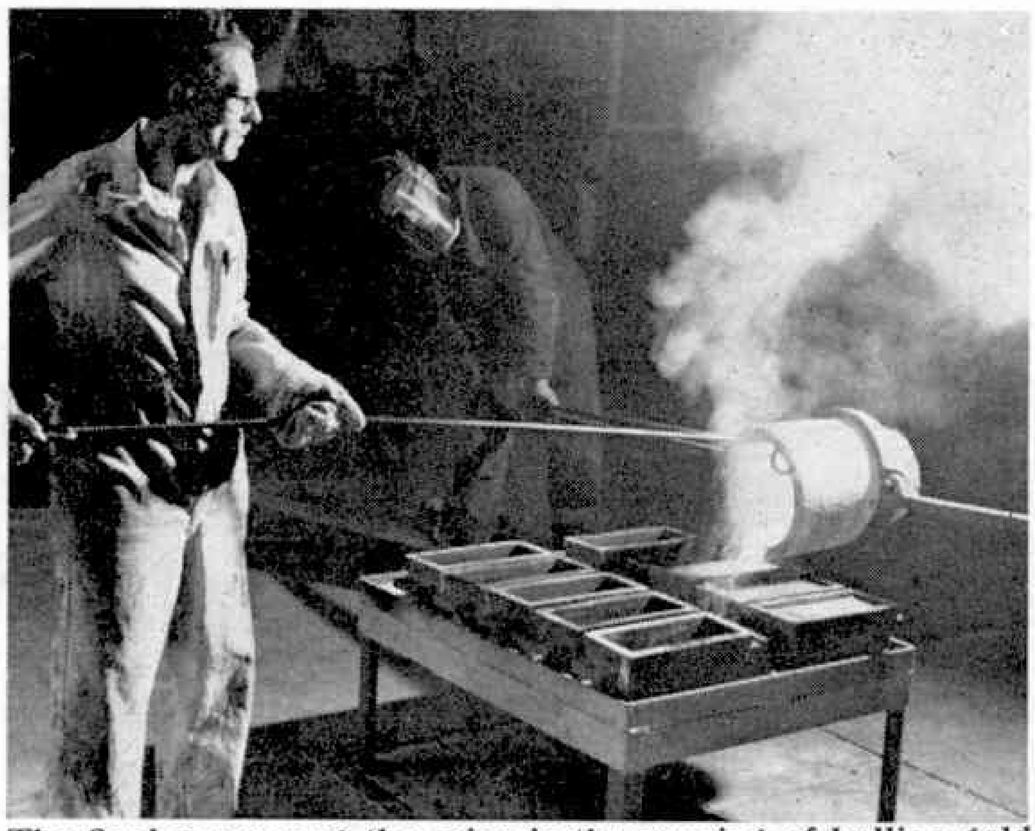
There are two methods of winning gold: 'placer' mining for alluvial deposits, and 'lode' or 'quartz' mining, where the gold is in solid rock. In placer mining, Nature has already done the greater part of the work. In the process of wearing down hills by erosion, gold, being one of the heaviest of minerals (19.27 times as heavy as water), naturally goes to the bottom of streams. There it is deposited in the form of scales or nuggets. The size of particles varies from fine powder (gold dust) to the great Australian "Welcome Stranger" nugget, weighing 2,520 ounces —the weight of a medium-sized man.

Alluvial gold is usually separated from other substances by water. "Washing" in its simplest form—as carried out by the old-time lone prospectors—consists of placing some of the gold-bearing sand or gravel in a shallow iron pan with water and tilting the pan slightly while giving it a circular motion. The lighter portions of matter are washed away over the lip of the pan, leaving the particles of gold and any pebbles to settle. The pebbles are picked out and the remaining deposit of sand and gold is carefully dried and the earthy dust can then be blown away.

Where large quantities of material have to be treated, a sluice is used. This is a long sloping wooden trough, with crossbars, known as riffles, nailed to the bottom. The water carries away the lighter waste material but heavier matter, including gold, is trapped by the riffles. This trapped material is collected at







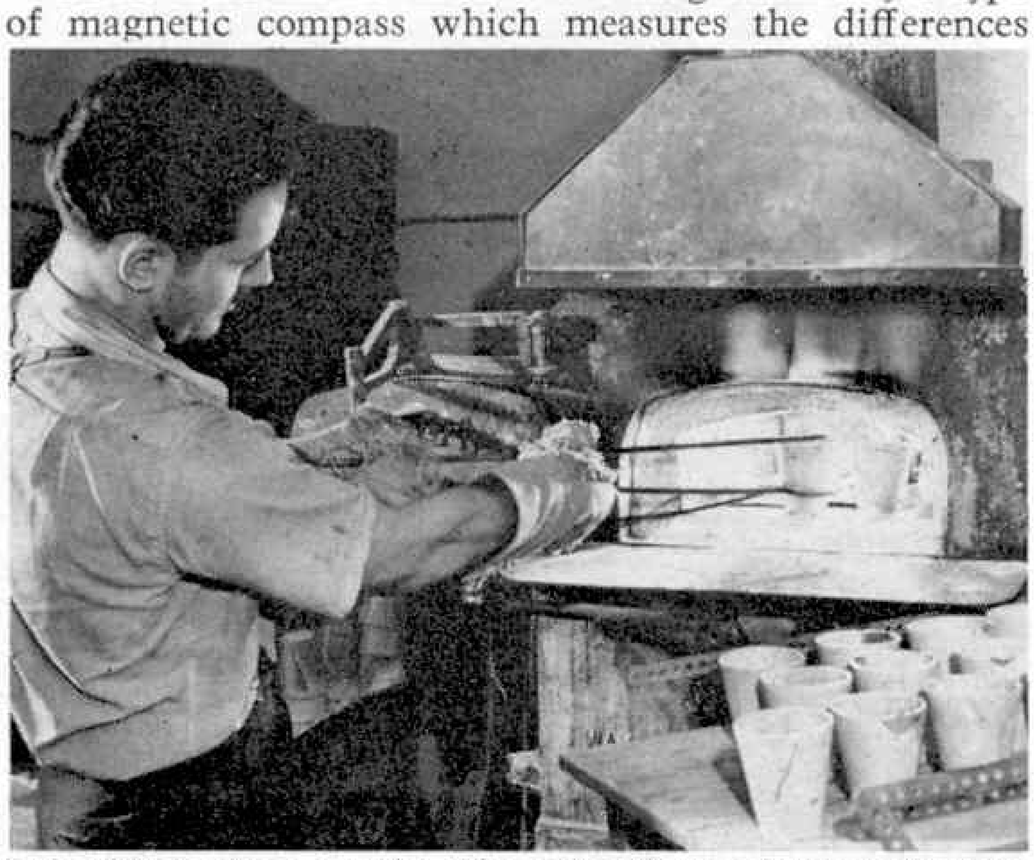
The final process at the mine is the pouring of bullion gold into bars. The temperature of molten gold is 1,175 deg. C. Bullion gold must be sent to the refinery as it contains about 12 per cent. impurities, often mostly silver. The final 400 ounce International gold bar is worth more than 14,000 dollars.

intervals and the gold recovered by further washing. In the past dredgers have been used to scoop up gold-bearing gravel from the bed of a river. Extraction plant aboard the dredger washes the gold from the gravel and the waste material is returned to the river-bed.

Deposits of alluvial gold have been exploited by man since earliest times, and although deposits still exist, rich finds are now unlikely. Today, the recovery of gold from the earth is a job for expert metallurgists and deep-mine engineers. The lone prospector has disappeared and highly organised mining companies have taken his place.

Highly trained prospecting teams and geologists search over vast areas for the types of rock formations normally present in gold-bearing regions. Nowadays, aerial survey speeds up this task enormously. As soon as promising regions are located, the geophysicists arrive and take readings with their instruments.

These instruments include the magnetometer, a type of magnetic compass which measures the differences in the earth's magnetic field; and the gravimeter, which is used to provide information on the nature of the underground rocks. But only test drilling can actually prove if gold is present in sufficient quantity to justify spending millions of pounds establishing and equipping a mine. So the deep-level bore-hole drillers set to work to collect samples of rock from thousands of feet below the surface. Not until the geologists have made their report on the samples will it be known whether or not a mine would prove a paying proposition.

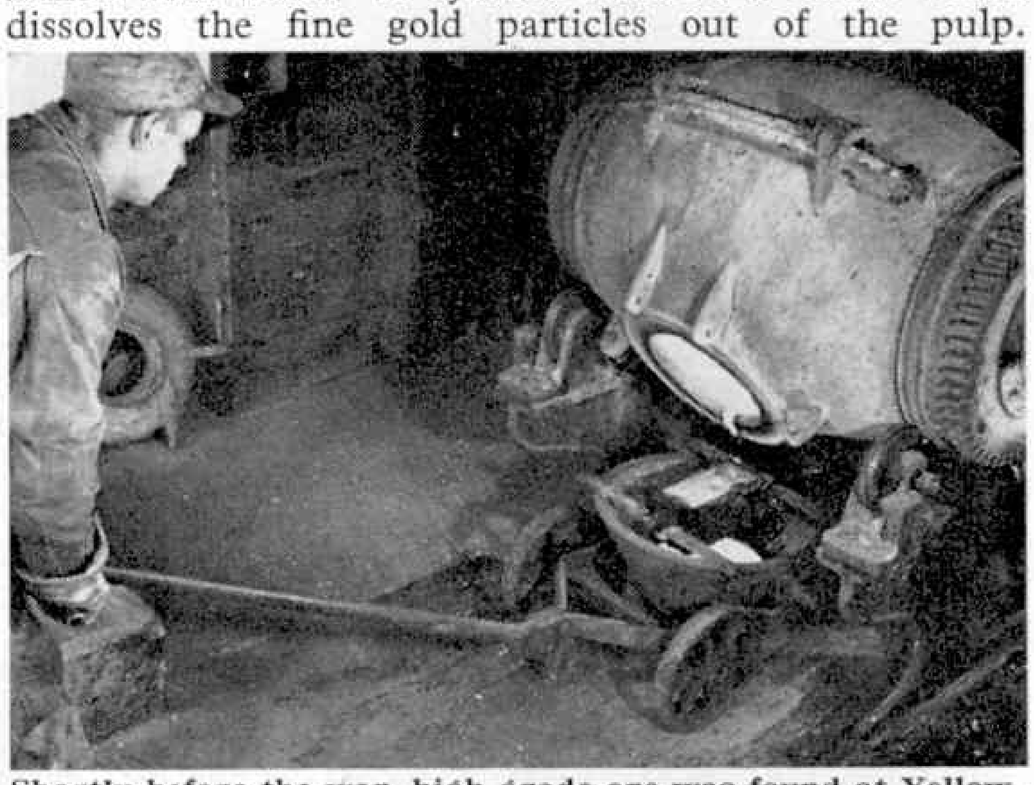


It is vital to the operation of a mine that a constant check is kept on the ore brought up from the underground workings to determine its gold content. Samples taken from different working faces can indicate where the richest ores lie and precisely what is their gold content. Here you see a chemist putting Yellowknife ore samples through their first stages of assaying.

If the report is favourable, the shafts are sunk down to the gold-bearing reef which may be only a few feet thick and lie anything down to 12,000 feet below the surface. A network of inter-connecting tunnels is then excavated so that the reef can be worked at several different ' faces ' simultaneously.

The ore is blasted from the rock-face by carefully-placed explosives and taken to the surface for processing. Incidentally, it may take five tons of ore to yield one ounce of gold !

First, the ore is crushed to a fine powder and mixed with water. A cyanide solution is added which dissolves the fine gold particles out of the pulp.



Shortly before the war, high grade ore was found at Yellowknife, N.W.T. War-time shortages of men and materials eventually brought work to a standstill. Then, in 1945, fresh new strikes were made and prosperity was assured. This photograph shows the first gold ingot poured at Negus mine after operations were resumed.

Rotary filters are then used to separate the gold-bearing cyanide solution from the pulp. This solution is next treated with zinc dust to precipitate the gold, which is deposited as a black slime.

This unlovely-looking black slime is treated with acid, filtered, smelted in crucibles in large furnaces, and finally poured into bars of bright gold. These bars are then sent to the refinery where any remaining impurities are removed. Finally, the molten metal is poured into 400-ounce bars which, when cool, possess the lustre and brilliance of burnished gold.

Gold is not only a very beautiful metal, but it is practically indestructible. It resists chemical action to a greater degree than any other common metal. The oxygen in the air does not harm it, so it never tarnishes. A very thin layer of gold will give sure protection against corrision.

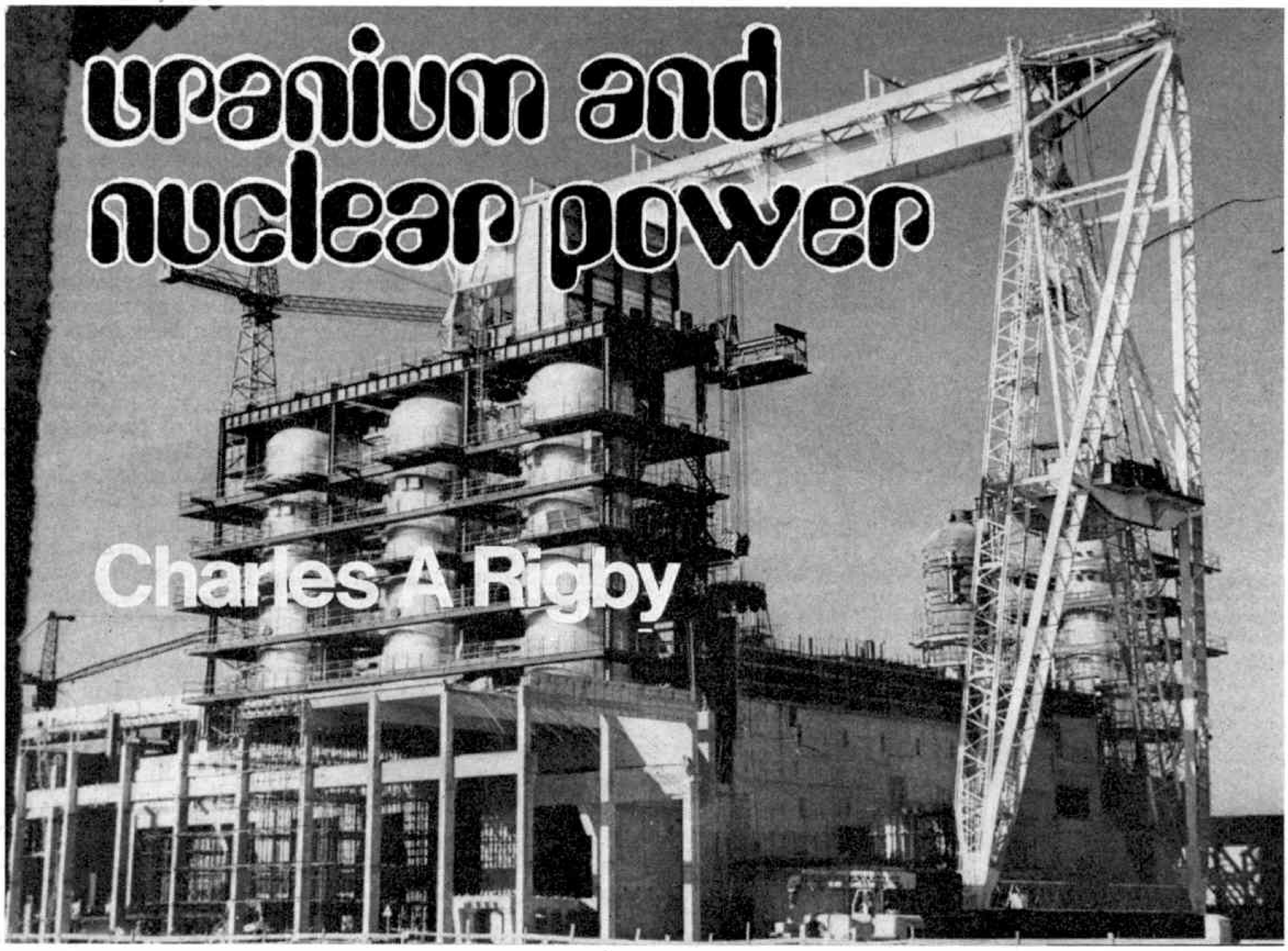
Beating out gold leaf is a highly skilled craft which has been carried on for over 4,000 years. The properties of gold are such that the metal can be beaten to a thickness of 1/250,000th (one two-hundred-and-fifty-thousandth) of an inch ! It has been stated that one ounce of gold could be beaten into a sheet of gold leaf over an acre in extent.

Wires compounded of silver and gold have been drawn to such fineness that 20,000 of them would be less than an inch thick. Gold lace is made up of thin gold wires so fine that up to 2,000 yards weigh only an ounce.

Britain supplies gold leaf to all parts of the world. It is used for sign-writing, decorating, lettering (particularly by bookbinders) and for adorning buildings. Among famous buildings in Britain with exterior adornment of pure fine gold may be mentioned the Houses of Parliament, Buckingham Palace, the National Gallery and, of course, the great gold cross that crowns St. Paul's Cathedral.

Western Deep Levels, in the Transvaal, South Africa, will ultimately be the world's largest—and deepest—gold mine. It is expected to give rich yields for at least sixty years and eventually reach a depth of 2½ miles where the temperature would be around 130 deg. F.

All down the ages gold has never lost favour in the sight of man and there is every reason to predict that its reign as The Queen of Metals will last till the end of time.

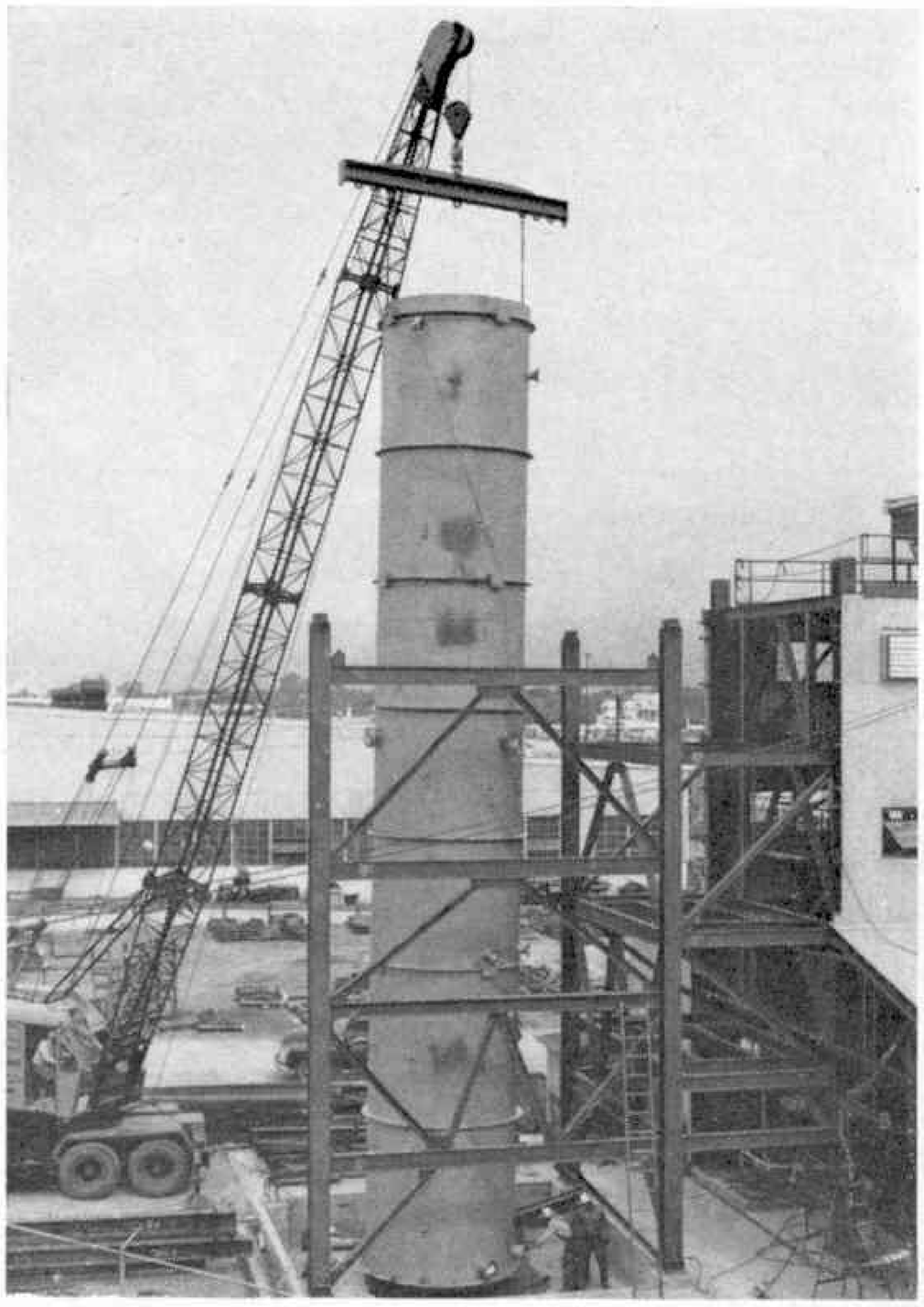


THE ATOMIC bomb of World War II not only changed the course of history, but also marked the beginning of a new age. Developments followed later, and the use of nuclear energy in place of coal became more important. Earlier experiments with radium showed that this element, like uranium, breaks up into others with the liberation of various particles and radiation.

Both J. J. Thompson and Sir Ernest Rutherford helped to advance our knowledge of atomic structure further. Indeed, Sir Ernest succeeded in producing changes in the nuclei of nitrogen atoms. The first successful 'atom smashing' was achieved in 1932, when J. D. Cockroft and E. T. S. Walton used nuclei of hydrogen atoms or 'protons' and accelerated them with energies of 700,000 volts and fired them at lithium atoms, thus 'smashing' them to produce nuclei of helium atoms. Atom-smashing machines were invented later and used for various purposes.

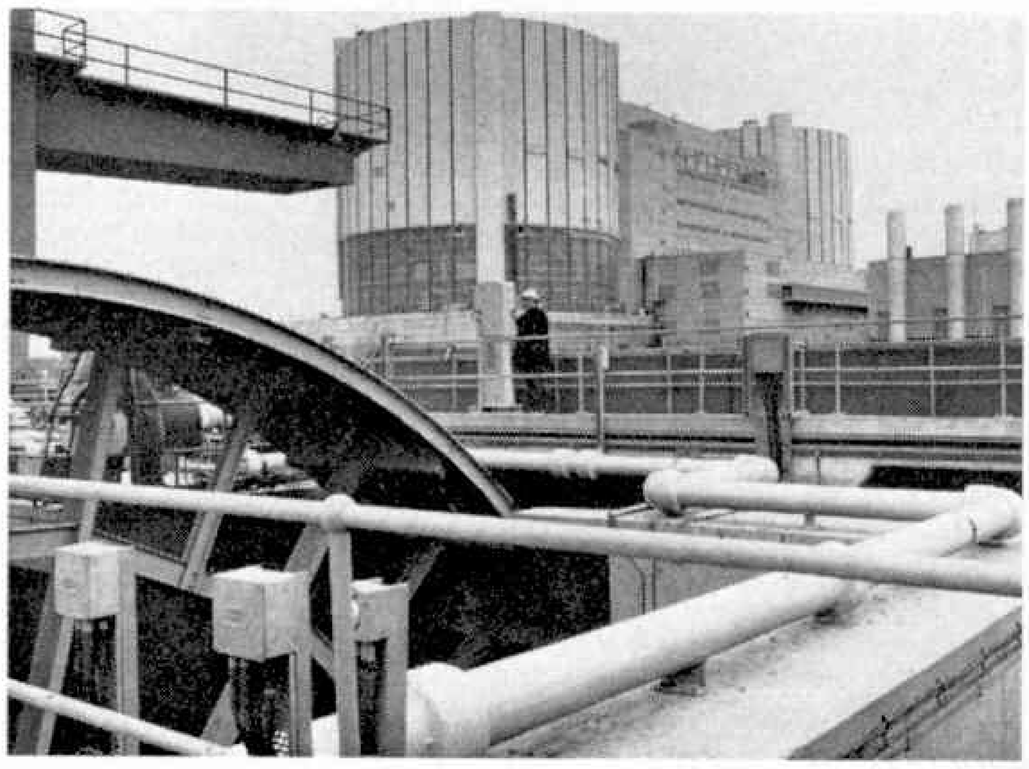
The theory that elements, including solids, liquids, and gases, are made up of atoms was evolved by John Dalton in 1807. The first of his four laws states that all matter is made up of atoms, is generally accepted. Others have been modified. Elements are the basic units of which other substances are composed. Matter is made up of molecules consisting of two or more atoms joined together by chemical bonds. An atom is the smallest particle of any element which can be obtained, and which can take part in a chemical change. The size of an atom depends on each kind of element, and they do not exist by themselves.

In chemistry all elements are written down in abbreviated form, such as C for Carbon, Zn for Zinc, Fe for Iron, H for Hydrogen and O for Oxygen, etc. In this way, the writing down of chemical formulae denoting both atoms and molecules is much simplified. Again, all atoms have an atomic weight and an atomic number, the atomic weight and number of hydrogen



Above: Test Tank for refuelling procedures to be used in atomic power reactors dropped at base headquarters of Atomic Power Equipment Department for development work on the 180,000-K.W. Dresden nuclear power station, near Chicago, U.S.A. *Photo by courtesy of General Electric Company of U.S.A.*

Below: A view taken from the C.W. system at the C.E.G.B.'s 600 MW Magnox power station built at Oldbury-on-Severn, Gloucestershire, showing, left to right, part of the cooling water system, the reactor block which contains the reactors and is linked by a common central services building, the central control building, the three gas turbine chimneys and the beginning of the turbine house. Started in 1960 the station was officially opened in June, 1969. *Photo by courtesy of The Central Electricity Generating Board.*



being 1 in each case, and those for Carbon 12 and 6 respectively. Uranium which forms several compounds, including five oxides, was discovered by Klaproth in 1789, but not isolated until 1840. A metallic element, its chemical symbol is U, atomic weight 238.07, atomic number 92, melting point, 1,133°C. and density 18.07. It is not found native but occurs in pitch-blende as uranous uranate in various parts of the world, including Cornwall, Bohemia, Norway, and U.S.A. Oxides of the metal were once used in the ceramics and glass industries.

During March 1939, two American scientists, Dr. Kenneth Kingdon and Dr. Herbert Pollock became greatly interested in uranium when they learned that when it is bombarded by 'neutrons,' which with 'protons' form the nucleus of an atom, traces of barium, another and much lighter element were formed. This meant that the nucleus of a uranium atom could break into two parts, one of which might be a barium nucleus. It was known that ordinary uranium consisted of two sorts of atoms or isotopes, about 140 parts of the heavier atom weighing 238 units were present for one part of the second atom, uranium 235. It was not known which would undergo fission, though the lighter isotope was suspected.

Believing that uranium might prove a useful source of energy, the two scientists began a series of experiments in separating the isotopes, beginning with "Thermal Diffusion." In this process, a gaseous compound of the element is placed in a long tube with a heated wire down the centre. If conditions are right, the gas made of the lighter atoms go to one end, and the heavier atoms to the other. Another method they tried was use of the "Mass Spectrometer." In an evacuated tube, in this, a stream of charged atoms is fired through the magnetic field created by a powerful electromagnet. This bends the atoms from a straight path, and the light atoms having less inertia are deviated more than those of greater mass. With this instrument, scientists could determine the proportion of the isotopes in many elements.

On March 15th, 1940, after many attempts, a satisfactory result was obtained, the amount of U-238 present being less than ten-millionth of an ounce, with 1/140th as much U-235. The scientists took their sample to Dr. Dunning, Head of the physics department of Columbia University on March 17th, where an even smaller quantity produced by Dr. A. O. Nier of Minnesota University had just been examined. Their sample was immediately exposed to a beam of neutrons from the Columbia 'cyclotron' atom-smasher.

Above the sample to collect fragments produced by any atom-splitting process was a plate connected to the oscillograph in which moving lines of light would show that nuclear fragments were produced and also indicate their energy. Sure enough, it was soon evident that fission was taking place. There were pieces of atoms which had more energy than the neutrons which caused splitting. This occurred with U-235, but not with U-238. This U-235 was indeed the isotope that could yield atomic energy by the fission process.

Atomic science deals with such elements as uranium, subject to fission. John Dalton had evolved the theory about atoms of ordinary elements but at that time little was known about their structure. According to the British Generating Board, (1) All matter, iron, stone, water and fabrics—is built of atoms, (2) Atoms are like tiny solar systems. In the centre is the nucleus (or Sun). Around it revolve "electrons" each in its own orbit, (3) A nucleus is a cluster of closely packed particles of 'protons' and 'neutrons,' (4) Each 'proton' carries a unit positive electrical charge, neutrons have

none, ' electrons ' carry unit negative charges, (5) When atoms are bombarded with ' neutrons,' occasionally a neutron hits a nucleus and causes fission, (6) Fission releases energy, mainly as heat. Commonly, two or three neutrons are shot off at the moment of fission, (7) Fission-released neutrons may strike other nuclei and cause fission and so on in chain-reaction, which is controlled to give continuous heat release.

Built during the last war, it was at the Hanford Works near Richland, Washington, where the first nuclear reactors or ' piles ' were used to transmute U-238 into plutonium used in the making of atom-bombs. This plant was then taken over by an important company in 1946. Another nuclear centre for conducting research and development work in atomic energy was built in New York during 1946.

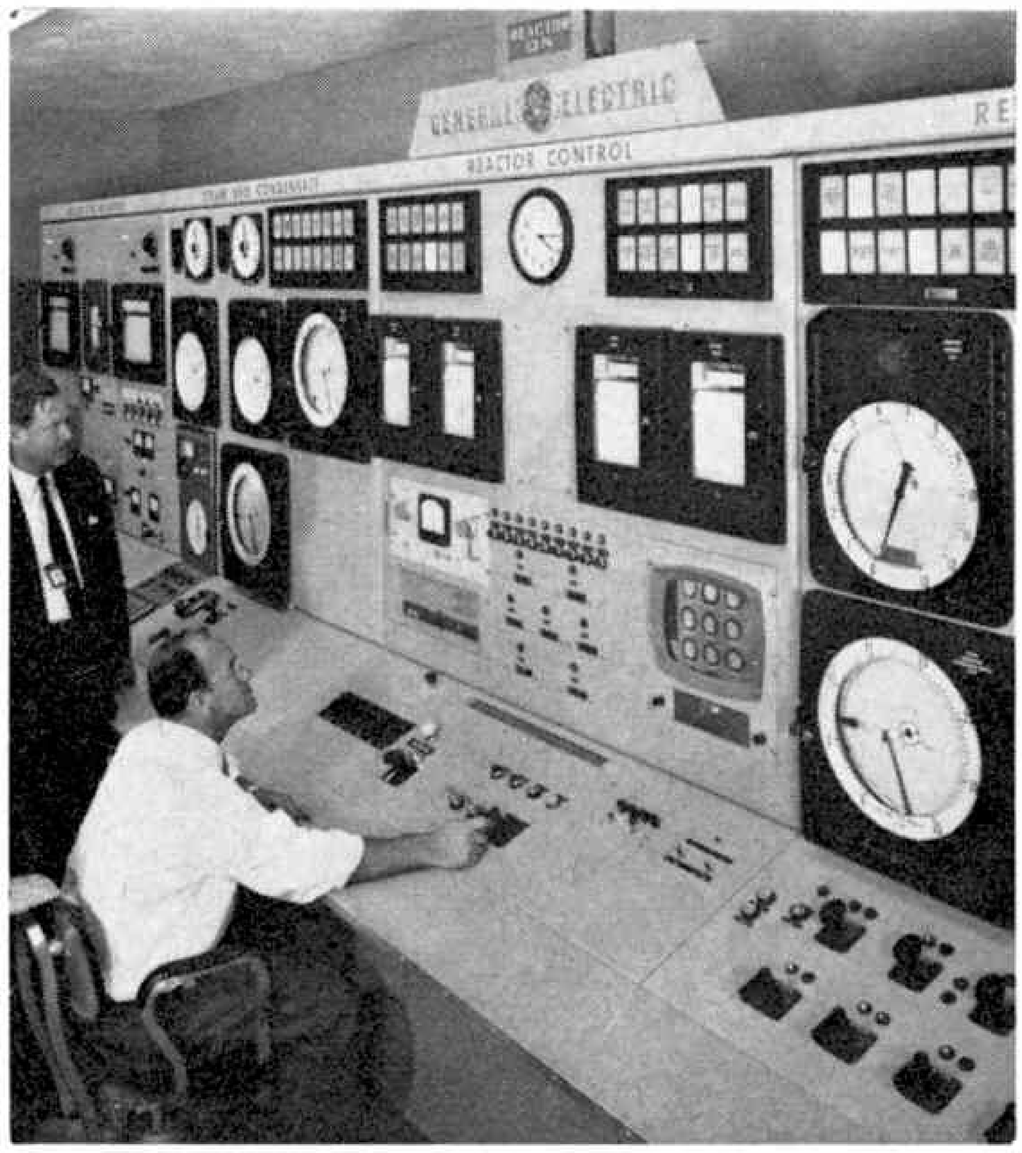
Realising the many difficulties to be faced in producing electrical power, American plans for its adoption were slow at first. During 1949, one authority stated that the country would probably have to spend about 200-million dollars in building a number of successive experimental power plants before it would be possible to judge the economic possibilities. Again the necessity for shielding the reactor also increased the cost and if small plants would operate, their heavy radiation shields would make them large and costly. Thus, there must be a succession of experimental plants, each larger and more costly than its predecessor, before atomic power would be practicable.

According to another speaker, the cost of fuel might relatively be competitive with that of coal or oil but much more knowledge and experience must be obtained before any valuable estimate could be made. Similar views about its adoption in Britain were also held. However, during the next few years rapid strides were made in atomic energy technology. For some long time, American scientists concentrated on the construction of suitable reactors and eventually succeeded in this work.

The plans made in both countries were far-seeing since there was a great demand for nuclear energy. Then again, the by-products of the process would be valuable. In 1947, a new super-cyclotron or atom-splitter was installed in the University of California, thus adding to the research possible in biology, medicine, chemistry and agriculture. The construction of reactors to prevent the radiation of alpha-, beta-, and gamma-rays was not such an impossible task. Those used in the British atomic power stations, such as at Calder Hall which H.M. the Queen opened during 1956, consist of a mass or core of graphite enclosed in a pressure shield of steel surrounded by a shell of thick concrete.

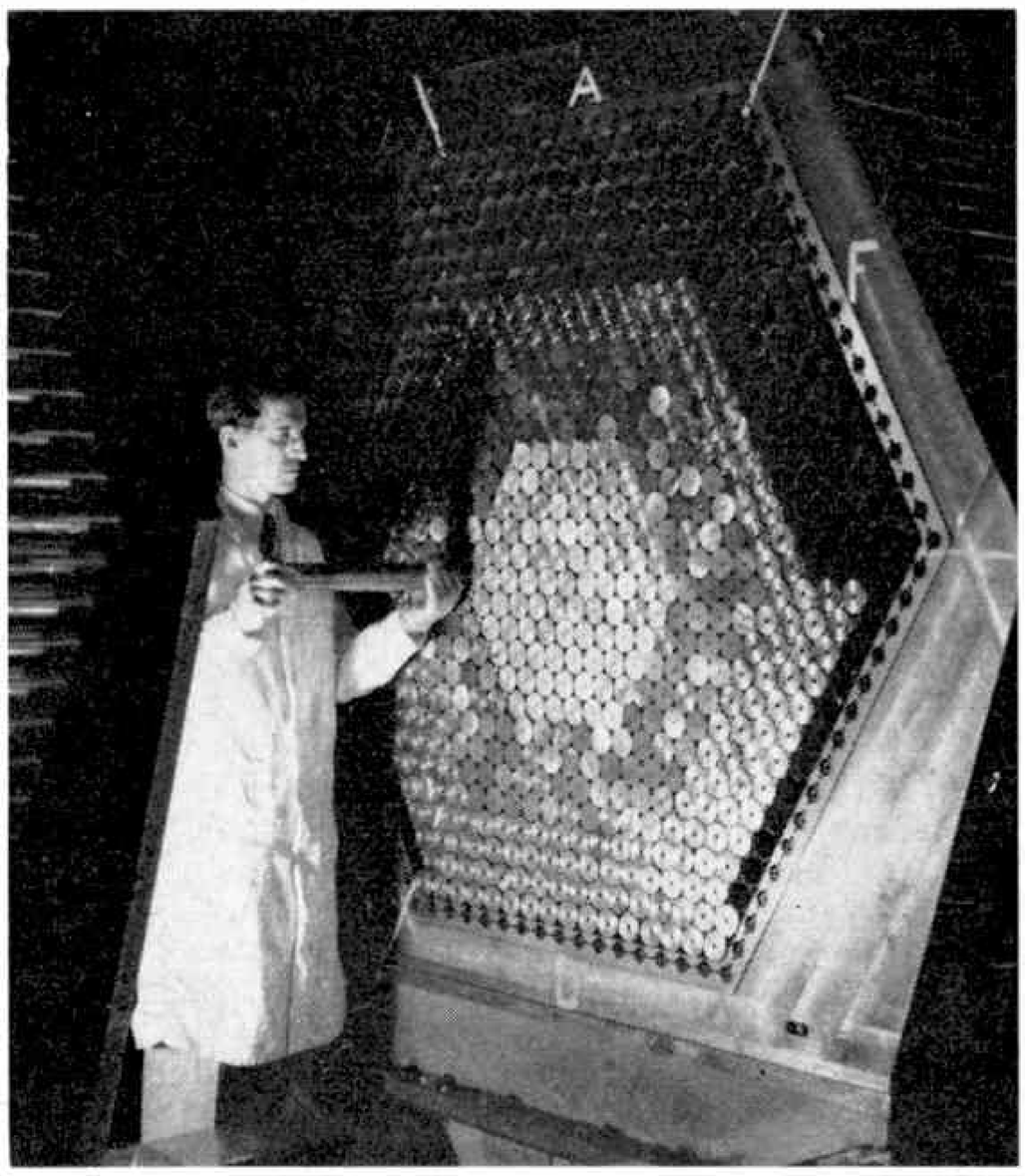
With this arrangement, electricity is produced thus: The enormous heat liberated by the splitting atoms in the reactor is collected by carbon dioxide gas which passes through, and the hot gas flowing among the pipes in an exchanger turns the water in them to steam. The steam then passes to orthodox turbines driving electric generators, and the electricity generated is fed into the national grid.

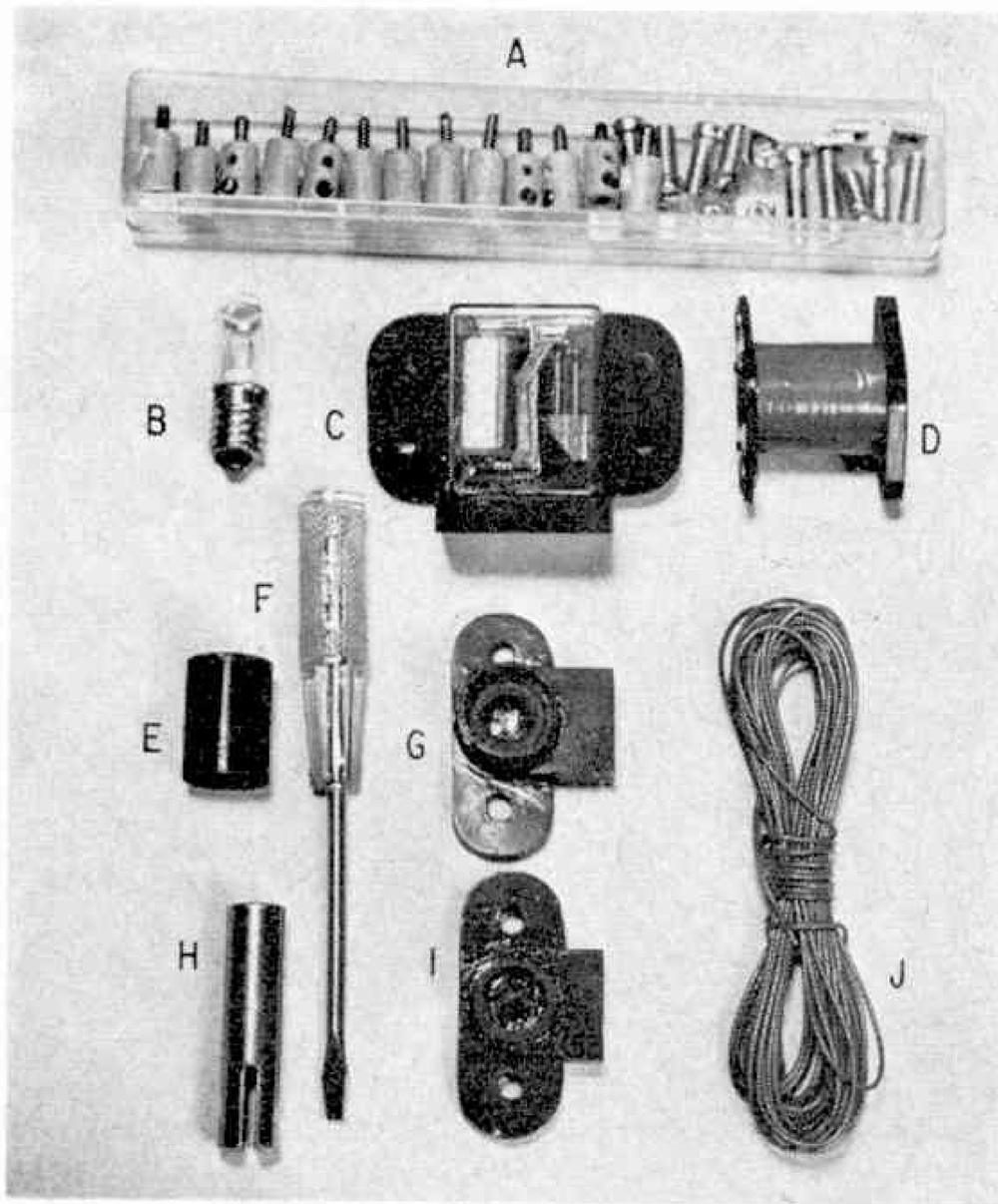
Atomic energy does not entirely replace coal but helps to eke out the world's supply since many countries have adopted it, and in many ways it has proved most valuable not only for producing electricity, but for supplying heat directly to warm homes. Besides these and other helpful developments, the last few years saw the introduction of various types of atom-smashers which have proved so useful both in nuclear research work, and the treatment of patients in hospitals; and also atomic submarines—but this marvel is another story.



Above: Reactor operations of General Electric's Vallecitos Atomic Laboratory at Pleasanton, California, U.S.A. The reactor was used primarily to test designs and features of a 180,000-kilowatt boiler water reactor being built for the Commonwealth Edison Group of Chicago and the Nuclear Power Group Inc. *Photo by courtesy of General Electric Company of U.S.A.*

Below: A technician inserts a fuel rod into the preliminary reactor assembly at the Atomic Power Laboratory in New York, built in 1946. The first reactor to be operated in the north-eastern United States it is believed to have set a record, having been started up more than 10,000 times. *Photo by courtesy of General Electric Company of U.S.A.*





The parts contained in the Electronics Control Set include: (A) plastic box containing a number of Miniature Plugs, No. 613, plus extra Nuts and Bolts, (B) Lamp, No. 608, (C) Relay, No. 606, (D) Cylindrical Coil, No. 614, (E) Hood, No. 604, (F) Screwdriver, No. 622, (G) Photo Cell, No. 602, (H) Core for Cylindrical Coil, No. 527, (I) Lamp Holder, No. 610, (J) Coil of Connecting Wire, 5 yards, No. 616.

Great News for the '70's says 'Spanner'

WHO SAID Meccano is old hat? I'll fight anybody who did! Meccano might be the oldest miniature engineering system in the world, but it has always been right bang up to date—and never more so than now, when Meccano Tri-ang in Liverpool have just finished revising the entire system. Yes! Meccano hits the seventies in style with new, attractively-boxed Sets, new parts, new manuals, new colours—in short, new life!

Hold on, though. There is no need for all you thousands of existing Meccano builders to think that your present Sets have become obsolete. They most certainly have not. Meccano is still Meccano and the new features will not reduce the use of existing Sets by the smallest fraction. What they will do, however, is increase tremendously the scope of Meccano and the enjoyment that can be had from the system.

"Exactly what changes have been made?", you will be asking, and this is a question which is best answered by looking at the various categories of the system separately.

New parts

Dealing first with individual parts, it is important to stress immediately that nothing in this section has been withdrawn. On the contrary, a number of new parts have been added, including special electronic components which completely revolutionise Meccano thinking. These electronic components are illustrated in the accompanying photograph, but before describing them, I would like to look at the new standard parts that have been added to the range:

No. 27f Multi-purpose Gear Wheel.
No. 131 Cam.
No. 167a Large-toothed Quadrant.
No. 167c Large-toothed Quadrant Pinion.

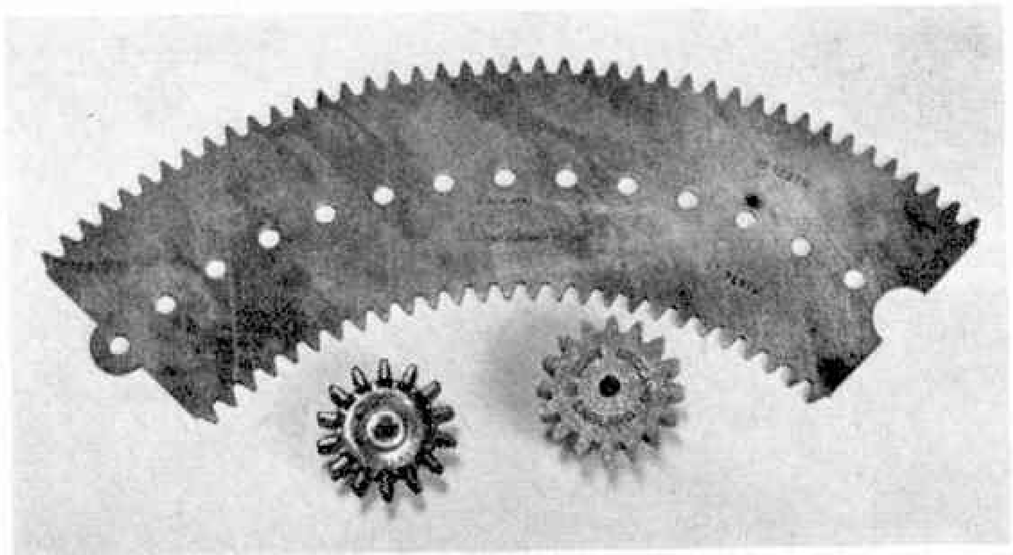
None of these parts is merely "useful" to Meccano builders—they are all invaluable! The Multi-purpose Gear, for example, with 14 teeth of unique design, can not only be used as a straightforward gear wheel, but also a handy pulley wheel with a 1 in. diameter and, in this role, it will take a Rubber Ring No. 155, or a Motor Tyre, No. 142c, thus serving as a handy road wheel. In addition, two Gears together will mesh at *any angle* from 0 to 90 degrees, while two placed face to face will even lock together to serve as clutch plates. In other words, the "multi-purpose" description is absolutely correct.

The Cam, of course, can be used only as a cam to convert rotary motion into reciprocating motion, but there are innumerable types of mechanisms in which the use of a good cam is essential. In fact, the Meccano system has needed such a part for a long time and so No. 131 will be particularly welcome to modellers.

Equally welcome will be the Quadrant which is another part with numerous invaluable uses. Basically speaking, the Quadrant is a wide curved strip with teeth cut in both edges, the ends of the Quadrants being designed to locate perfectly with each other so that four Quadrants placed end to end will make a full circular gear ring of 11.08 in. overall diameter. Each Quadrant has 42 external teeth and 27 teeth internally, four segments therefore forming a complete gear ring with 168 teeth externally and 108 teeth internally. The parts, of course, are not limited to being used only as sections of a gear ring. They can also be used separately, but, when used in a gear ring, they are designed to be bolted to a $9\frac{7}{8}$ in. Flanged Ring (Part No. 167b), which then provides an excellent base for a driven turntable or large roller race.

A glance at the Quadrant will show that its teeth have not been cut to standard Meccano form, but to a considerably larger form. The prime reason for this

Three of the new standard parts just added to the Meccano system: No. 167a Large-toothed Quadrant (top); No. 167c Large-toothed Quadrant Pinion (lower right); No. 27f Multi-purpose Gear Wheel (lower left).



is simply to reduce the danger of gear slip. A gear ring built up from Quadrants is so large compared to other Meccano gears that, if its teeth were cut to standard form, they would be so relatively small that the slightest "play" in the supporting structure might cause the driving gear to slip momentarily out of mesh with the Quadrants. Then, again, such a gear ring would generally be used in large, often heavy structures and, if small-form teeth were used, the danger of them not only slipping, but *stripping* would be real. The large teeth overcome both problems, although the large tooth-form does mean that an existing Gear Wheel or Pinion cannot be used with the Quadrant. And this is where the Large-toothed Quadrant Pinion comes in.

This Pinion has been produced exclusively for use with the Quadrant, having 16 teeth cut to the same form as those on the Quadrant. When the Pinion is meshed with a complete gear ring, externally, a reduction ratio of 21:2 is obtained and, when meshed internally, the resulting ratio is 27:4. The new Pinion can of course be integrated with the existing standard gears by fixing a standard gear on the shaft carrying the new Pinion and then by transmitting the drive via the standard gear.

In addition to these new parts, a useful alteration has been made to the existing 2 in. Strip, Part No. 6 Previously produced with four holes, this part now has an extra centrally-positioned hole to allow it to be secured through the middle—a small point but very important.

Electronic parts

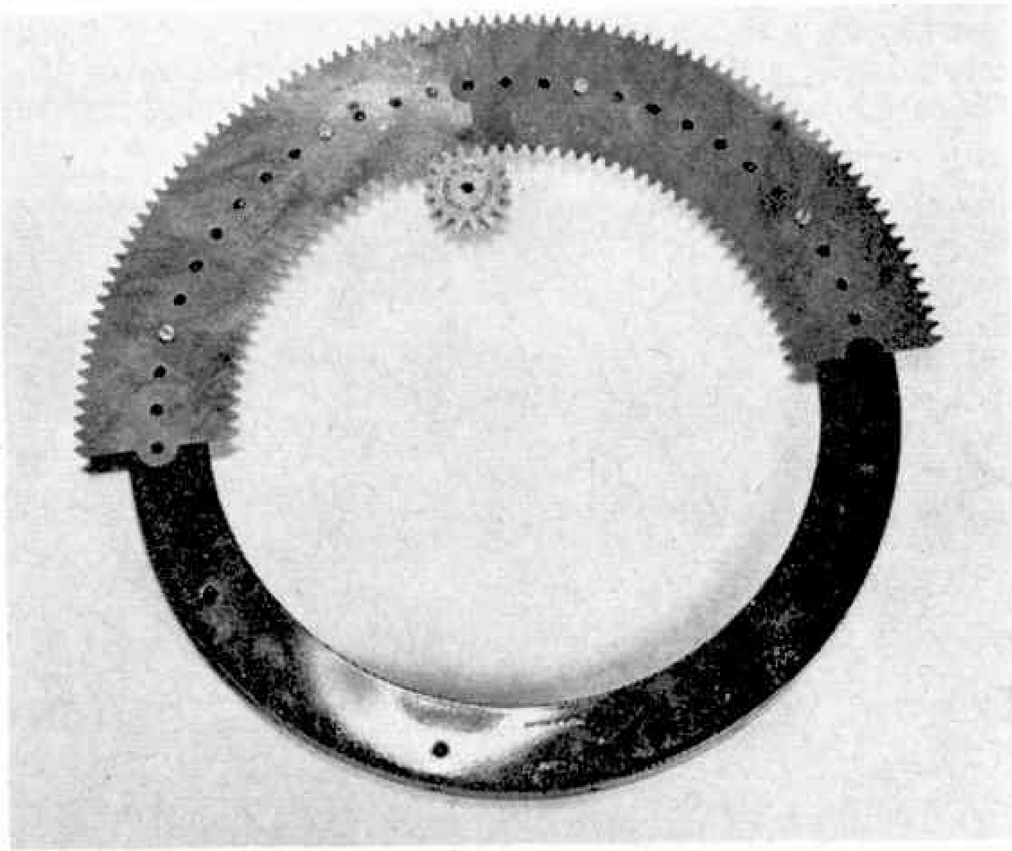
While the new standard parts make invaluable additions to the Meccano range, the new series of electronic parts open up completely new and exciting horizons to the Meccano modeller. Thanks to these marvellous components, you can now introduce genuine automatic control to models: control governed almost unbelievably by a beam of light !

I can understand that mention of the word "electronic" may perhaps deter a few modellers who know very little about the subject, so let me say straight away that you do not need to be anything near an electronic genius to work with the parts. If you can successfully use the electrical parts included in the existing Meccano system, you will have no trouble with the new electronic components, which are mainly intended to do nothing more complicated than provide an advanced method of stop/start control over Meccano motors. The parts in question are as follows :

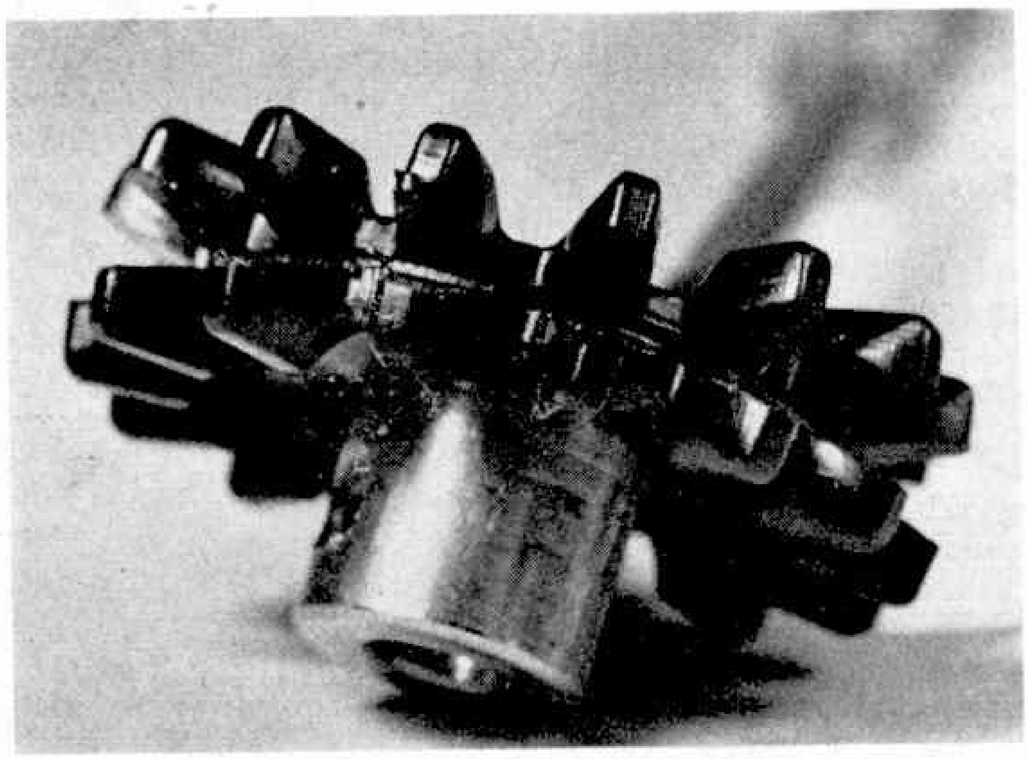
602 Photo Cell.
604 Hood.
606 Relay.
608 Lamp.
610 Lamp Holder.
612 Miniature Plug.
613 Miniature Plug Socket.
614 Cylindrical Coil.
616 Connecting Wire, 5 yards.
620 Remote Control Battery Box.
622 Screwdriver.

Perhaps the most important of these parts is the Photo Cell which consists of a specially treated chemical, cadmium sulphide, enclosed within a special plastic. When in darkness, the cadmium sulphide is an insulator which of course does not allow an electric current to pass through it, but it becomes a conductor as soon as light falls upon it, owing to the release of electrons within the chemical, and accordingly allows the passage of current. The amount of current allowed through depends on the brightness of the light falling on the Photo Cell, or, in other words, the brighter the light, the greater the current flow.

As most model-building is done either in daylight or in artificial light, a certain amount of light is bound



The new Large-toothed Quadrant, No. 167a is specially designed to be bolted to the existing 9⅞ in. Flanged Ring, No. 167b, as shown here. Four Quadrants will give a complete gear ring of large diameter.



A close-up view of the Multi-purpose Gear Wheel, No. 27f, showing the unique tooth form which results in the "multi-purpose" application.

The Meccano Hand Generator—a compact manually-driven dynamo which generates current up to 12 volts D.C.

to fall permanently on the Photo Cell. This will not necessarily activate the Cell sufficiently to upset experiments, but the Hood, No. 604, is nonetheless provided to fit over the Cell as a shade for keeping " unwanted " light to a minimum. Naturally, the recommended light source for the Photo Cell is the special high-intensity Lamp with built-in focussing lens, No. 608, which is normally carried in the Lamp Holder, No. 610.

Another extremely important part is the Relay, No. 606. This, in effect, is a magnetic switch, requiring a certain amount of current to operate it and it is generally used in conjunction with the Photo Cell. When the two are incorporated in a circuit, sufficient light falling on the Photo Cell will operate the Relay. Thus, if the Relay, in turn, is connected to a motor, the action of light on the Photo Cell will control the stop/start characteristics of the motor. By using alternative wiring circuits a stationary motor can be made to run during the time light is shone on the Cell, or a running motor can be made to stop. In the first case, blocking the light beam will stop the motor and, in the latter case blocking the beam will start it.

Obviously, the model-building applications of the Photo Cell and Relay coupled to a motor are tremendous, but this combination does not account for the entire value of the new parts. A solenoid has many uses in a photo cell/relay circuit, the photo cell activating the solenoid through the relay. A very good solenoid can be built up using the Cylindrical Coil, Part No. 614, together with the existing ferrite Core, Part No. 527, the Core being carried inside the Coil. When the Coil is energised, the Core is pulled into the Coil on the electromagnet principle, and this action can be put to good use. One application which immediately jumps to mind, for example, is in an automatic counting unit and there are numerous others.

Of the remaining parts, the uses of the Miniature Plug, No. 612, the Miniature Plug Socket, No. 613, and the Connecting Wire, No. 616, are obvious, but the Remote Control Battery Box, No. 620, is worthy of special mention. This is a strong polystyrene box specially designed to take nine Ever Ready U11 or equivalent batteries and intended to be used not only for models utilising electronic parts, but also for any job requiring a Direct Current power supply of either 4½ or 12 volts. It can, for instance, be used with all Meccano electric motors, the particular voltage required being chosen by one of two on/off/reversing switches built into the top of the box. The joy of this accessory is that it does away with the necessity to change batteries when a different voltage is required and means no more fiddling about with a host of wires, connecting batteries in series. Connections are made to just two plug sockets and, what's more, the batteries used are available all over the world in both standard and high-power forms, the latter being recommended for use with Meccano equipment. Also, the fact that the Battery Box allows stop, start and reverse control on two different voltages means that you really do have a " remote control " box—not just a basic power source —and it can be neatly bolted, as a unit, into place in suitable models which then become really self-contained: no trailing wires and loose batteries !

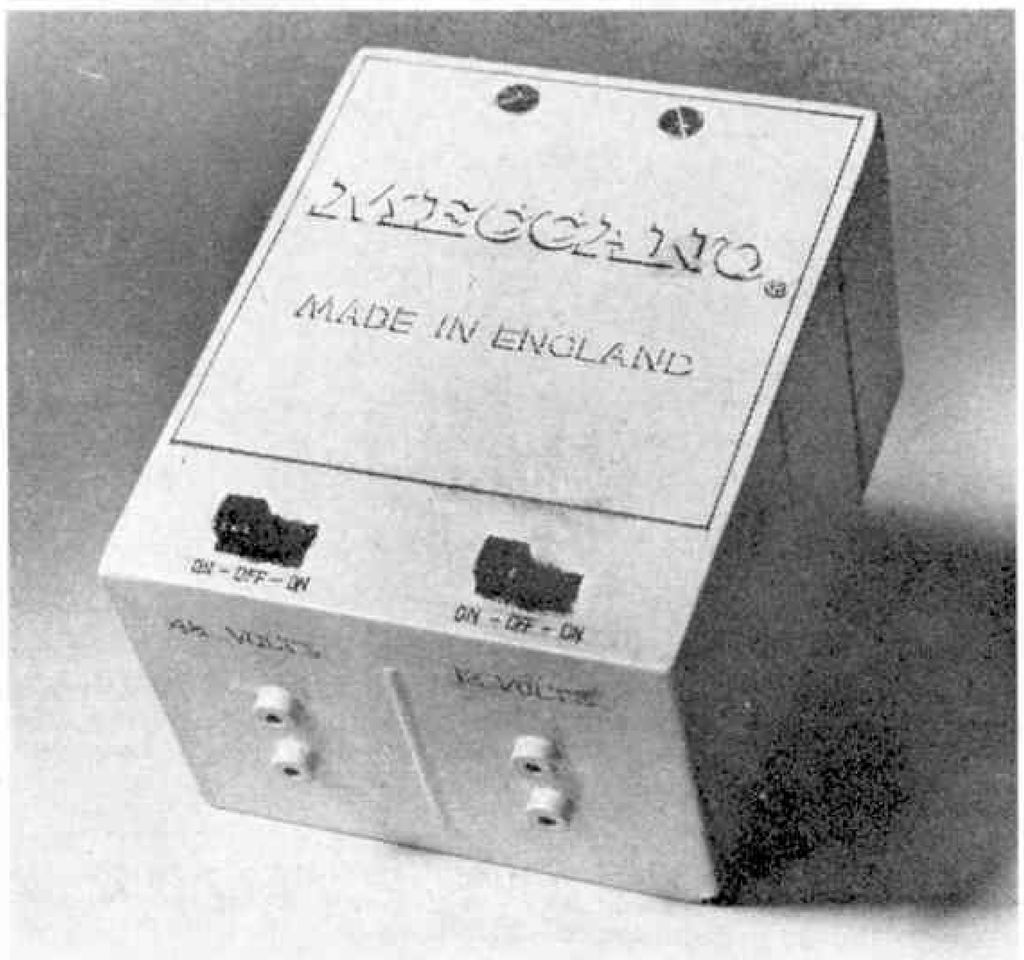
Lastly, the Screwdriver, No. 622, is a special small example intended primarily for use with the Miniature Plugs, the blades of standard Meccano Screwdrivers being too large to fit the small Screws used in the Plugs.

All the electronic parts, together with the existing Cylindrical Core, various Nuts and Bolts and an Instructions Booklet are available in the brand new Electronic Control Set; part of the new deal for 1970.

New Sets

And talking of Sets, this really is where the change has come to Meccano. Gone are the days when the only self-contained, ready-to-build outfits were the range of standard Main Sets (1, 2, 3, etc.) and the entirely separate Junior Power Drive and Power Drive Sets. At last we have a rationalised system where the numerous specialised outfits are directly related to the standard system. Owners of a suitable standard Set can now convert to the appropriate specialised Set and vice versa with the minimum amount of trouble and expense.

Before coming to the specialised outfits, however, let us look at the changes affecting the range of standard outfits. To begin with, Set No. 9 has, for economic reasons, been discontinued and this has



Designed to take nine Ever Ready UII or equivalent batteries, the Meccano Remote Control Battery Box gives start, stop and reverse control at either 4½ or 12 volts D.C.

necessitated the re-allocation of the remaining Set Numbers to keep numbering continuity. As a result, the old No. 0 Set becomes the new No. 1, the old No. 1 becomes the new No. 2, and so on up to No. 8 which now becomes the new No. 9 Set, the No. 10 Set remaining unaltered. Similiarly, the seven Conversion Sets have been renumbered, at the same time changing the code letter from "A" to "X" to distinguish between the new and old series.

As before, new Conversion Set 1X will convert the new No. 1 Set into the new No. 2, and so on, but it is most important to remember that the 1X Set will *not* convert the *old* No. 1 Set into the new No. 2. Because of the change in numbering, the old No. 1 Set is equivalent to the new No. 2, therefore a new 2X Set is required for conversion purposes. The following is a useful table showing the relationship between the old and new main Sets and the new Conversion Sets. Reading up and down gives the equivalent old and new main Sets; reading diagonally from top left to bottom right gives the appropriate new Conversion Set.

Old Main Sets	0	1	2	3	4	5	6	7	8
New Conversion Sets		1X	2X	3X	4X	5X	6X	7X	8X
New Main Sets	1	2	3	4	5	6	7	8	9

In addition to the change in numbers, all the *new* outfits from Set No. 4 upwards have been given a selection of extra parts and these parts must of course be added to old Sets from No. 3 upwards to bring them into line with the appropriate new Sets before a new Conversion Set can be used successfully. The parts that have been added to the various Sets are as follows:

No.		4	5	6	7	8	9
6a	Perforated Strip, 1½ in.	–	–	–	2	–	–
23a	Pulley, ½ in. diameter with boss and grub screw	–	1	1	–	–	–
27f	Multi-purpose Gear Wheel, 14 teeth with grub screw	2	2	2	2	2	2
35	Spring Clip	2	8	6	6	2	1
37a	Nut	14	14	24	24	–	–
37b	Bolt, 7/32 in.	6	14	24	24	–	–
38	Washer	–	4	4	4	–	–
48	Double Angle Strip 1½ × ½ in.	–	1	1	–	–	–
111	Bolt, ¾ in.	–	2	–	–	–	–
111a	Bolt, ½ in.	–	2	2	2	2	–
186a	Driving Band, 6 in. light	–	1	–	–	–	–
193c	Transparent Plastic Plate 4½ × 2½ in.	–	–	–	–	–	1

Just two of the range of new standard Meccano Sets—Sets 2 and 5. In all the new Sets, the parts are packed in recessed moulded polystyrene trays enclosed in modern-looking and extremely attractive boxes.

Special Sets

So much for the standard series—now what about the specialised outfits? Well, to begin with, the Gears and Mechanisms Sets have been retained unaltered except for the design of their boxes, but the Elektrikit, Junior Power Drive and Power Drive Sets have been replaced by a series of new motorised, electrical and electronic Sets more closely associated with the standard series than were the outfits they replace. You will see the association from the following descriptive list of the Sets:

No. 3M Meccano Set: basically the new standard No. 3 Set, but with the addition of the Reversible 4½ volt D.C. Motor to make it a self-contained motorised outfit.

No. 4M Meccano Set: composed of the new standard No. 4 Set plus the Reversible 4½ volt D.C. Motor and the new Battery Box, mentioned earlier.

No. 4EL Meccano Set: made up of the new standard No. 4 Set combined with the old Elektrikit, but less the parts which are unnecessarily duplicated by the combination of the two outfits.

No. 5ME Meccano Set: basically the new standard No. 5 Set plus a 3-12 volt D.C. Motor with 6-ratio Gearbox and the parts contained in the new Electronic Control Set.

Electronic Control Set: containing all the special new electronic parts, already described. Intended mainly, although not exclusively, for remote control of Meccano motors.

The advantages of the new Sets are obvious. They are, for instance, self-contained, and this could not be said of the old Elektrikit which was intended for use in conjunction with a standard Main Set. Also, by being built round a new standard Meccano Set, they can be easily enlarged with a new standard Conversion Set, at the same time bringing a new range of model plans within the scope of the Set. For example, a new 4X Conversion Set added to the 4M Set would enable most of the models featured in the instructions Book for Set No. 5 to be built, and so on. In short, the new special outfits are far more sensible than anything produced in this line in the past and greatly increase the versatility of the system generally.

New power source

The versatility of the system is increased even more by an exciting new power source for use with Meccano —the Meccano Hand Generator. This really is a breakthrough in electrical modelling equipment as it gives the modeller an entirely new form of independence. No longer need he worry about batteries or transformers, mains supply or rectifiers; he can now generate his own electricity! Yes, the Hand Generator is a genuine manually-driven dynamo that will produce anything from 0 to 12 volts D.C., which means that it can be used for powering all the Meccano electric motors, as well as suitable electrical models built with the 4EL Set. All you do is connect two leads to your model, or motor, and wind the handle mounted on the Generator. The faster you wind the handle, the more current you produce—it's easy! The only thing to remember is not to wind too fast for too long when using the Generator with a piece of equipment requiring less than 12 volts otherwise you will pump too high a current through it.

Obviously, the independence allowed by the Hand Generator is its most appealing point, but it also serves another important function when used with a Meccano motor. The speed of Meccano motors will increase as the driving current is increased and, because the current output of the Generator depends on the speed at which its winding handle is turned, the Generator can, therefore be used as an infinitely variable speed controller. In addition, the motor drive itself may be reversed at will by simply turning the Generator handle in the opposite direction, thus reversing the polarity of the current supply. In short, therefore, the Meccano Hand Generator serves as an independent power source, offering start, speed, reverse and stop control—just about everything in one!

New manuals

No new system would be complete without instructions literature, and so, specially prepared for the new standard Meccano Sets from 1 to 7 is a brand new set of Instructions Books giving detailed plans for a large number of new or greatly improved models. In these Books, as in the previous Manuals, the model plans are given in "exploded" illustration form, but this time, the illustrations are in full colour! This greatly assists identification of the parts and generally allows the plans to be more easily followed. Again, because the specialised Sets are based on standard Sets, the particular standard Instructions Book is packed with the specialised Sets, except for the 4EL and Electronic Accessory Sets which have their own special Books. The Electronic booklet is also packed with the 5ME Set, but the standard No. 7 and 8 Sets contain the relevant portion (attractively rebound and renumbered) of the *old* 7/8 Manual. The No. 10 Set contains the existing series of No. 10 Special Model Leaflets, plus the *old* series of No. 9 Special Model Leaflets.

A point which should be mentioned here is that, because the new Manuals apply to both the standard and motorised Sets, many of the models included in them have been fitted with a motor of one sort or another. These models can, of course, also be built for hand operation. In addition, a few of the models are shown with a motor which is not included in any of the motorised Sets. This has been done to assist owners of a standard outfit who already own, or wish to buy one of the motors in question.

New colours

Last of all we come to the subject of colour. Certain colour changes have occurred within the system, these serving to greatly increase the attraction not only of the comparatively few parts involved, but also of the models in which the new colour parts are used. Compared to the last colour changes, in 1964, the present alterations are small. In general terms, the majority of parts which, before 1970, were black are now blue and the only frequently-used parts which this really affects are the Flanged Plates, No's. 51, 52, 53 and 54, and the Black Plastic Plates, numbered 194 to 194e, the latter now being officially termed "Blue Plastic Plates". Less-frequently-used parts affected include most of the circular and cylindrical components, as follows:

No. 19a Spoked Wheel.
No. 19c 6 in. Pulley.
No. 109 Face Plate.
No. 118 Hub Disc.
No. 130 Eccentric, Triple-throw.
No. 130a Eccentric, Single-throw.
No. 143 5½ in. Circular Girder.
No. 145 7½ in. Circular Strip.
No. 146 6 in. Circular Plate.
No. 146a 4 in. Circular Plate.
No. 157 Fan.
No. 162 Boiler.
No. 162a Boiler End.
No. 163 Chimney Adaptor.
No. 167b 9⅞ in. Flanged Ring.
No. 168a Ball Thrust Race Flanged Disc.
No. 216 Cylinder.

In addition to these changes, the blue rims of the two Steering Wheels No's. 185 and 185a become black, while the Wheel Flange, No. 137, which is also blue, is now zinc plated, as also is the yellow 1½ in. Corner Bracket, No. 133. All the existing black Gear Wheels, Sprocket Wheels and Rack Strips, however, remain black, while the various Tyres, numbered 142a to 142d and the Rubber Ring, No. 155, are changed from grey to black, as are the rims of the two Road Wheels, 187 and 187b. The green Meccano Cord is changed to blue. The blue colour used in the majority of the changes, by the way, is the same as that in which the existing 2 in. and 3 in. Pulleys are finished.

As a matter of interest, the main reason for the colour changes is to enable the Meccano system to be easily recognised as Meccano all over the world. It may come as a surprise to some readers to learn that Meccano is not only made in Liverpool, but also in France by Meccano Tri-ang of Paris. While the French system is identical in design to the British system, the French company have for many years had their own, entirely separate colour-scheme of blue, gold and red. Now, however, both the French and British companies have rationalised on the one colour-scheme so that Meccano becomes a single, truly universal product.

Seeing all the colour-changes listed together as they are here does tend to give the impression that their number is great. When compared to the range as a whole, however, the number is really very small and, whether large or small, the changes are all for the better. A system cannot improve without change and this year's changes certainly bring a vastly improved Meccano system!

a new home for an old ship

John Mannering

IN THE AUTUMN of 1969 a strange looking vessel made her way down the North Sea, through the English Channel and headed out into the Atlantic bound on the long voyage to San Francisco. She was the 166 ton steam paddle tug *Eppleton Hall*.

Built in South Shields in 1914 by Hepper & Co. she spent most of her working life in the coal ports of the north east coast; working up until about two years ago in Seaham Harbour. She was the last paddle tug still serving under the 'Red Duster.'

But her useful life had come to an end, and she was condemned to the breakers' yard. Fortunately there was some delay in actually breaking up her hull, and early in 1969 Mr. Scott Newall, editor of the *San Francisco Chronicle*, and a great lover of old ships, read of her plight; came over to England and bought her.

Her steel hull and her 120 h.p. engine were in reasonable condition, but already her decks, bulwarks, paddle wheels and paddle boxes, and all the timber in her construction had been removed. Undaunted, her new owner gave orders for her to be completely restored to her original condition as she had been on that long ago day in 1914, when she went down the slipway at South Shields, a gleaming new vessel about to start her long life of service and aid to shipping on the stormy coasts of Northumberland and Durham.

To Messrs. R. B. Harrison, Ship Builders and Repairers on the Tyne, was entrusted the task of bringing her back to sea worthiness. This they have faithfully done. The only major alteration being the change from coal to oil firing for her boilers.

This was done principally because she would be unable to carry enough coal for the longer sea passages, and it is not so easy to bunker with coal as it used to be before the days of oil burning and motor ships.

As a further aid to her engines she was given a useful spread of canvas to help her along in the trade winds. She now carries a large squaresail on the foremast, with a fore staysail; and a mizzen mast has been stepped on which a staysail is set together with gaff rigged fore and aft canvas. This rig, it was hoped, would give her a modest five knots in the South East Trades, thus saving a useful amount of fuel and wear and tear on her engines and paddles.

It should be remembered that for many decades in the early years of steam all ocean going vessels, whether paddle or screw driven, carried a large spread of canvas to take advantage of the strong ocean winds. So Eppleton Hall was following the tradition of the early steamships.

Commanded by her new owner, with a volunteer crew of eleven Americans including three young women and a twelve-year-old boy, the old tug, now under the Stars and Stripes, left the N.E. coast, made a call at Dover and was clear of the chops of the Channel by early October.

At the time of writing, November 1969, she has been reported from Lisbon and Madeira. Scott Newall proposed to sail to the Cape Verde Islands, thence to the north coast of Brazil, then coastwise to the Panama Canal, and up the western American seaboard to San Francisco—a long voyage for a small steam paddle tug, but avoiding as much as possible, long ocean passages.

On arrival she may be taken over by the San Francisco Maritime Museum. There she will lie, cared for; and admired by all ship lovers: the humble little steam 'paddler' that served the ports of our north-east coast for over half a century, and now a fitting testimonial to the skill of the men who built her and the crews that sailed in her. Not the least of her achievements being the long haul to her Pacific home.

Edyth Harper shows readers some interesting things to be seen when . . . .

LOOKING IN LONDON

THE VISITOR to London is often bewildered and exhausted by the wide choice of things to see and places to visit. While guide books steer him to famous spots, there are many other interesting and curious things to notice that are well worth searching out.

London has spread through the centuries from the old walled City of London to its present dimensions. Village roads in Kensington, or Islington, for example, became London streets but kept their curves and corners. The 'Hare and Hounds Inn' in Islington is a reminder of its rural past. Bond Street, the centre of London fashion, was a lane with marshland near it until the 18th century.

The heading photograph shows one of the magnificent Lions in Trafalgar Square. One of the four symbolic Lion statues, part of the Queen Victoria Memorial, which stand in front of Buckingham Palace.

Fortunately, much of old London is still there if you take the trouble to look for it. To help you in your search, here are a few things to visit and possibly to photograph, or sketch.

In Whitehall the mounted Horse Guard Sentries appear to guard the entrance to Horse Guards Parade. Really they are on guard at the entrance to the Palace of Whitehall, which once stretched from the Parade to Westminster. Built by Tudor monarchs in the 15th and 16th century, fire destroyed it in the 17th century. Yet the sentries still guard the gate as they have done since Kings and Queens lived there.

Walk across Horse Guard's Parade to St. James' Park. Here you will find Daphne, a pelican, given by the Governor of Louisiana. Aged about 19, Daphne had a wing amputated after an accident in 1962, but she lives quite happily, queening it over the ducks and wild fowl that surround her.

Turn and look back from the bridge over the lake to see one of London's loveliest sky-lines with quaint 'onion' roof towers and minarets looking more Oriental than English.

Across the other side of London on Highgate Hill, once the haunt of highwaymen, you can see a stone cat, belonging to Dick Whittington, Mayor of London. He is said to have stopped at this spot to hear the Bow bells call "Turn again Whittington." No one knows what Puss looked like, but a modern artist has carved his idea. The statue stands where Dick is said to have rested.

London is full of old churches. One well worth noticing is that of St. Pancras, near St. Pancras station. Cecil Rhodes' family tombstone lies in St. Pancras churchyard with Rhodes' name on it. In this church the Roman catholic form of Mass was said long after it was forbidden after the Reformation in Britain. Queen Elizabeth I gave special instructions that the old priest there should be allowed the form of service he preferred, with no restrictions.

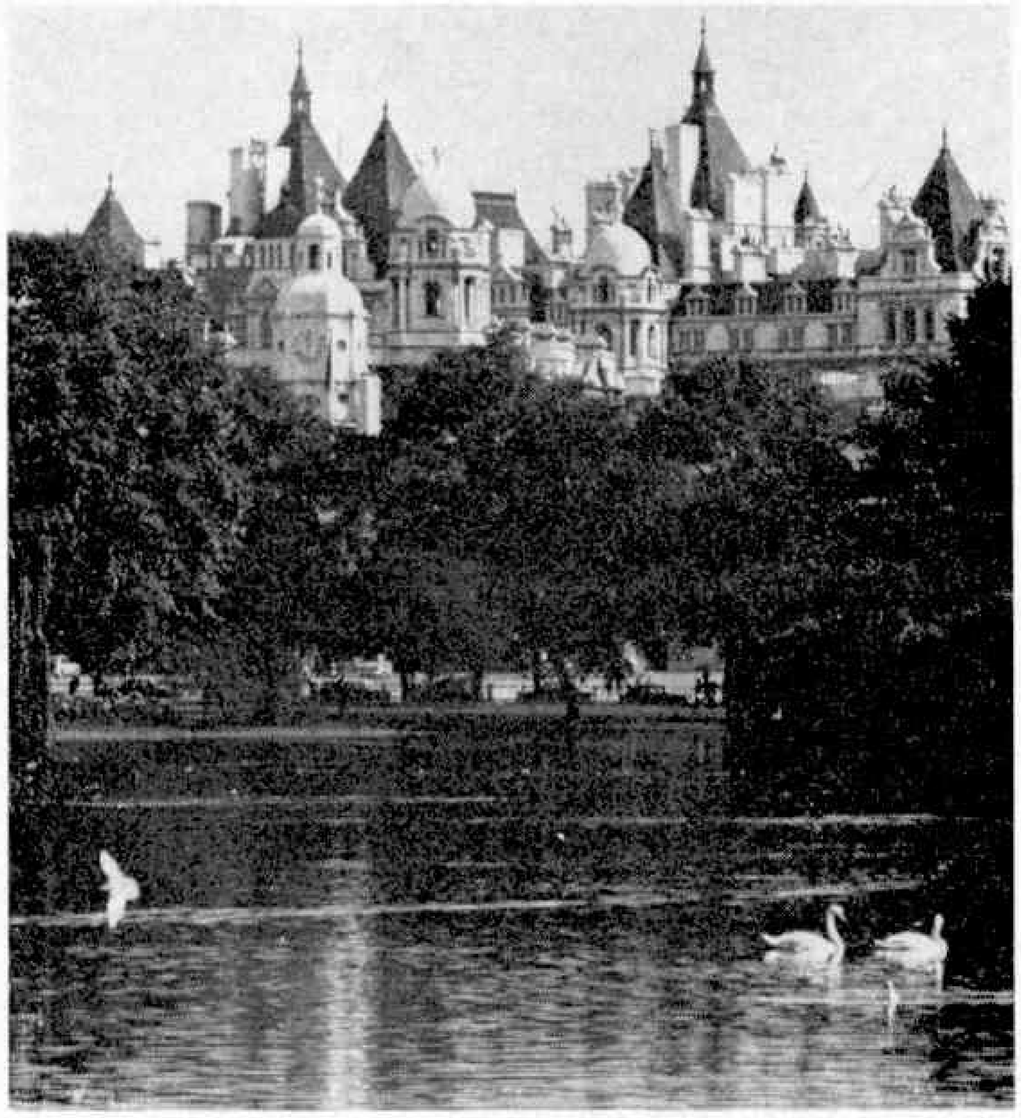
This Queen was very fond of London, so it is fitting that London's oldest statue is one of her. Ever since 1586 Elizabeth I has looked down on her people with an amused smile. Once she stood over Ludgate, a

prison, but since 1766 she has been in a niche on the wall of St. Dunstan-in-the-West.

Notice the statue of St. Paul on the north side of the Cathedral churchyard. Nearby Father Garnet was executed, the only man ever to have suffered that fate in this place. He was a fellow conspirator with Guy Fawkes in the Gunpowder Plot to blow up the Houses of Parliament in 1604. Notice too the fig trees in the Cathedral Yard. They were first introduced into England by Cardinal Pole in the 16th century.

London is full of lions too, live ones at the Zoo, stone ones in Trafalgar Square and many other places. An interesting lion is the Coade stone one now standing on Westminster Bridge. Originally it stood outside a brewery near Waterloo station. As a boy, King George VI looked out for it when he went by train from that station. It was scheduled to be destroyed but the King asked to have it preserved. On moving it, workmen found a flap cut in its side, and inside a William IV coin.

These are only a few of the many unusual things to see in London. Did you know that an official tape-measure exists in the side of the National Gallery to



check the yards on your tape-measure? Or, that not all lamp-standards are really lamps? One in Trafalgar Square is a disguised police-box complete with telephone, while another gas lamp carries away sewer smells near the Savoy Hotel.

You may see the Queen's mail carried in a horse-drawn brougham, or pause beneath a 200 year old plane tree near No. 10 Downing Street. London boasts the only pub with a swinging doctor—the "John Snow" in Soho, which commemorates this man, who introduced anaesthesia in childbirth while the originator of vaccination sits in stone at Kensington Gardens.

The postmen have their own garden in Aldgate, a memorial to many brave men and women. Another garden at Craven Hill is still set aside as a burial place for plague victims, should that disease ever devastate the capital again.

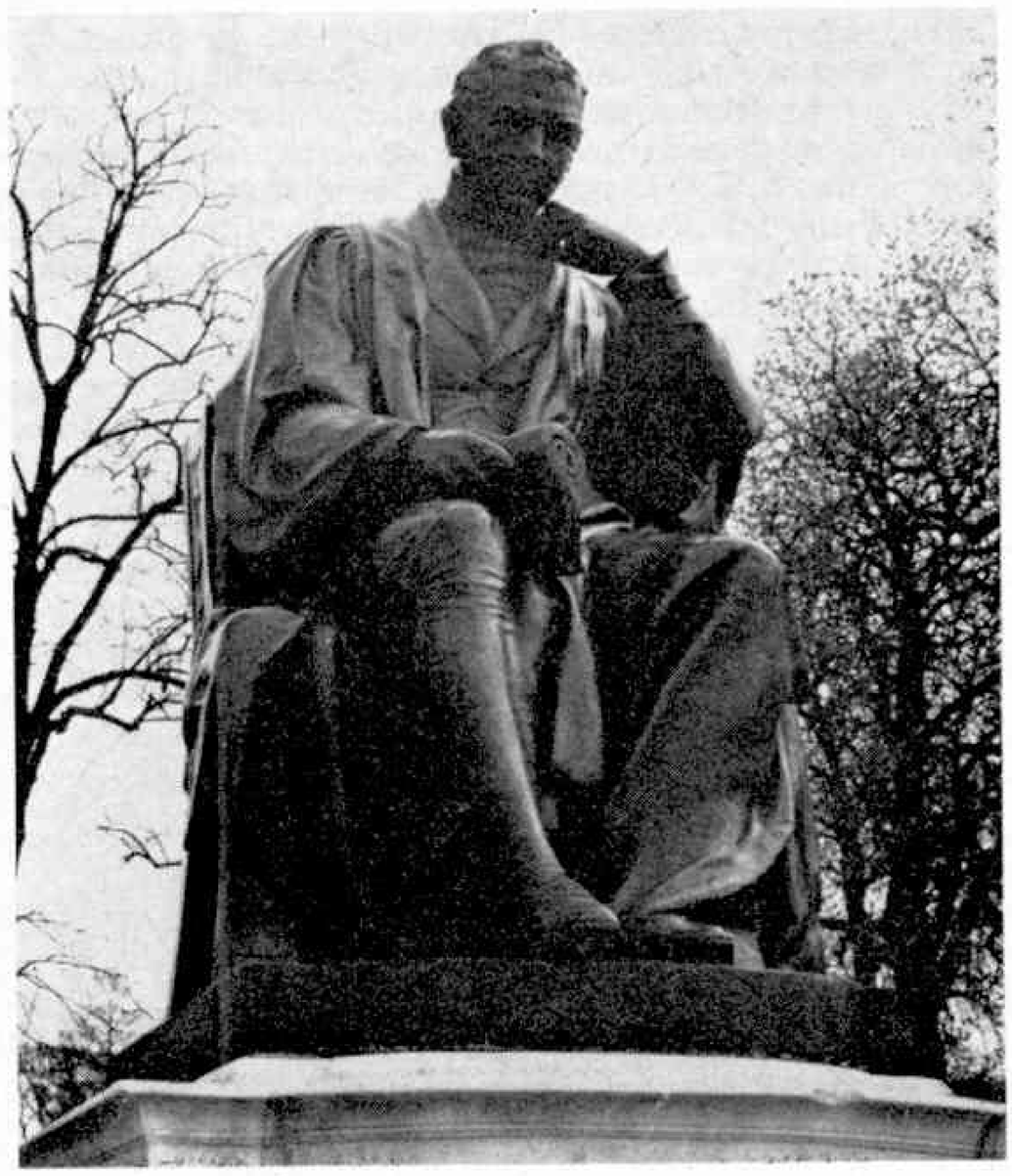
Leave the set guide books and find out London's curiosities. They have been there a long time and are well worth the effort.

Above: Another of the Queen Victoria Memorial Lion statues by Sir Thomas Brock, "On Guard" outside Buckingham Palace.

Left: Looking towards Whitehall from St. James Park.

Below: Edward Jenner carried out extensive research resulting in the wide use of vaccination against smallpox. This memorial stands in Kensington Gardens.

Photographs by Richard Bristow.



An early L.C.C. TRAMCAR

described by
LESLIE DOUGALL

Photographed by
BERT LOVE

PARTS REQUIRED

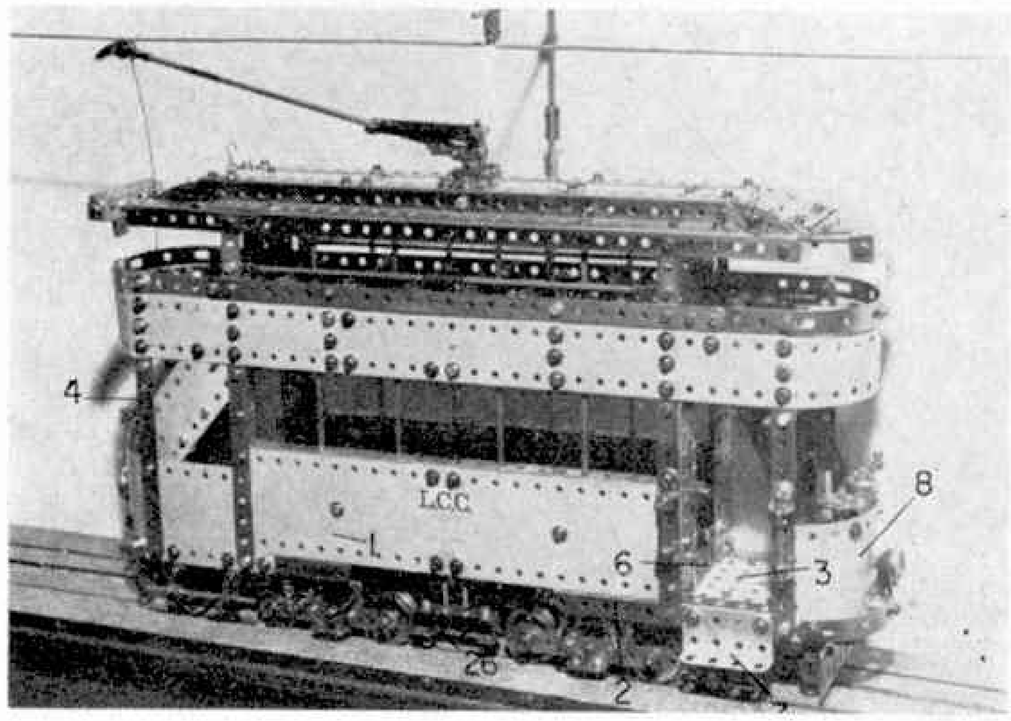
2—1	5—17	22—59	14—126a
8—2	4—18a	2—61	4—128
2—2a	8—20	1—63	2—147c
12—3	2—22a	2—72	2—161
8—5	2—23a	8—77	2—163
9—6	2—24	4—90	2—164
6—8	1—26	2—90a	3—179
4—9	1—27a	21—94	10—188
2—9a	8—35	1—96	17—189
4—9b	485—37a	3—96a	3—190

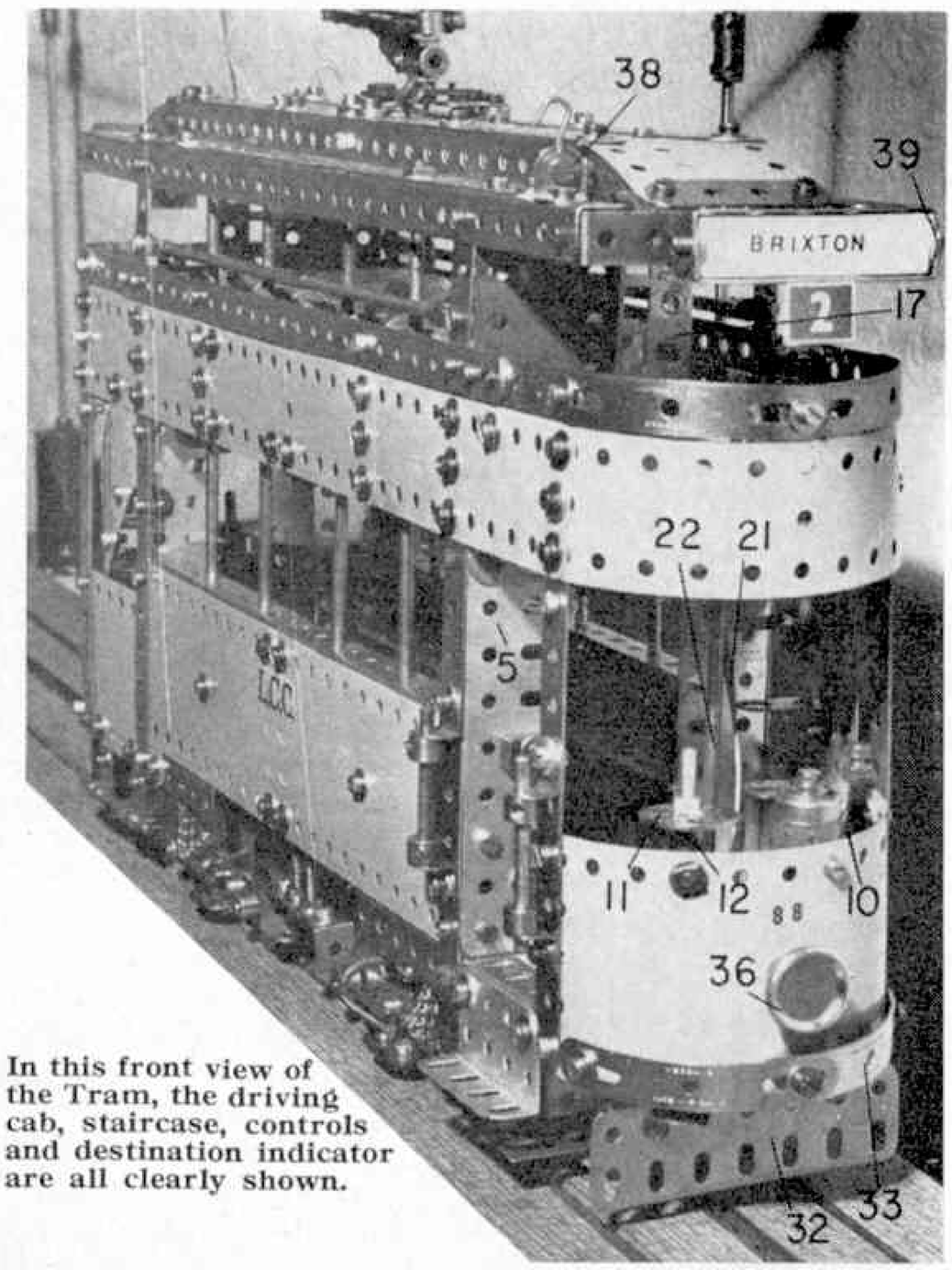
continued opposite

DUE TO an understandable reluctance on the part of the London County Council to permit the use of overhead conductor wires in the highly congested streets of central London and the inner suburbs, these areas were somewhat late in having the convenience of an electric tramway system. Such a system did eventually appear, however, but when it did, the usual mass of overhead cables did not appear with it, for the opening of the L.C.C. Tramways in their electrified form in 1903 by the Prince of Wales, later King George V, saw the introduction of the Conduit System where current for the cars was collected, not from an overhead wire, but from two conductor rails placed in a pit between the tracks. Access was by means of a narrow slot through which a long slender collector, known as a "plough", was drawn along by the car. This tramway system was probably the largest in the world and certainly the most sophisticated.

Later, through-running on systems already operating on overhead wires in the outer suburbs and the extension of the L.C.C. System to areas where trolley wires were permitted necessitated the modification of certain cars so as to be able to collect current from both beneath and over the track.

The model featured here shows an early open-deck car which has been roofed and equipped for overhead working. Certain obsolete parts have been used but





In this front view of the Tram, the driving cab, staircase, controls and destination indicator are all clearly shown.

these are not essential to the working of the model and suggested alternatives will be mentioned later on in the text.

Construction of the model is begun by forming the sides of the lower saloon 1 from two $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plates bolted together by their Flanges. These are then covered by two $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates and one $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate placed beneath them at the centre. Each platform is made from two $5\frac{1}{2}$ in. Angle Girders 2 and one $5\frac{1}{2} \times 3\frac{1}{2}$ in. Flat Plate 3 extended at the front end by a Semi-circular Plate 3a. All these Plates are bolted to the $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plates, as shown. Eight $5\frac{1}{2}$ in. Strips 4 are bolted to the Angle Girders to receive the upper deck. Four $4\frac{1}{2}$ Flat Girders 5 are attached as shown, these being joined at the lower end by a $3\frac{1}{2}$ in. Angle Girder 6 and at the upper end by a $3\frac{1}{2}$ in. Strip. Two $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates, joined by a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate, are attached to $3\frac{1}{2}$ in. Angle Girders 6 to form the floor of the lower saloon, while passenger seats running the length of the lower saloon on each side are made up from two $7\frac{1}{2}$ in. Flat Girders overlapped four holes and attached by Angle Brackets to the car sides. A passenger step 7, consisting of a Girder Bracket is fitted to each side as shown, then each front dash 8 is made from a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate, extended by a $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate, and is attached to upright $5\frac{1}{2}$ in. Strips 5, the end of the $3\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate being inserted behind the Flexible Plates forming the side of the car.

A Used Ticket Box 9 is formed from an electrical Short Circuit Piece fixed to the door frame by a Washer and $\frac{1}{2}$ in. Bolt, a Sleeve Piece being bolted to each dash

A general view of the author's highly realistic Tramcar, based on an early vehicle used by London County Council Tramways. Motive power is supplied by the "Emebo" Motor, recently withdrawn from the Meccano system.

to form the controller 10. The controller handle is made from a narrow 1 in. piece cut from the perforated edge of an old Flexible Plate and bolted to a Chimney Adaptor using a Washer. A Bolt is locked in the second hole to represent a knob, the whole unit being cranked to make a realistic controller handle.

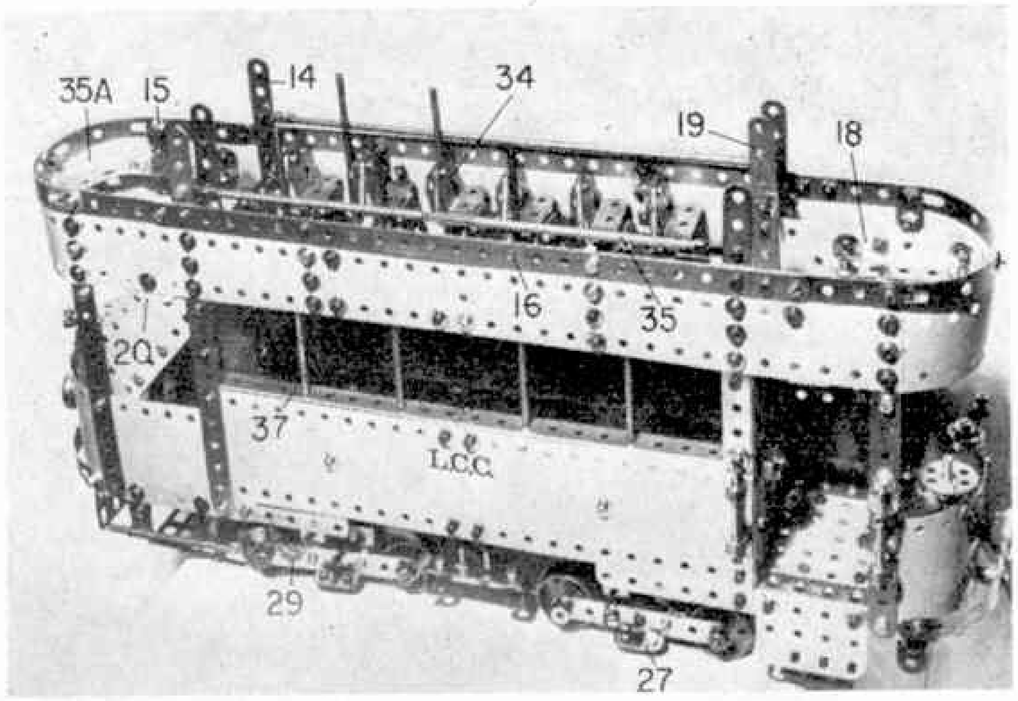
Each Peacock Brake 11 consists of an electrical 1 in. Bush Wheel and Threaded Pin on a 3 in. Rod, journalled in an Angle Bracket 12, attached to the dash and in a Flat Trunnion 13 fixed to the Semi-circular Plate on each platform. A ½ in. Pulley with boss is fitted to the bottom of the Rod.

Construction of the upper deck is now undertaken. The four central pillars are extended upwards by four 3½ in. Strips 14, while the outer uprights are extended by four 2 in. Strips 15. Bolted to these uprights to form the sides and ends of the upper saloon are a number of 5½ × 1½ in. Flexible Plates and two 2½ × 1½ in. Flexible Plates, these being topped with two 12½ in. Strips 16, four 2½ in. Strips and four Formed Slotted Strips.

The floor of the upper deck consists of two 5½ × 3½ in. Flat Plates attached to the Flexible Plates by Angle Brackets, the ends of the upper saloon being enclosed by means of two 2½ × 1½ in. Flexible Plates overlapped three holes, and one Windmill Sail 17, the latter representing the sliding door to the open section of the top deck. A floor for both open sections is constructed from a 2½ × 2½ in. Flexible Plate extended by a Semi-circular Plate, the whole being fixed in place by Angle Brackets. The side of each staircase headway 18 is made up from two 2½ × 1½ in. Flexible Plates attached by Angle Brackets to the floor and it is provided with an upright consisting of a 3½ in. Strip 19, the Flexible Plates being overlapped two holes.

Next to be fitted are the staircases, each of which is made from a 5½ × 1½ in. Flexible Plate, to which five 1 × ½ in. Angle Brackets are attached to form the treads. Bolting of the Angle Brackets is started at the third hole from the top and note that the bottom Angle Bracket has a ½ in. Reversed Angle Bracket bolted to its slotted hole. The top of the staircase is fixed as shown at 20, while at its lower end, it is bolted to the platform floor by the Reversed Angle Bracket. The inner staircase rail 21 is formed from a 4½ in. Strip, extended by a Fishplate, and bent to conform to the bend of the Flexible Plate with its 1 × ½ in. Angle Brackets. It is attached to the 3½ in. Strip forming the top of the lower saloon door by another Angle Bracket, its lower end being bolted to the Reversed Angle Bracket on the lowest tread of the staircase, the securing Bolt carrying a Rod and Strip Connector in which is held a 4 in. Rod 22.

At this point the model should be up-ended and the running gear fitted. This consists of the trucks 23 the safety guards, the bumper beams, the motor



An open view of the upper deck showing the seating arrangement and construction methods.

assembly and the plough guide. An Emebo Motor 24 is bolted to two 3½ in. Angle Girders attached to the 5½ × 2½ in. Flanged Plates forming the sides of the car in the position shown. A ½ in. Pinion on the shaft of the motor engages with a 57-teeth Gear Wheel on a 2 in. Rod journalled in two 1 × 1 in. Angle Brackets 25 bolted to the 3½ in. Girders, this Rod also carrying a ¾ in. Sprocket Wheel and a Collar. The plough guides 26 are each represented by a 2 in. Strip to which two Double Brackets are attached, these being fixed to the frame of the car by 1⅛ in. Bolts as shown.

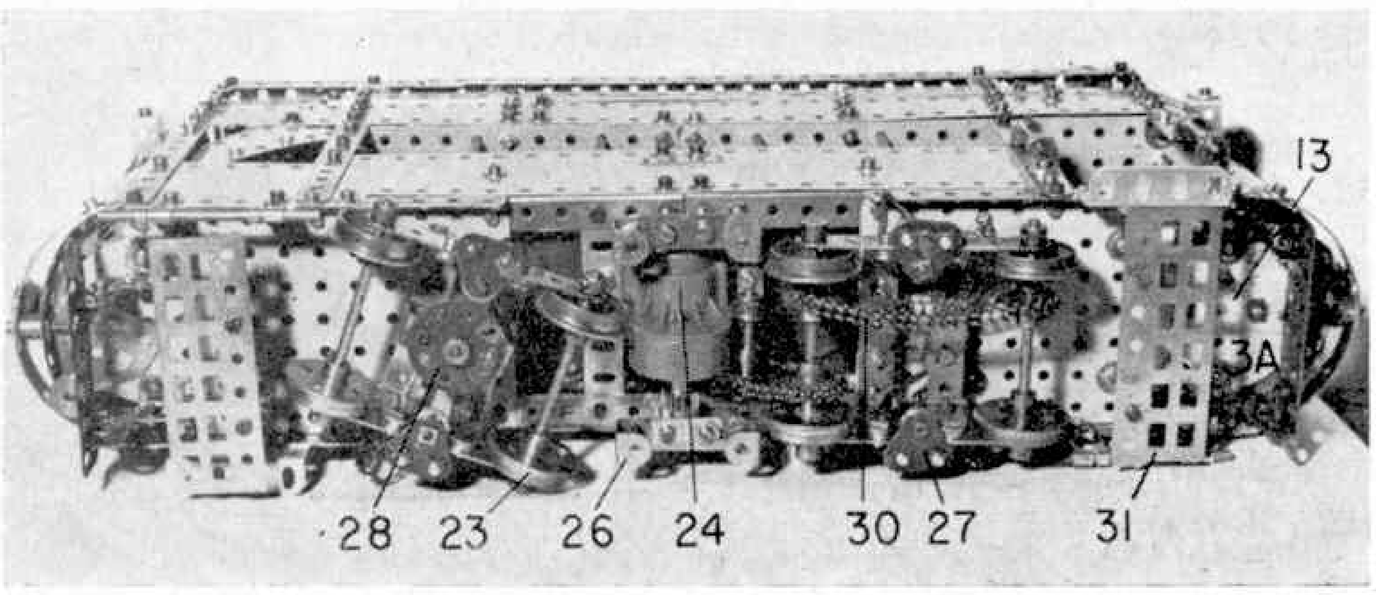
Each truck is made up from two 2½ × 1 in. Double Angle Strips to which are attached two 3½ in. Strips spaced by two Washers, then four 1⅛ in. Flanged Wheels are fitted, using four Rods and Collars. The magnetic track brakes 27 are represented by two 1 in. Triangular Plates attached to the trucks by Angle Brackets. A small piece of rubber-covered wire is held in one of the securing Bolts and pushed through one of the Double Angle Strips to represent the usual connection to this type of brake. The driven truck is attached to the 5½ × 3½ in. Flat Plate forming one of the platforms by two Double Bent Strips. The other truck, which swivels, is provided with a Bush Wheel 28, attached to the Double Angle Strips by two Double Brackets, whereas a second Bush Wheel fixed to the platform floor is fitted with a 2 in. Rod, the truck then being held in position on this Rod by a Collar. Washers are added, as necessary, to ensure that the car is level on the track. Truck Radius-limiting Chains 29, consisting of short lengths of Sprocket Chain, are fitted to the trucks and the frame of the car by cord.

Drive from the motor is taken by Sprocket Chain from the earlier-mentioned ¾ in. Sprocket to a 1 in. Sprocket on the driven truck axle. Both axles of the

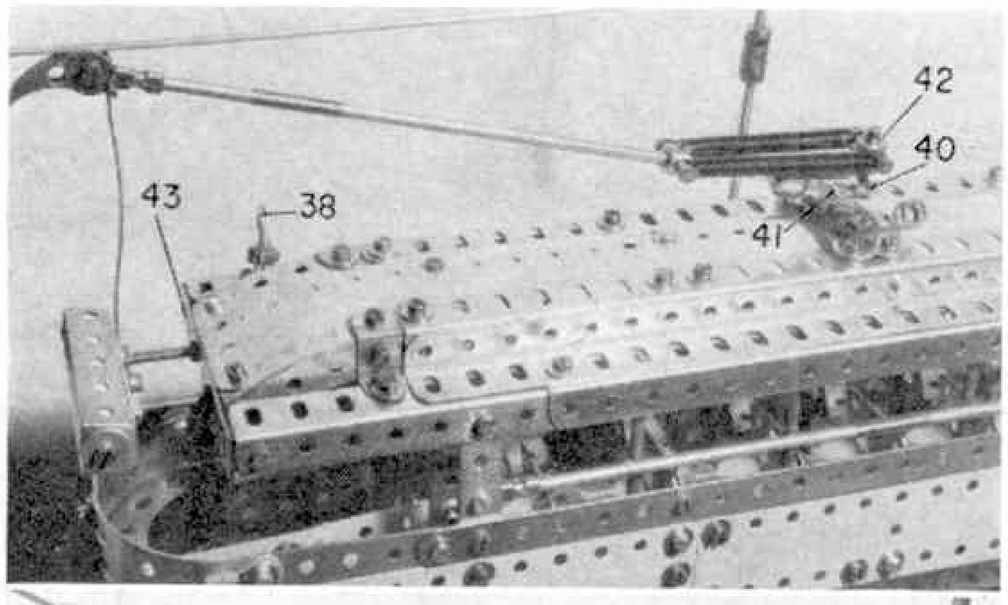
PARTS REQUIRED CONTINUED

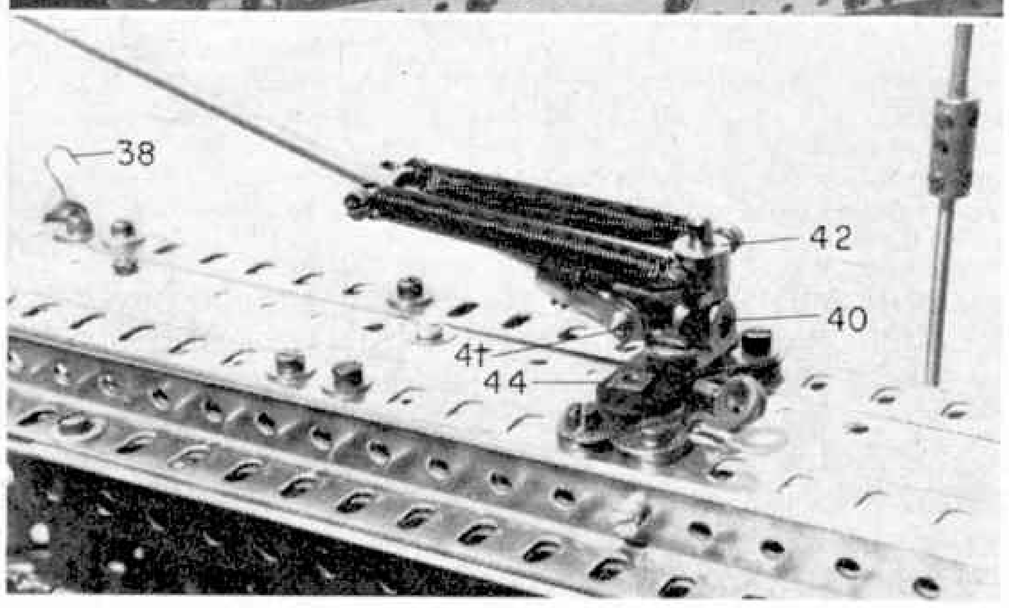
19—10	441—37b	4—103c	2—190a
6—11	265—38	4—103b	8—192
80—12	2—43	4—103k	7—212
2—12a	2—45	2—111	4—212a
22—12b	4—46	2—111a	3—213
6—14	4—48	2—111c	4—214
3—15	6—48a	8—111d	8—215
3—15a	2—48b	4—115	1—503
5—16	4—52	1—116a	2—518
3—16a	4—52a	4—125	1—550
3—16b	3—37d	12—126	2—554

1—Emebo Motor.



The bogie trucks and drive system, viewed from below.





Upper: A view of the roof structure showing the trolley pole and slipper contact, the latter a change from the more usual type of pulley pick-up. Lower: Construction of the trolley pole swivel as well as the tensioning arrangements and electrical connections is obvious from this detail shot of the trolley pole mounting.

driven truck are connected by Sprocket Chain 30 running on ¾ in. Sprockets.

In the model illustrated, obsolete Windmill Sails 31 are used to represent the bottom rack of the safety guard, but these can be replaced by a 3½ in. Flat Girder supported on two 1½ in. Double Angle Strips bolted to the platform floor. The front safety guard 32 also consists of a 3½ in. Flat Girder which is attached by Angle Brackets to Bell Cranks or 1½ in. Corner Brackets, also fixed by Angle Brackets to the platform. The side guards on the other hand are represented by 2½ in. Rods held in Rod and Strip Connectors and connected to the frame of the car by Fishplates. Each bumper beam 33 consists of two Formed Slotted Strips, the centre Strip being spaced from the dash by a Collar and two Washers, a ¾ in. Bolt being used for fixing purposes.

Lastly, here, one motor lead should be earthed to the driven truck frame and the other led up through the bottom saloon to the top deck, then the car should be righted and tested on a track, made up from Angle Girders spaced by 3½ × 2½ in. Flanged Plates. The construction and attachment of the trucks should impart to the car the characteristic rolling action of a typical tramcar.

Fitting out the upper saloon can now begin. In the closed section of the upper deck twenty-four seats 34 are provided, each double-seat back consisting of a Flat Trunnion attached to the floor by a 1 × ½ in. Angle Bracket and each seat squab consisting of a Trunnion bolted to the Flat Trunnion. Each seat is given a slight backward rake by slightly bending the Angle Bracket.

The top saloon window safety rails 35 each consists of two 4½ in. Rods joined by a Rod Connector and it is fitted to the uprights by Rod and Strip Connectors. Additional seats are provided in each of the open ends of the upper deck by 2½ in. Stepped Curved Strips 35a and 2½ in. Strips joined together and bolted to the sides of the upper deck and the staircase headway. The headlights 36 on the tramcar illustrated are pre-war obsolete Meccano parts and should be replaced by 1 in. loose Pulleys fitted with ¾ in. Washers.

For the window frames 37, 6½ in. Rods are passed through the upper deck, at the points shown, and into the flange of the 5½ × 2½ in. Flanged Plates, being retained in position by Spring Clips on the floor level of the upper saloon. Due to the incidence and rake of the seats three points will be found where it is not possible to fit the window frames in this matter and, in these cases, 3 in. Rods are used for the lower deck and two Rods held in Rod Sockets are fixed to the roof members.

Construction of the roof and the trolley arm is now begun. Two compound girders each consisting of a 12½ in. Girder and a 4½ in. Girder overlapped two holes, are joined together at the ends by 3½ × ½ in. Double Angle Strips 43, the compound girders then being secured to the side uprights. Two 12½ in. Girders are now bolted in place as shown, the whole arrangement being extended by two ½ in. Reversed Angle Brackets. Four 2½ in. Curved Strips are now bolted to the upper roof members followed by a number of 5½ × 1½ in. Flexible Plates overlapped to make a roof section 2 × 16 in., the curved ends being attached by Angle Brackets to the four 2½ in. Curved Strips. Wire Hooks, 38 for parking the trolley pole are fixed in place by Angle Brackets, while the destination indicators 39 are made up from three 2½ × ½ in. Double Angle Strips fixed to the front roof members by 1⅛ in. Bolts. The route number is fixed to an Angle Bracket attached below the indicator.

The lead from the motor is now led up one of the vertical members of the top deck along the underside of the roof, to emerge through a hole in one of the Flexible Plates at the centre of the roof. It is connected to a Threaded Pin fixed in a 1½ in. Insulating Strip, serving as the trolley pole support. This is attached to two pairs of two Fishplates, bolted together by their slotted holes, and fixed to the roof, one pair at each side with two Washers being used as spacers. The trolley pole, itself, is built up from a Coupling 40 loose on the Threaded Pin and with a further Threaded Pin screwed into it. At its opposite end, this Coupling is fitted with a Small Fork Piece, retained by an electrical Short Pivot 41, the Fork Piece carrying a 6½ in. Rod extended, via a Rod Connector, by a 2 in. Rod. A Collar 42 is fixed to the second Threaded Pin by two Bolts which carry two Tension Springs, connected to a further Collar on the trolley pole.

As regards the collector, this is unusual as it has no pulley wheel, but, instead, is the experimental Carbon Slide type at one time used on certain L.C.C. cars. This Carbon Slide is represented in the model by two Pawls without boss, spaced by three Washers and attached to a Rod and Strip Connector. A length of cord from the Collector is fitted with a Wire Hook which clips conveniently on the uprights of the lower platform and allows the trolley to be raised, lowered and turned. The tram, as shown, operates on a special track made up from 12½ in. Angle Girders, but a suitable track and overhead wire system can be built up to suit all requirements.

It is necessary, owing to the weight of the model, to operate the Emebo Motor at the upper limit of 12 volts and, at this voltage, the tram runs at almost scale speed.

Mike Rickett says let's go SHOOTING

Handled sensibly an air rifle or pistol can give many hours of enjoyment. In this feature Mike Rickett takes a look at the latest guns and equipment, and advises readers on selection

IF you are one of the many people who have never held—let alone fired—a rifle of any kind, you may well ask what the fascination of shooting is, and why the sport has so many devotees. In the first place, it is perhaps one of the most challenging and satisfying hobbies there is, where skill and marksmanship come only from practice. It also has the great advantage of being one of the very cheapest of hobbies to pursue once you have bought your rifle and equipment.

As far as this article is concerned, I will be talking only about air rifles, not air pistols or match rifles, which are specially made rifles for competition use. Before proceeding any further however, I must also acknowledge with grateful thanks the considerable help and assistance given me by gun dealer Mr. D. R. Hughes, an expert on air rifles who specialises in both selling and advising on this subject. In fact, he has made the generous offer of giving free help or advice to all readers of M.M. who have any questions they would like to ask after reading this article. He only asks that they include with their letters a stamped addressed envelope.

Before going out to buy yourself one of the many rifles available, or even for that matter, writing to someone like Mr. Hughes to buy a gun, it is as well to decide what you intend to use your rifle for, because naturally the type or size of rifle that is best for you wlll depend on this. Junior readers will find that the smaller guns are ideal for getting the " feel " of a rifle at small cost and also for shooting at both indoor or outdoor targets at up to about fifteen feet distance.

Apart from the junior air rifles, most people use a

The majority of air rifles are cocked by breaking down the barrel as shown here. The pellet is loaded into the barrel at the same time.

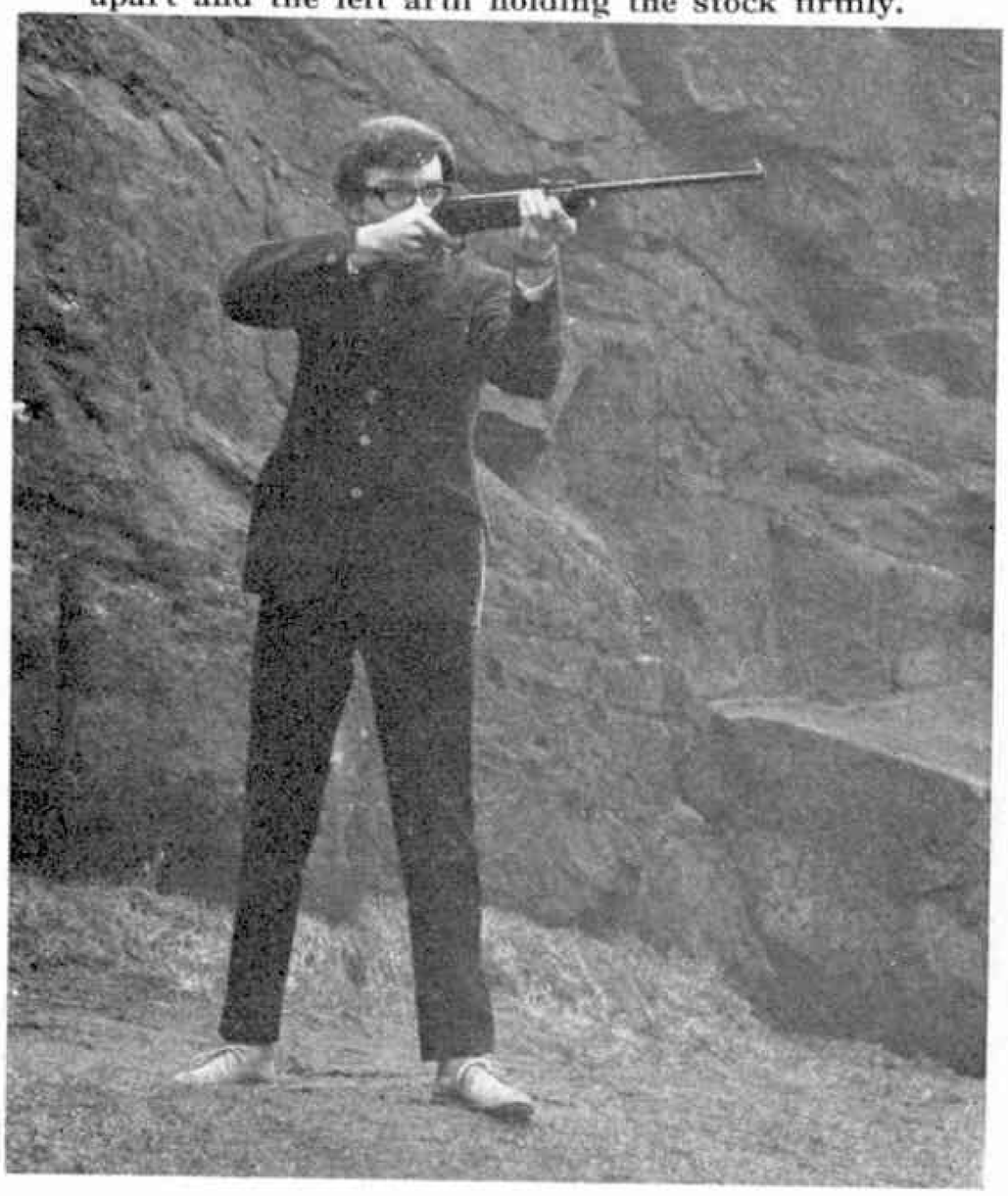
A variety of target holders made by Webley, B.S.A. and Milbro and also showing a B.S.A. telescopic sight and " Express " gun coil.

The A.S.I. Paratrooper, shown here, features a pistol-grip and was an exceedingly comfortable rifle to use.

general purpose gun for either casual shooting at targets—perhaps in the garden—or plinking, which is an American term meaning the shooting of tin cans or other objects. More serious shooting enthusiasts will want to use a general purpose or high power air rifle for sport purposes, like the shooting of small game—rabbits, hares, rats—or a target gun for serious shooting at targets at distances greater than 33 ft.—the international range for target shooting.

Before talking about the thirteen different air rifles that we have selected for this article, it might be best to explain first, two technical differences between various rifles. Basically, every air rifle works on the principle of a piston attached to a compressed spring within a chamber, pushing air through the barrel to propel the pellet to its target. On most rifles, compression of the spring is done by a break-barrel mechanism, so that when the front half of the barrel is pulled back, the spring in the chamber is compressed.

Our rifleman demonstrates how a rifle should be aimed in a free-standing position. Notice the stance with the legs apart and the left arm holding the stock firmly.



A few rifles use the underlever principle of compressing the spring, so that instead of a break in the barrel, a lever mounted under the stock is pulled out and forced back.

Apart from the shape, cost and size of a rifle, the next most important difference is the calibre, which to some extent will be determined by personal preference, more often by usage, and occasionally because the gun will be available in one calibre only. Normally, the smaller guns, like the *Webley Jaguar* and the *Milbro Explorer*, are sold in .177 calibre only. Where more serious shooting is concerned however, calibre becomes much more important and should be given some thought. The smaller .177 pellet gives a much higher muzzle velocity—the speed the pellet travels—and it is this, together with the quality of the barrel, that determines the final accuracy. This is why all international competition air rifle shooting is done with .177 guns.

Where sport shooting is concerned however, the weight of the pellet becomes more important because a heavier pellet will develop greater energy—measured in ft lbs—and therefore be harder hitting. A .22 pellet is much heavier than any .177 made and it is this weight that helps carry it further even though most .22 guns have a slower muzzle velocity than their .177 counterparts. In theory therefore, a .22 gun developing about 9 ft lbs muzzle energy will be able to kill game at about 60 yards or more. In practice however, only a considerable marksman would be able to accomplish this because a rabbit or rat presents so small and fast moving a target at that sort of range. You would be lucky to even see it! Incidentally, the limit set by the Home Office on the power of air guns that can be bought without a firearms certificate is 12 ft lbs and although none of the guns mentioned in this article exceed that figure, the excellent *Weihrauch HW*35 comes very near it. Worthy of consideration however is that fact that only 3 ft lbs is needed to kill small game or vermin at short distances, so many .177 rifles can successfully be used for this as well as target shooting. Remember however that the muzzle velocity will depend on the weight of pellet, so different makes of pellet will give a different m.v. in the same gun.

If you were an expert rifleman, you would almost certainly measure the accuracy of any particular rifle by its "group," a term given to the area hit by pellets aimed round a common point when fired from a distance of 33 ft. This means that a gun with a group of ½ in. will place all its shots in a hole ½ in. across. Only a marksman would be expected to produce this result in practice however, and the "grouping" figure of any particular rifle, as far as the beginner is concerned, is only of academic interest in that it refers to its potential performance.

Do not however think that an accurate rifle will cost the most, or that the larger the gun the more accurate it will be. A *B.S.A.* .177 "*Meteor*" is just as accurate over shorter distances as the far larger, and more expensive, *Weihrauch HW*35. The difference is that the latter will continue to be as accurate over much longer distances. Certainly one of the surprises was the inexpensive *Milbro* .177 "*Explorer*" which proved, on test, to be as accurate, even at longer distances, as other larger rifles. Certainly for junior shooting I would recommend this, as well as the sturdily made *Webley* .177 "*Jaguar*", the cheapest of all the guns mentioned here. Both the Original .177 Model 27 and the .22 *A.S.I.* "*Sniper*" are slightly larger but can still be suggested for junior use. The Original *Model* 27 is a very handsome rifle, and the *A.S.I. Sniper* has the advantage of costing only slightly more than the *Milbro*

" *Explorer* ".

No less than seven rifles of those we examined have the power, accuracy and range necessary for both target and sport shooting, and among them is the *B.S.A.* " *Meteor* ", available in both calibres and in standard and super versions. A pleasant rifle to handle, it is almost certainly among the most reliable of British made rifles for its size. Exceptional value however is the surprisingly accurate and powerful *Haenel* .177, complete with the added feature of a safety catch. The Original *Model* 35 is a beautifully made rifle, complete with two-pressure trigger, but has the disadvantage of being a little more expensive than the other rifles mentioned here. Almost half the price, in fact, is the .22 *Milbro* " *Targetmaster* " fitted with a micro-aperture sight and safety catch, with the alternative of normal open sights in another version. Most unusual of all these guns is the *A.S.I.* " *Paratrooper* ", often advertised in this magazine, which proved on test to be highly accurate and fairly powerful. Its more conventional sister, the *A.S.I.* " *Commando* ", also in .22 calibre, is one of the two cheapest rifles in this section, and is ideal for plinking.

Of the three high performance rifles, the .22 *Weihrauch HW*35 is undoubtedly the most powerful, which makes it the best for sport. It also however makes a good target rifle and I would equally recommend that old favourite, the .22 *Webley Mark III* for both sport and target competition shooting. Finally, I examined the very handsome *B.S.A.* " *Airsporter* ", which has all the power needed for sport and which is ideal for this purpose.

Many of these guns can be fitted with telescopic sights, and the most useful application I have found for these is for spotting in target shooting. It saves you walking to the target after every group of shots.

If you have never fired an air rifle before, you should concentrate at first on adopting the correct stance. Make sure that the rifle butt is firmly tucked into your shoulder, with your cheek resting on the butt so that your eye looks along the barrel through both sights. When aiming, make sure the front sight is neatly between the " V " of the rear sight before gently squeezing the trigger. Don't pull or jerk it and make sure your left hand is holding the front stock firmly. In essence, you should feel comfortable when shooting, although it will take a few hundred pellets before you really become accustomed to your air rifle. You will also find that your arms ache both during and after the first few sessions, and don't place the target too far away until you have the " feel " of the gun.

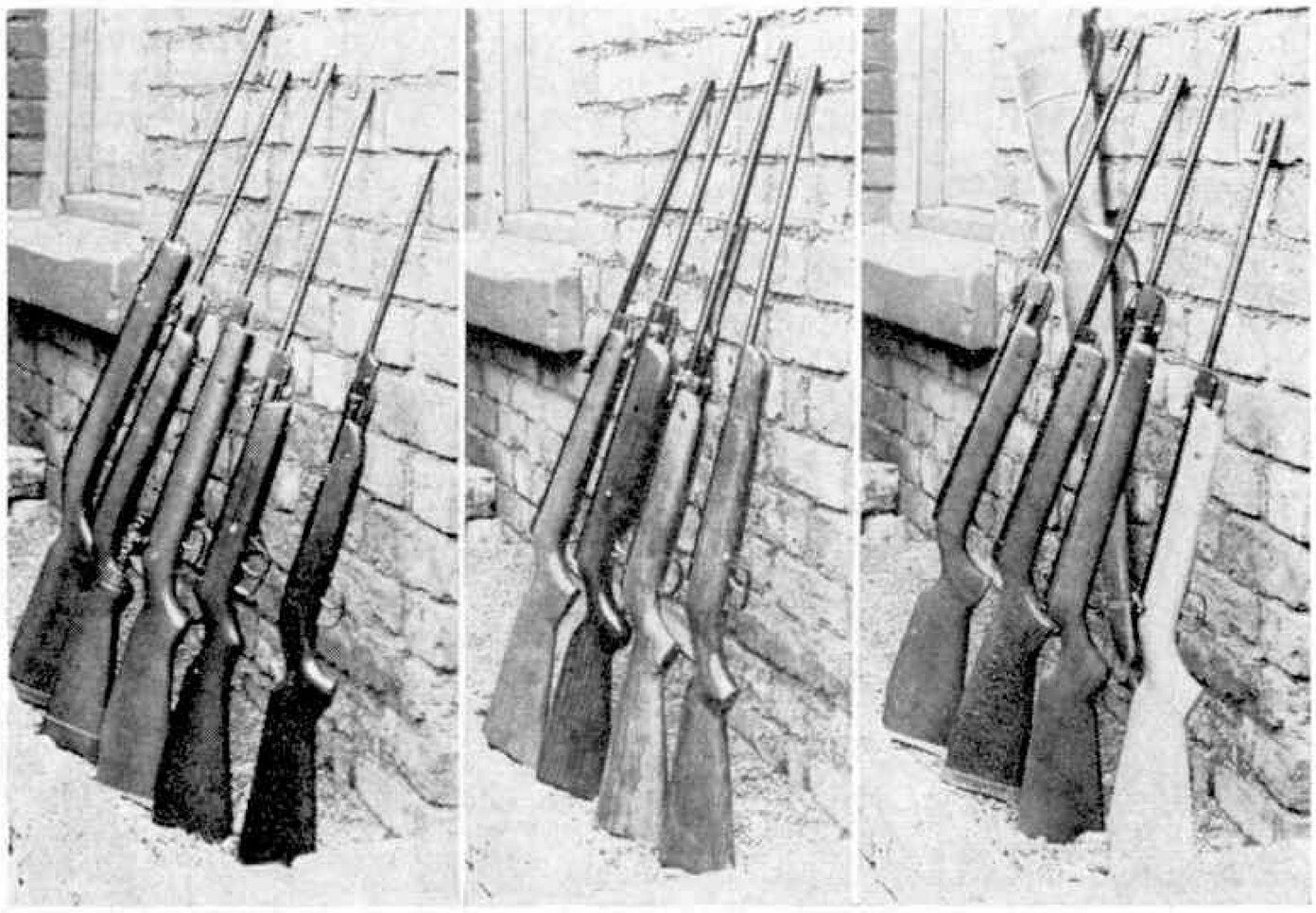
When you go out on your first " shoot ", make sure that your target is placed in a safe position and use one of the metal target holders made by *Webley*, *Milbro* or *A.S.I.* Never shoot when there is any possibility of people standing behind your target—even if they are concealed in trees, bushes or fields. NEVER, EVER point your gun at anyone—loaded or not, and resist the temptation to wander about the countryside shooting everything that moves. Many birds are now protected by law and if you enter fields belonging to anyone in order to shoot rabbits or mice, remember that you can be prosecuted for trespass unless you have the written permission of the owner. By law you are also required to carry your rifle in a gun cover in any public place and Mr. Hughes will be able to advise you on these items.

The law also lays down that no air gun can be fired within 30 feet of a public road and it also says that no person under the age of 14 may buy or be given an air rifle. He may however use it on private premises, but only when supervised by an adult. No person under 17 years of age may buy or use an air gun except on private premises, and the rifle MUST be covered at all times when it is in a public place. Over this age, you can freely buy and use an air rifle, providing you remember the laws of game and trespass, safety, and common sense.

Remember these rules, act sensibly and responsibly and you will have many happy hours. Good shooting!

AIR RIFLES MENTIONED IN THIS ARTICLE

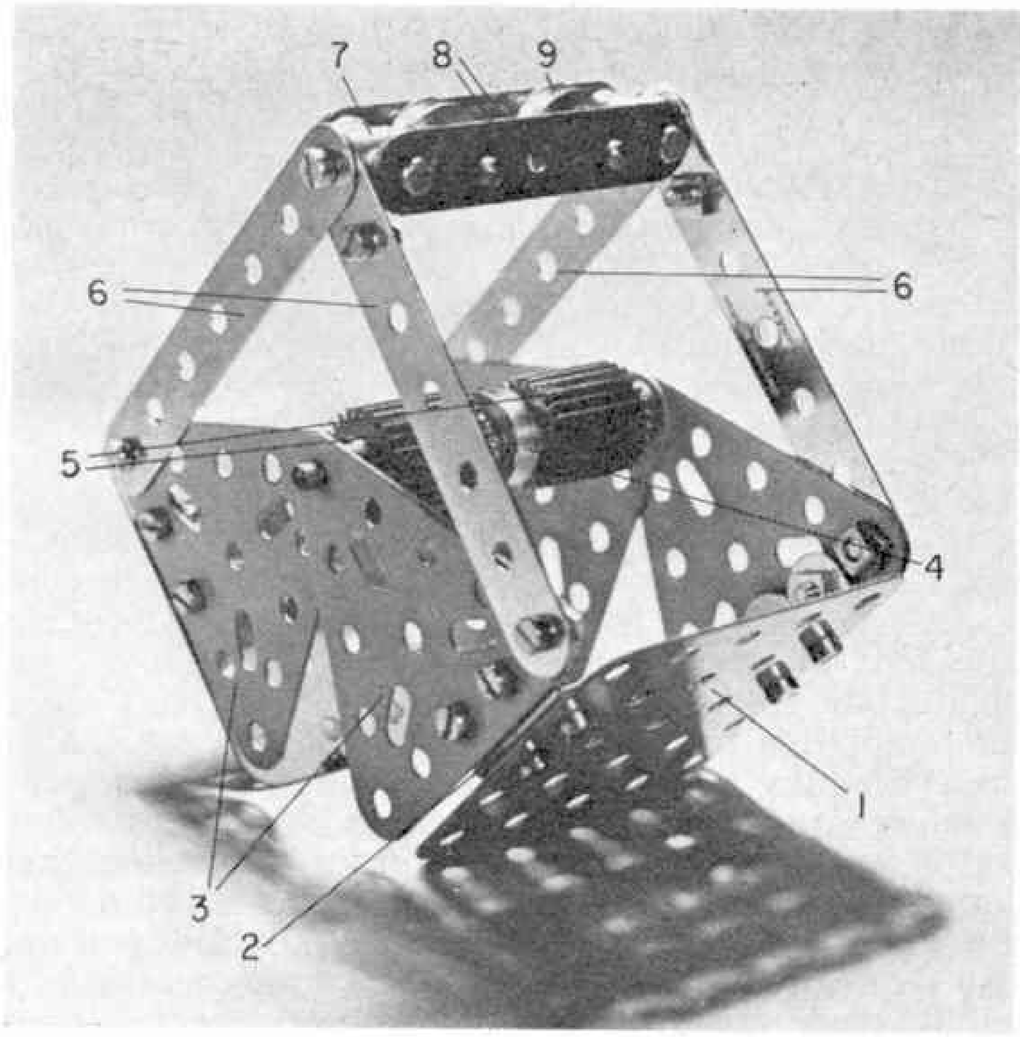
B.S.A. Meteor .177 calibre Standard	£10.19.6	Original Model 27 .177 calibre	£16. 5.0
B.S.A. Meteor .22 calibre Super	£12. 2.3	Original Model 35 .22 calibre	£20. 5.0
B.S.A. Airsporter .22 calibre	£24. 1.8	Milbro G25 Explorer .177 calibre	£8.12.0
Webley Mark III .22 calibre	£24 approx.	Milbro G46 Targetmaster .177 calibre	£11.3.10
Webley Jaguar .177 calibre	£7. 7.4	A.S.I. Paratrooper .22 calibre	£12.10.0
Weihrauch HW 35 .22 calibre	£27 approx.	A.S.I. Commando .22 calibre	£9. 5.0
Haenel .177 calibre	£9 approx.	A.S.I. Sniper .22 calibre	£8.19.6



Near right (left to right): B.S.A. " Airsporter," Original 27, Milbro G46 Targetmaster, A.S.I. Sniper Webley " Jaguar." Centre right (left to right): B.S.A. 177 " Meteor," Weihrauch HW35, Webley Mark III, A.S.I. " Commando." Far right (left to right) " Original 35." B.S.A. " Meteor " .22, Haenel .177 Milbro G25.

AMONG THE MODEL BUILDERS

Readers' Meccano ideas described by Spanner

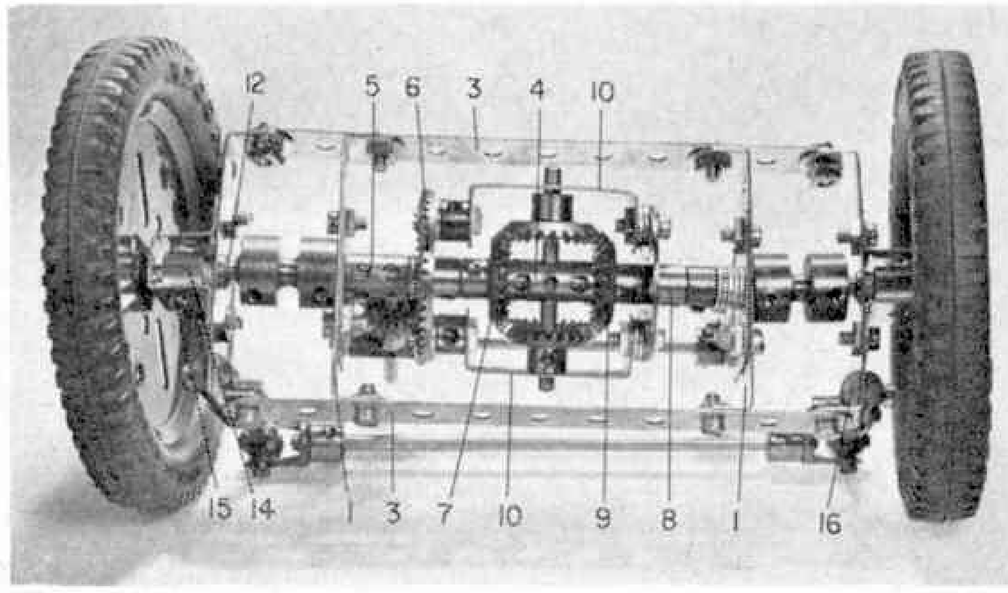


A simple, but extremely efficient Priestman Grab which can be opened automatically from the control box of its parent model.

Front-Wheel-Drive unit

WITH ALL the fuss that is made over front-wheel-driven cars, these days, you might be forgiven for thinking that front-wheel-drive was something new. In actual fact, of course, it isn't. It's been going for almost as long as the motor car, itself! Meccano Limited even published details of a genuine miniature front-wheel-drive system something like 40 years ago and, since then, similar mechanisms have appeared in the M.M. from time to time. Featured here is another unit in the same series, the work of Mr. Pat Lewis of Formby, Lancs., and this example is of particular interest because of the first-rate swivel joints it incorporates. These joints allow a positive flexible drive to the wheels and also allow the wheels themselves to move through a considerably larger angle than is the case in most other Meccano front-wheel-drive units.

To ensure smooth running, care should be taken with construction. A frame is first produced from two $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 1, to each of which a Flat Trunnion 2 is bolted, the Double Angle Strips then being connected together, as shown, by two $5\frac{1}{2}$ in. Strips 3, the Strips projecting two holes beyond the Double Angle Strips. Journalled in the Double Angle Strips and in part of the longitudinal bore of a Coupling 4 are two 2 in. Rods, one Rod carrying a fixing Collar outside its Double Angle Strip and a Short Coupling 5, two Washers, a $1\frac{1}{2}$ in. Bevel Gear 6 and a $\frac{7}{8}$ in. Bevel Gear 7 inside its Double Angle Strip. The other Rod also carries a fixing Collar outside its Double Angle Strip, while, inside, it carries five Washers, another Collar, an 8-hole Bush Wheel 8 and a $\frac{7}{8}$ in. Bevel Gear 9. Note that Short Coupling 5, Bevel Gear 6 and Bush Wheel 8 are free to turn on the Rods and that the external fixing Collars are held in place by *Set Screws*.



An effective Front-Wheel-Drive Unit designed by Mr. Pat Lewis of Formby, Lancashire.

The faces of Bevel 6 and Bush Wheel 8 are now joined by two $1\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 10, these being spaced from the Bush Wheel by two Washers on each securing Bolt and spaced from the Bevel by a Collar and one Washer on each Bolt. Mounted in these Double Angle Strips, but fixed in the centre transverse bore of Coupling 4, is a 2 in. Rod on which two $\frac{7}{8}$ in. Bevel Gears 11 are secured, these Gears meshing with Gears 7 and 9.

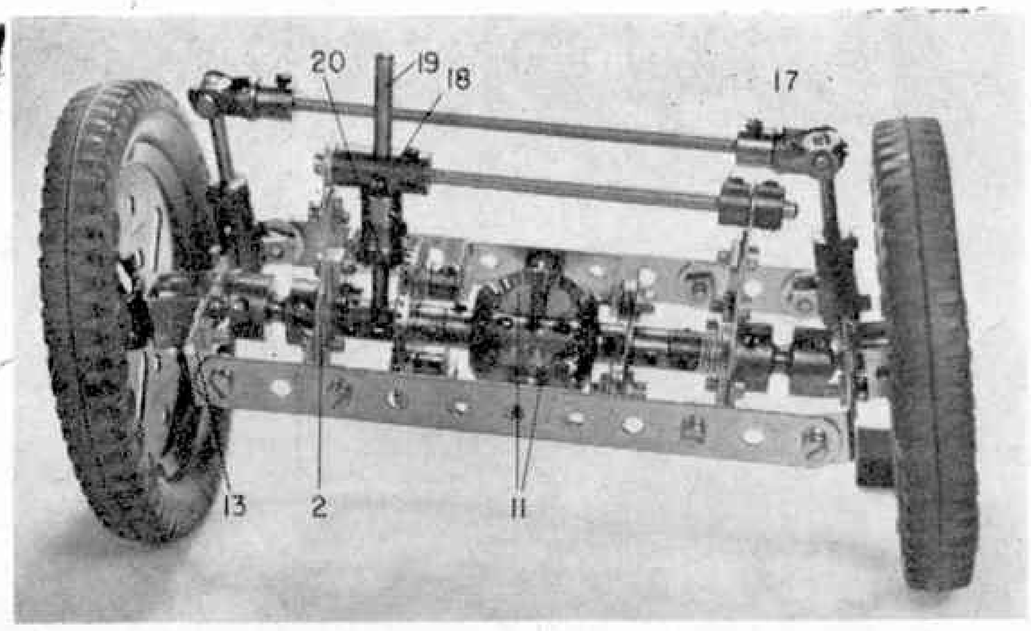
Turning to the ball joints, these are both similarly built up from a Handrail Support 12, passed free through a $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strip 13 and locked by a Nut in an Adaptor for Screwed Rod 14. (The Double Angle Strip must not be mounted in place in the unit at this stage). A Double Bent Strip 15 is slipped over the Adaptor and bolted to the Double Angle Strip. A *Set Screw* is screwed into the head of the Handrail Support, after which the Support is inserted, unfixed, into one end of a Socket Coupling, the other end of which is positioned, also unfixed, over one or other of the external fixing Collars. The lugs of the Double Angle Strip are then lock-nutted to the ends of Strips 3. Secured to each Double Angle Strip is a Slotted Coupling 16, in the longitudinal bore of which a $1\frac{1}{2}$ in. Rod is fixed. A Swivel Bearing 17, is mounted on the end of each Rod, the Swivel Bearings then being connected by a 5 in. Rod.

Each Flat Trunnion 2 is now extended one hole by a $1\frac{1}{2}$ in. Strip, as shown. Fixed to the Strip nearest Bevel Gear 6, but spaced from it by a Washer, is a Threaded Coupling 18, in the longitudinal bore of which a $3\frac{1}{2}$ in. Rod is held, this Rod also being held by Collars in the other $1\frac{1}{2}$ in. Strip. Journalled in the centre transverse bore of the Threaded Coupling and in the appropriate transverse bore of Short Coupling 5, is a $2\frac{1}{2}$ in. Rod 19, held in place by a Collar and carrying a $\frac{1}{2}$ in. Bevel Gear 20. This Bevel meshes with Bevel 6.

Finally, 3 in. Pulleys with Motor Tyres are mounted, free, on Adaptors for Screwed Rod 14, where they are held by Collars. The Unit is of course driven through Rod 19. The Set Screws in the Collar and Handrail Support inside each Socket Coupling, by the way, engage in the slots in the Socket Coupling to enable the drive to be passed on to the wheels.

PARTS REQUIRED

2—2	1—24	2—48	2—111c
2—6a	4—30	4—48a	2—126a
1—15	1—30a	10—59	2—136
1—16	1—30c	1—63	2—142b
1—16a	30—37a	2—63b	2—165
3—17	22—37b	1—63c	2—171
2—18a	16—38	1—63d	2—173a
2—19b	2—45	2—111a	



Another view of the Front-Wheel-Drive Unit showing the driving axle.

Priestman Grab

On an entirely different subject, I recently noticed a fairly small excavator in Meccano's Model-building Department which included a simple, but extremely effective Bucket Grab, controlled by an equally simple and effective operating mechanism. I felt that both the Grab and control mechanism would be of interest to crane builders and so I would like to include slightly modified versions of them here.

To being with, the actual Bucket is easily produced from two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates 1, each attached by two $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips 2 to two $2\frac{1}{2}$ in. Triangular Plates 3. The apexes of each pair of Triangular Plates are pivotally joined by a 3 in. Rod, in the centre of which a free-running $\frac{1}{2}$ in. loose Pulley 4 is mounted. Also mounted on the Rod should be a number of parts to serve as weights for opening the Bucket, and we used two $\frac{3}{4}$ in. faced $\frac{3}{4}$ in. diameter Pinions 5 plus half-a-dozen Washers.

Lock-nutted to the Triangular Plates are four $3\frac{1}{2}$ in. Strips 6, these being brought together in pairs at the top and pivotally attached to two Threaded Bosses 7. Fixed between these Threaded Bosses through their transverse bores are two $2\frac{1}{2}$ in. Strips 8, spaced from the Bosses by two Washers on the shank of each securing Bolt, and in the Strips are journalled two 1 in. Rods, each carrying two Washers and a $\frac{1}{2}$ in. fixed Pulley 9. When the Grab is lifted by Strips 8, the Bucket should open under the weight of the parts on the hinge Rod.

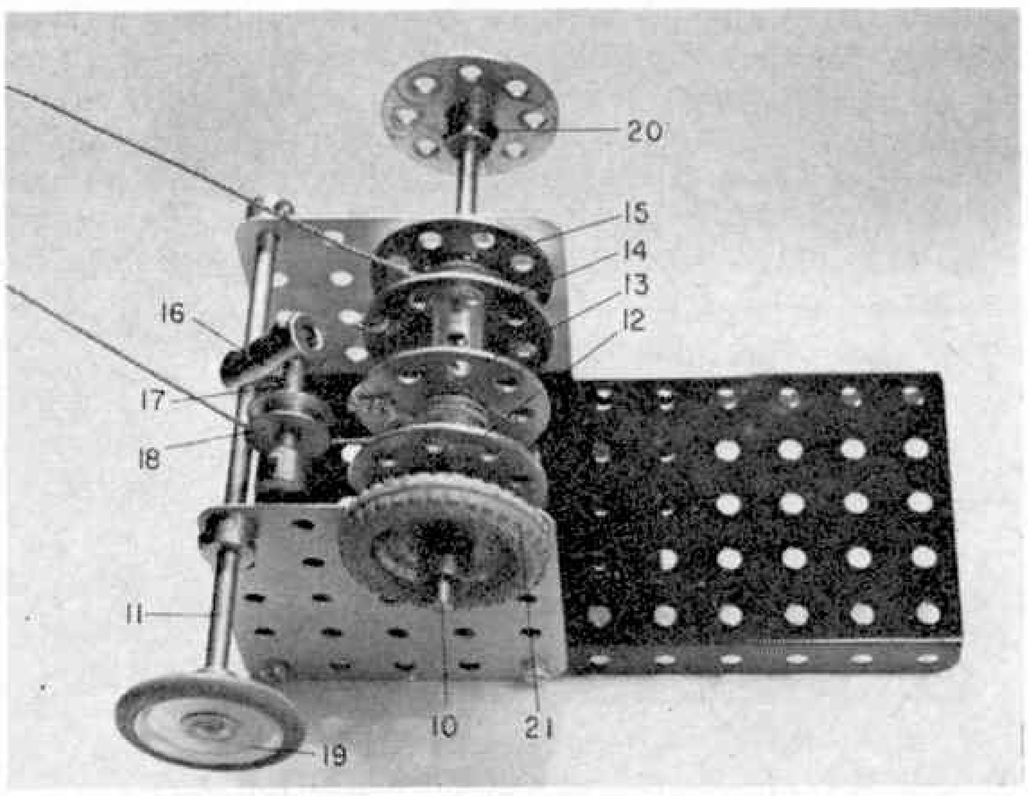
In the case of the control mechanism, the mounting would depend on the parent model, but, for demonstration purposes, we used two $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flat Plates bolted to a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate. Journalled in the Flat Plates are two $4\frac{1}{2}$ in. Rods 10 and 11, Rod 10 carrying four fixed 8-hole Bush Wheels 12, 13, 14 and 15, and Rod 11 carrying a Coupling 16 in which a $1\frac{1}{2}$ in. Rod 17 is fixed. Free to turn and slide on this last Rod is a $\frac{1}{2}$ in. loose Pulley 18 that is prevented from coming off the Rod by a Collar. Rod 11 is held in place by Collars and is turned by means of a 1 in. Pulley 19, fitted with a Rubber Ring, while Rod 10 is turned by a handwheel built up from an 8-hole Bush Wheel 20 fitted with a $\frac{1}{2}$ in. Bolt. A 1 in. Pulley with Motor Tyre 21 is also fixed on Rod 10, the Tyre rubbing against one of the Flat Plates to serve as a friction brake.

Bush Wheels 12, 13, 14 and 15 make up two winding drums, Bush Wheels 12 and 13 serving as the end checks of drum 1 and Bush Wheels 14 and 15 as the end checks of Drum 2. The Cord from drum 1 is passed beneath Pulley 18, is taken up and around a Pulley in the jib-head of the parent model, then is taken down and beneath one Pulley 9; along and up around the other Pulley 9, to be finally tied to the jib of the parent model. The Cord from drum 2, on the other hand, is taken straight up and over a second Pulley in the jib-head; is brought down and around Pulley 4, then is taken up and also tied to the parent model.

In operation, the Grab can be raised and lowered by turning handwheel 20, while the Busket can be opened by turning Pulley 19 in a clockwise direction, this causing Pulley 18 to press against the Cord from Drum 1, thus, in effect, shortening the Cord. The other Cord, however, remains the same length, therefore the weights on the Bucket hinge Rod cause the Bucket to open.

PARTS REQUIRED

Bucket Grab		Control Mechanism	
4—3	26—37a	2—15a	4—37b
2—5	28—37b	1—18a	1—52
1—16b	22—38	2—22	3—59
2—18b	4—48a	1—23	1—63
1—23	2—64	5—24	2—72
2—23a	4—76	6—37a	1—111a
2—25b			1—142c
			1—155



A useful winding unit and control mechanism specially designed for use with the Priestman Grab described in this article.

Meccano Constructors' Guide

by B. N. Love

Part 2 *(continued)*

Gears . . .

AN EXCELLENT example of these latter mechanisms is embodied in the automatic gearbox illustrated in Fig. 11. The input shaft is identified by the 2 in. Sprocket Wheel which receives a chain drive from an electric motor. In addition to the 19-teeth Pinion and 1 in. Gear Wheel, the input shaft also carries a Worm at its centre. The idler Pinion, also of 19-teeth, can be seen clearly, bolted to the side of the gearbox frame by means of a ¾ in. Bolt and double lock-nuts. The output shaft carries a third 19-teeth Pinion and a second 1 in. Gear Wheel between the side frames and a 19-teeth Pinion with a ¾ in. face at its extreme end.

The under view of the gearbox in Fig. 11 shows the "secret" of the automatic operation. A 57-teeth Gear Wheel mounted on a 1½ in. Axle Rod is free to turn in journals made from a Double Bent Strip and the end plate of the gearbox. This Gear Wheel carries a Slide Piece secured by its Grub Screws to a ⅜ in. Bolt carried in one of the radial holes of the Gear Wheel. The Slide Piece pivots freely on its Bolt and holds a 3½ in. Perforated Strip in its jaws. The centre hole of this Strip has a standard Bolt lock-nutted firmly in position so that the bolthead engages between the boss of the 1 in. Gear Wheel on the output shaft and a Collar next to the final 19-teeth Pinion. The upper end of the 3½ in. Strip pivots on a 1½ in. Axle Rod held firmly by a Crank reinforced by four 2½ in. Perforated Strips bolted to the end plate of the gearbox. The 3½ in. Strip is positioned at its pivoting end by a Collar locked to the fixed pivot rod and a 1½ in. Perforated Strip bolted to the 3½ in. Strip three holes down from the top, but spaced from it by a second Collar through which a ⅜ in. Bolt is passed. This construction forms a parallel fork giving stability to the 3½ in. Strip when it is moved across the face of the 57-teeth Gear Wheel by the Slide Piece.

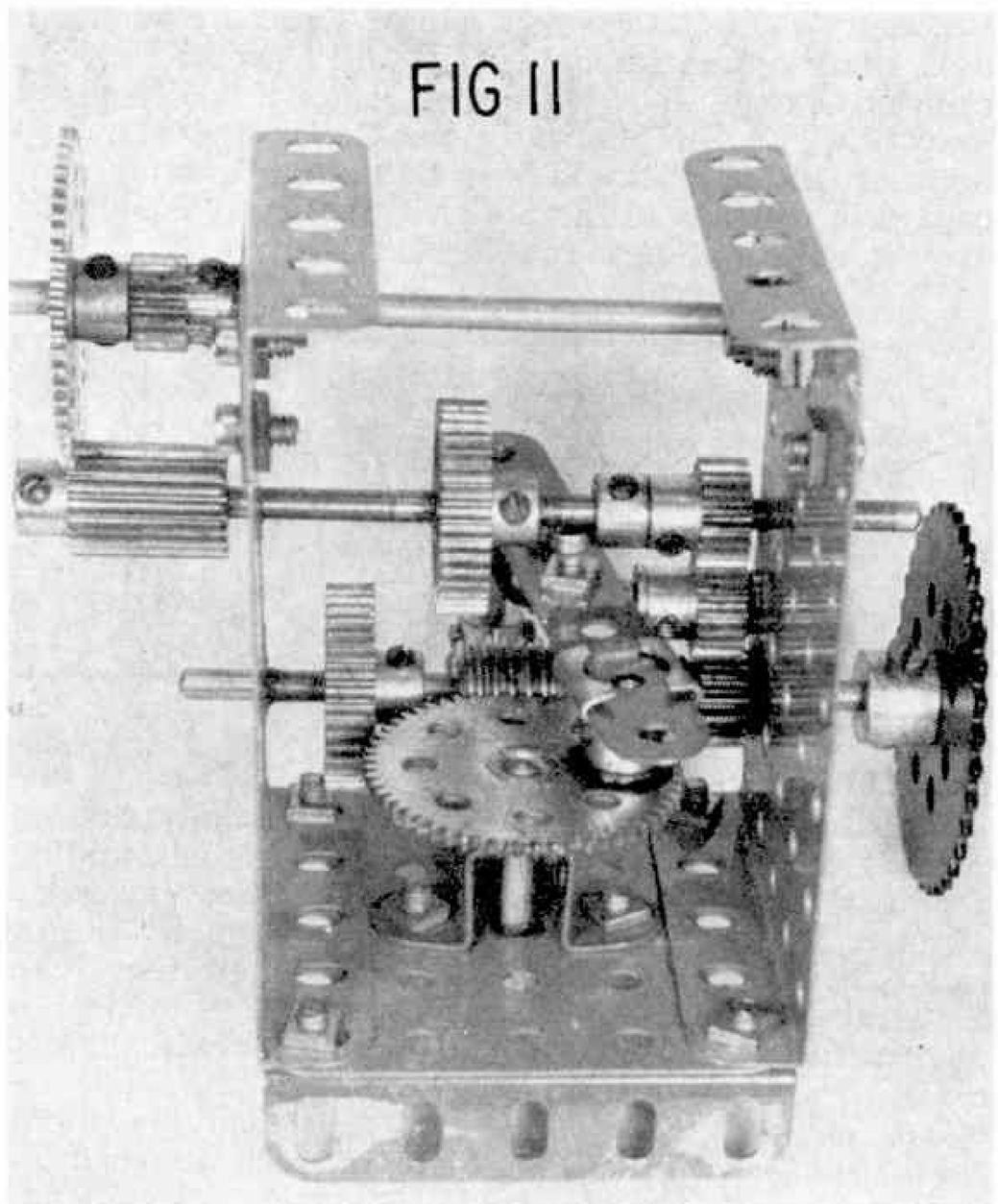


Fig. 11. The automatic reversing gearbox. The top view shows the pivot arrangements at the upper end of the gear change lever. The under view shows the Worm-driven Gear Wheel which moves the gear-change lever.

Operation is as follows: as the input shaft rotates, the Worm drives the 57-teeth Gear Wheel which rotates slowly and causes the Slide Piece to traverse its face. In so doing, the Slide Piece causes the 3½ in. Strip to oscillate, also very slowly, and the Bolt located in the centre of the Strip simply moves the output shaft alternately left and right, thus changing over the meshing from the 19-teeth Pinions to the 1 in. Gear Wheels and vice versa. As mentioned before, this gear arrangement gives a 1 : 1 ratio, but provides for a slight "pause" when neither gear on the output shaft is actually engaged. This particular mechanism is very suitable for a demonstration model which carries out repetitive movements requiring a continued reversing sequence. In other words, the mechanism is entirely self programming.

No chapter on the use of Meccano Gears would be complete without a mention of two special forms of application which offer tremendous scope for the advancing model builder. These are the Differential Gear and the Epicyclic Gear. At this stage of the Constructors' Guide it is not intended to discuss them

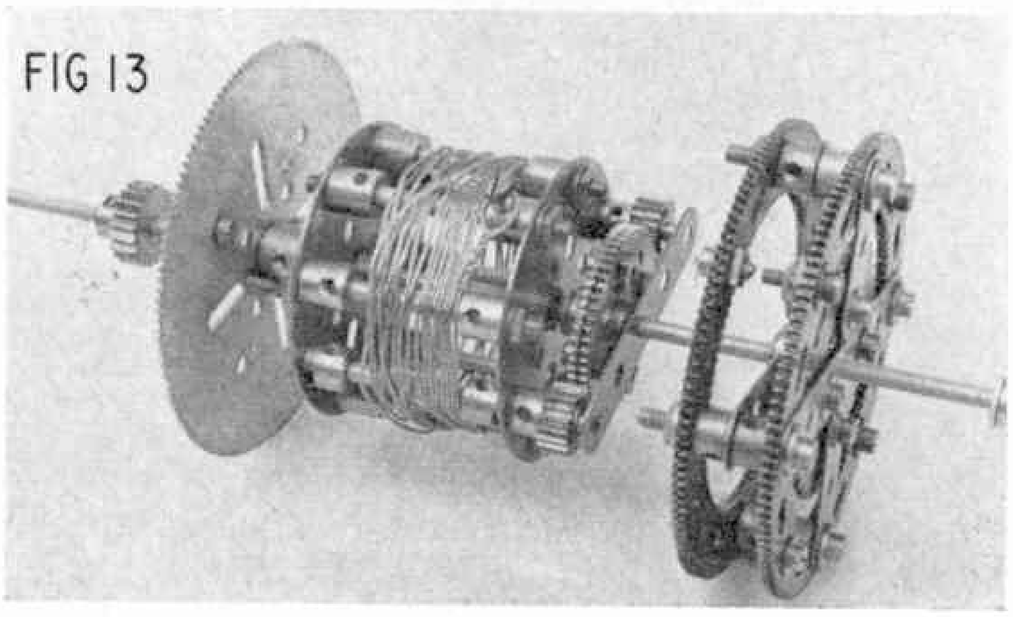


Fig. 13. The epicyclic gear made from Meccano parts. The upper view shows the component parts which made the self-maintaining clock winding drum in the lower view.

at length as they will feature in other mechanisms to be dealt with in later chapters. However, Fig. 12 illustrates two applications of the Differential Gear, the upper view showing the use of it in the rear axle drive of a heavy duty crawler tractor. In this case, the differential "cage" carrying two Pinions and two Contrate Wheels is rotated by a Pinion drive applied to a 2½ in. Gear Wheel bolted to the cage. This gives a very powerful drive to the rear axle assembly, but allows either "half-shaft" to rotate at different speeds for steering and braking purposes. This mechanism will be more fully explained in a later chapter dealing with motor vehicle transmissions.

The lower illustration of Fig. 12 shows an unusual application of the differential, this time in the works of an astronomical clock. As this particular clock shows the phases of the moon with great accuracy, the dial which shows the moon information is supplied with motion from different sources, all coupled to the clock's 24-hour timing mechanism and finally fed to the moon dial shaft via a differential gear which can be seen in the illustration.

Finally, possibly the most sophisticated of all the gear systems available in Meccano are the epicyclic gear arrangements. Briefly, these consist of "sun and planet" mechanisms in which a Pinion or similar gear "runs round" a central gear in the same way that a planet orbits the sun, so to speak. Part No. 180, the 3½ in. diameter Gear Ring, is of great assistance in forming epicyclic arrangements as it has both internal and external teeth. Fig. 13 shows a "self-maintaining" winding drum for a weight driven apparatus in which the weight will still continue to drive the mechanism, even while the weight is actually being wound up.

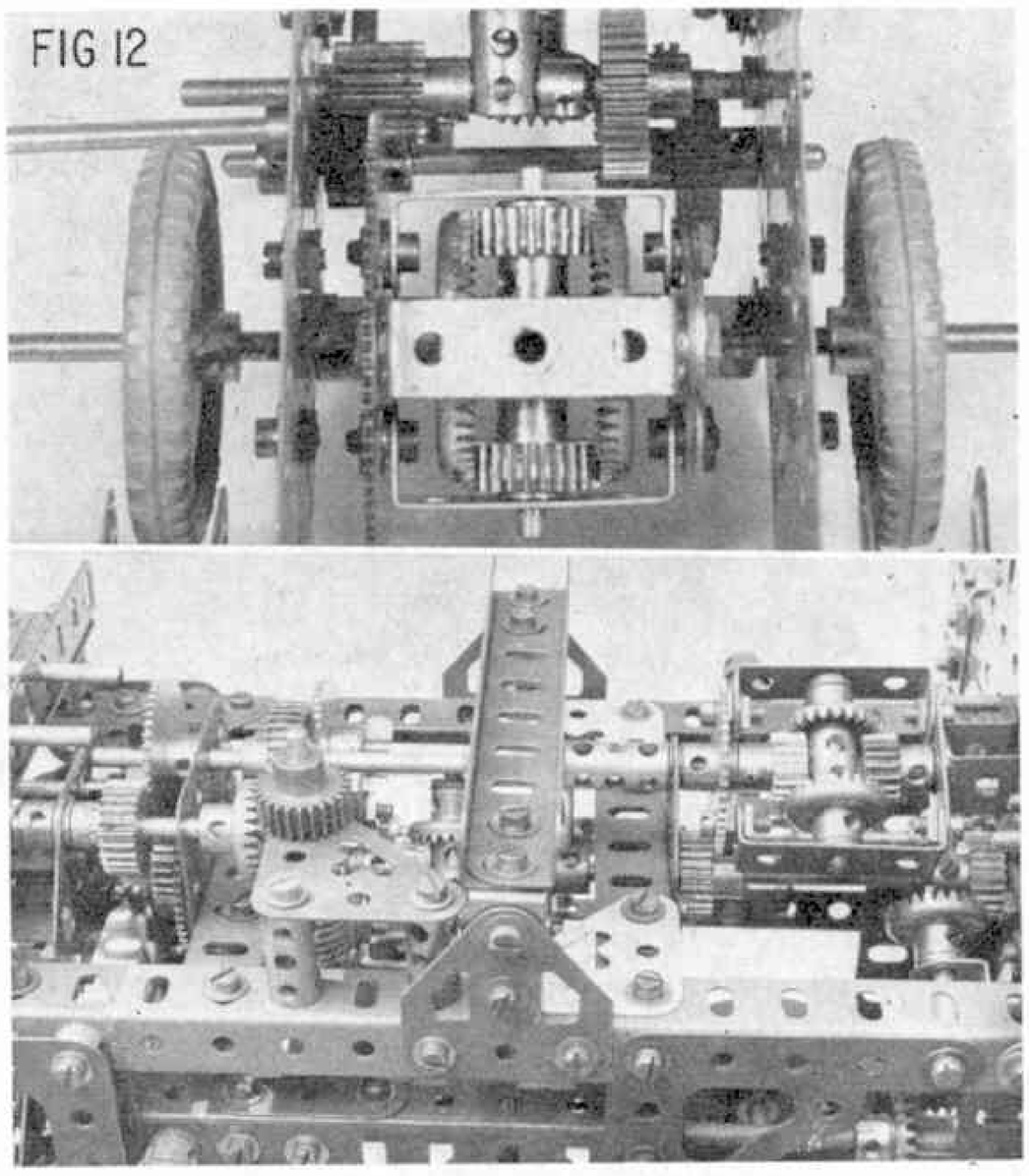


Fig. 12. Two applications of the Differential gear. Upper illustration shows its use in the rear axle assembly of a tractor. Lower view shows its use as a "mixing" box for clock motions combining to show lunar movement.

Part 3 : Basic Crane Structures

FOR THE majority of Meccano enthusiasts a working model of a crane is among the first of their endeavours and for many it remains an ambition to build bigger and better cranes as they grow older and their outfits grow larger. In this chapter we shall be considering basic crane structures and their development. Probably the simplest and oldest crane in history is the pole hoist, known as the 'Shaduf' and used by desert farmers for countless centuries to raise water for the irrigation of their land. Fig. 1 shows how basically simple the Shaduf is. A counterbalanced pole carrying a rope fixed to a bucket at one end and a heavy stone at the other is pivotted by a rope lashing at the top of a forked post set firmly in the ground. The point of pivot is arranged to give the farmer a mechanical advantage adjustable to his height, reach and the weight of the filled bucket so that minimum effort is required to raise the water.

The invention of the windlass was an early development of applying a lever in rotary fashion for raising weights and we are all familiar with the examples of this found over water wells, etc. By adding a pulley to the system, at a fixed height, the primitive crane developed into its basic mechanical form of the crane so that drawbridges, sacks of corn and stone blocks were handled quite easily by our forefathers. However, such fixed hoisting systems suffered from lack of mobility and the need for portability gave rise to the use of 'sheerlegs', a simple Meccano model of which appears in Fig. 2. This is simply a pair of strong poles lashed together at the top to support a single pulley block and set on the ground with 'feet apart', rope stays being used to support the sheerlegs. In the Meccano model, Axle Rods are used to form the legs and Meccano cord is used for the stays and hoisting ropes. Despite its crude design, this simple crane has the advantage both of portability and of 'luffing', i.e. the sheer legs can be raised or lowered to alter the 'reach' of the crane. The huge stone blocks of the ancient Pyramids and world-famous cathedrals were

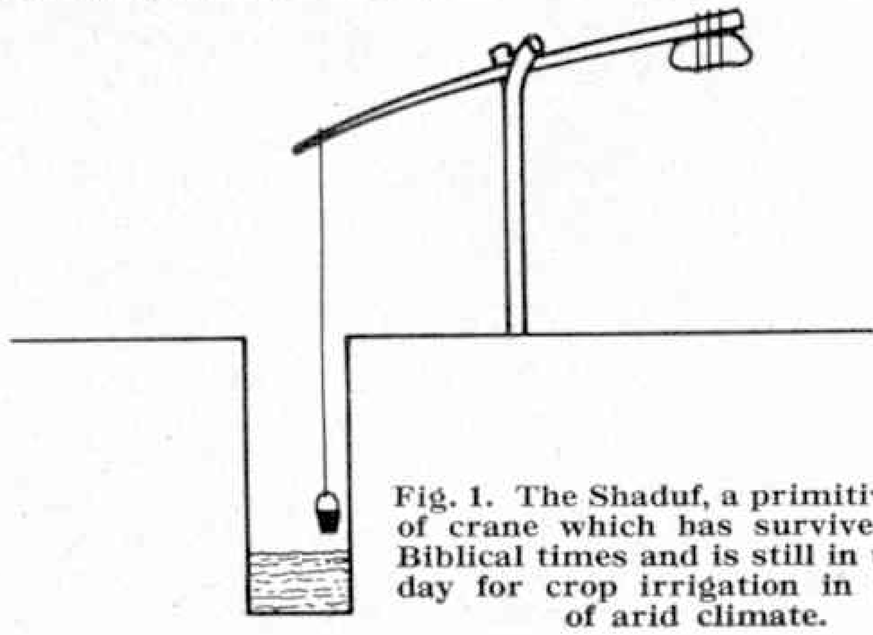


Fig. 1. The Shaduf, a primitive form of crane which has survived from Biblical times and is still in use today for crop irrigation in regions of arid climate.

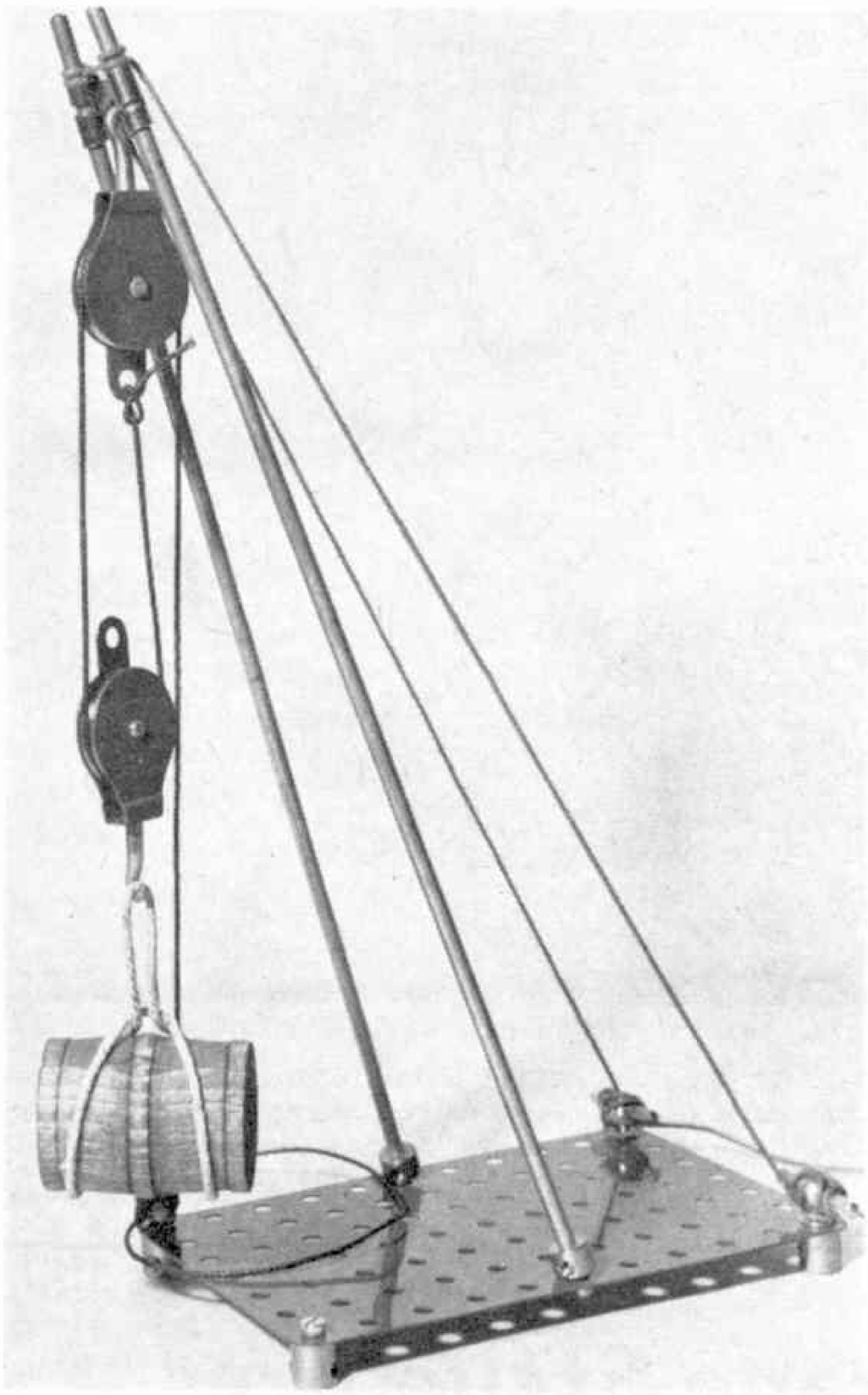
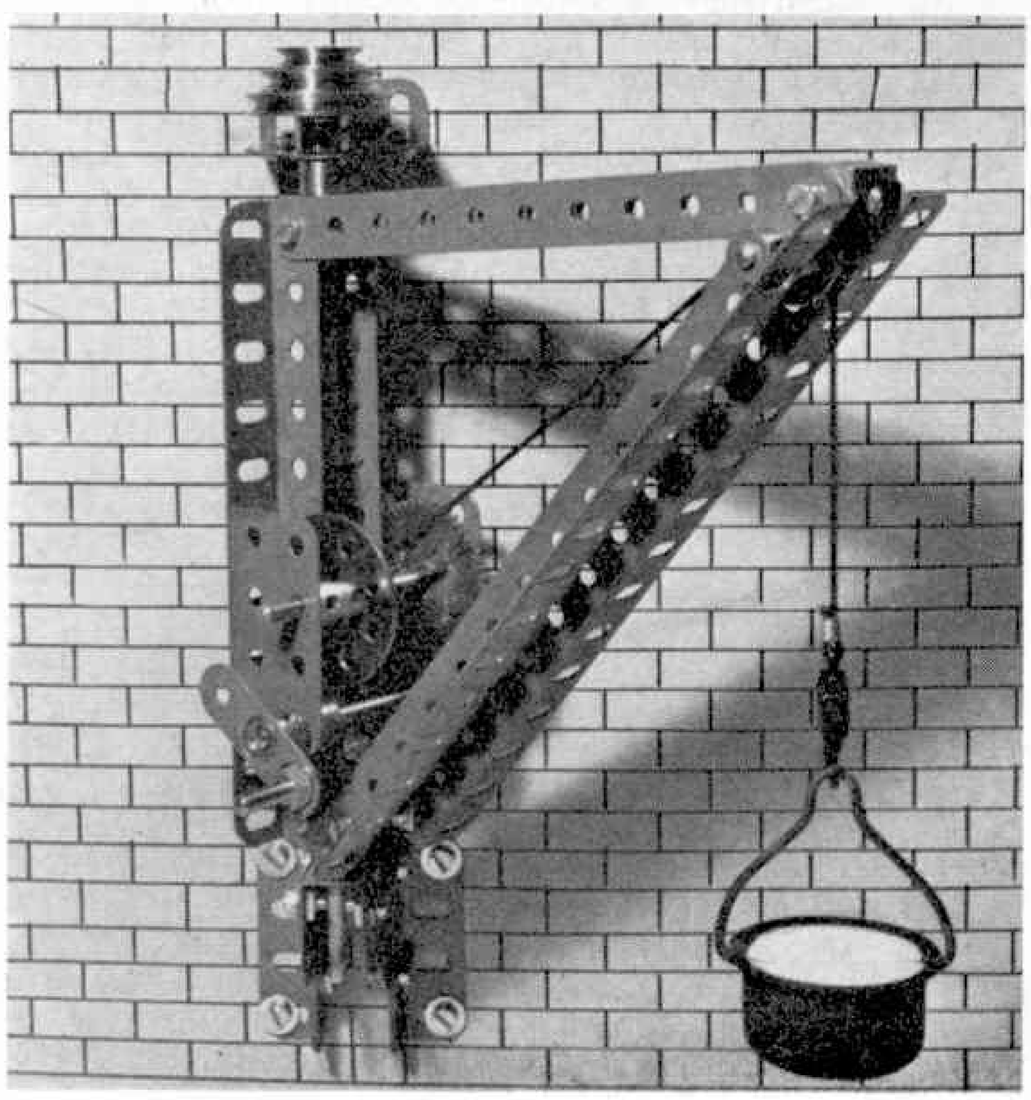


Fig. 2. Meccano model of a Sheerlegs, a simple but versatile crane.



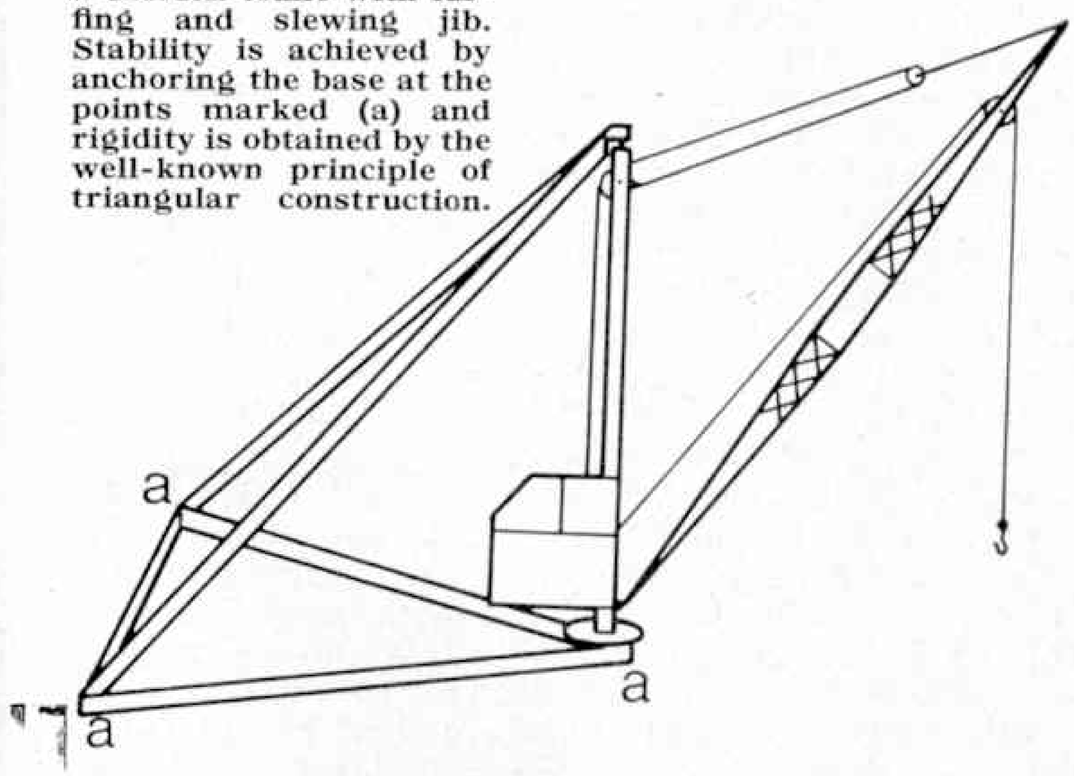


Fig. 3. Typical outline of a derrick crane with luffing and slewing jib. Stability is achieved by anchoring the base at the points marked (a) and rigidity is obtained by the well-known principle of triangular construction.

set in place by such simple tackle and today's jobbing builder with a steel joist to raise on a small building job still uses sheerlegs in preference to an expensive hiring of a mobile crane.

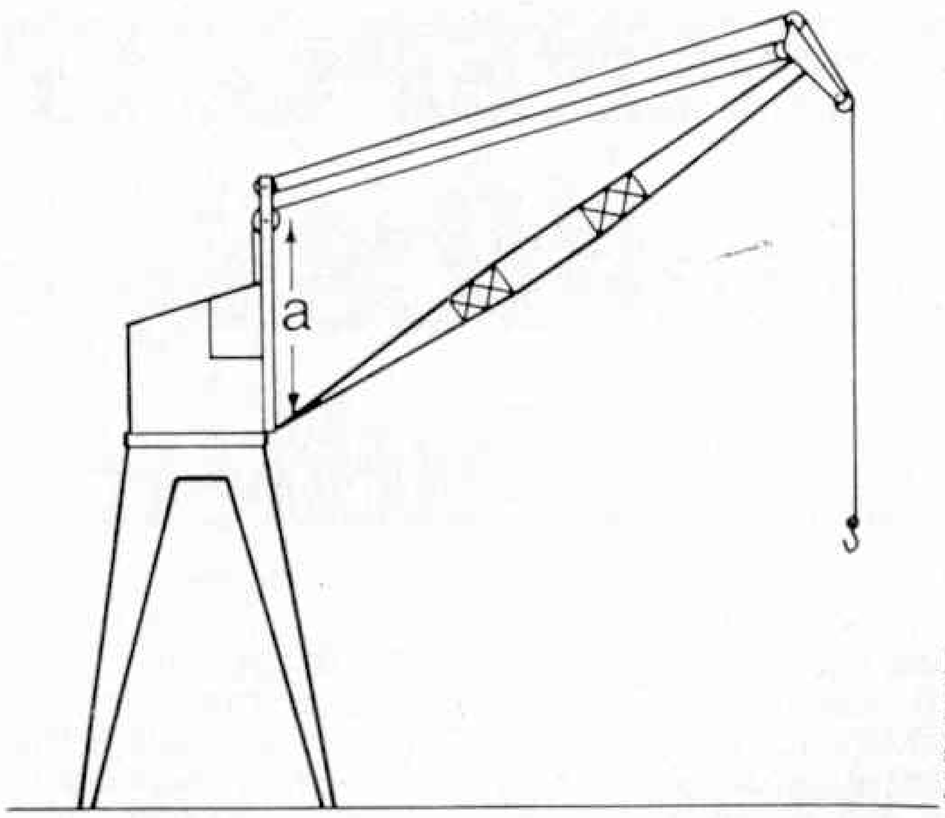
When men were able to strengthen their sheer legs with iron bands and to provide cast irong gearing, the derrick crane evolved as the natural course. The twin sheer legs were replaced by a single jib and, once again, the basic rigidity of triangular construction was well exploited in supporting the jib (see Fig. 3). A major improvement lay in the fact that not only could the derrick crane be 'luffed' but the jib could also be 'slewed', i.e. rotated at its base so that the jib could swing in a wide arc.

Much of this natural development evolved from the use of ships' spars as harbour derricks. When the huge square sails of the old sailing ships were stowed below, the sail spars and yard arms became working derricks for hoisting cargo and swinging it aboard. It is from such nautical beginnings that terms like 'luff' and 'slew' and others like 'mast' and 'brace' have been adopted into the language of the crane engineer. So long as the triangular base of the derrick crane is securely anchored to the ground at the points (a) in Fig. 3, the derrick is a very rigid and sturdy crane. It is still found in stonemasons yards, timber yards and on modern building sites at low levels. By mounting each corner of the triangular base on rail trucks, ballasted with pig iron or concrete slabs, the derrick becomes mobile and can be shifted across the building site bodily.

Because of the simplicity of its open structure and its inherent stability, the derrick crane is a popular feature in many of the Meccano Manuals of Instructions. Fig. 4 shows a simple type of foundry derrick crane modelled in Meccano for use in a fixed position on a wall. The jib has a fixed radius and is designed to slew over a fixed arc carrying a bucket of molten metal with no fear of a collapsing jib.

Despite its versatility, the derrick crane has a serious disadvantage in certain circumstances and this is illustrated in Fig. 5. The diagram at (a) shows a simple derrick crane with the hook at ground level. When the jib is luffed to the position shown in (b), it is seen that the hook has been raised through a considerable height even though there has been no winding on of the hoisting rope. If such a derrick is luffed at the same time as it is being slewed, for example when loading

Fig. 4. Model of a wall-mounted foundry derrick crane for handling molten metal. The jib is "tied" at a fixed angle for safety and swings through an arc of fixed radius.



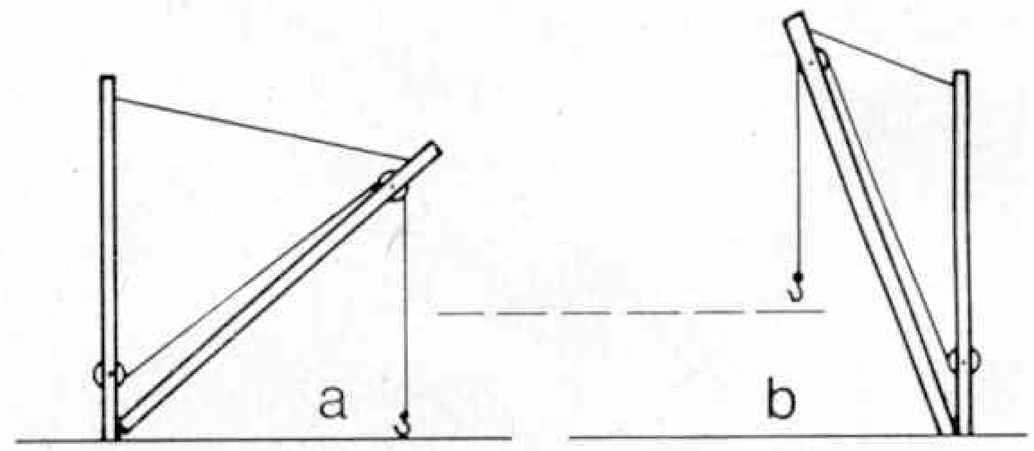


Fig. 5. If two derricks of identical jib length are luffed at different angles without change of the winding drum, the hook will rise through a considerable distance.

Fig. 6. Diagram of a dockside crane employing Toplis level-luffing gear. Note that the hoisting rope is continuous throughout and constitutes a 3 : 1 Pulley system to compensate for the luffing movement of the jib giving a level position of the load over a wide range of jib angle.

ships' holds at the docksides, a dangerous change in the level of the load could occur. To combat this tendency, a simple but ingenious method of maintaining the load at the same height during luffing operation was introduced and is known as the Toplis Level-Luffing Gear. This is illustrated diagrammatically in Fig. 6 which shows the outline of a level luffing crane. For clarity, no ropes or mechanisms are shown for raising or lowering the jib and the ropes appearing in the diagram are concerned with load hoisting only. In fact, it is a single rope which is shown and it is in the reeving of this hoisting rope over the pulley system that the level luffing principles lies. As long as the jib is not being raised or lowered, any length of hoisting rope paid out from the winding drum will result in an equal fall of the crane hook. When the winding drum is stopped and the jib is raised however, the pulley system (in this case with a 3 : 1 ratio) allows the hoisting rope to run back over the jib head and thus maintains the hook at a constant height. The distance 'a' between the lower end of the jib and the top guide pulleys is critical and bears a direct ratio to the length of the jib of approximately 5 : 16. Although the diagram shows the hoisting rope guide pulleys set one above the other, in practice they would normally be side by side on the same spindle but for clarity of the reeving arrangement they are drawn as shown.

It is not really very easy to visualise this compensating action in the abstract and it is therefore very interesting and instructive to make a model of a crane employing the Toplis Level-Luffing Gear and such a model is illustrated in Fig. 7. As a refinement, the jib pivot has been made adjustable over a wide range so that variations of its position can be made in conjunction with observations of the range of jib angle over which the load can be made to remain at a constant height. It is important to remember that, when making these observations, the winding drum for the load must be left untouched and only the luffing crank should be turned. When the critical point for the lower end of the jib has been found, the degree of level luffing obtained is quite surprising, departing from the ideal only at the extreme limits of jib lowering.

Because of the single rope simplicity of this type of crane, it is very useful for the rapid handling of light loads at the dockside, etc., but where a more powerful crane is required, the problem of level luffing may be solved by the geometrical arrangement of the jib structure. Fig. 8 shows a very efficient luffing system in Meccano in which the principle of a pivotted parallelogram is employed to cause the tip of the fly jib (from which the final hoist rope is suspended) to maintain a constant level above the ground. Such a system lends itself very easily to counterbalancing so that very little power is actually required to operate the mechanical luffing movement and a small economical motor can be employed for the job. This mechanical linked system also has the advantage that no maintenance or replacement of luffing ropes is required.

To be continued next month.

An additional illustration to Fig. 7 and an illustration Fig. 8, referred to in the text will appear in the next instalment which will continue on the subject of BASIC CRANE STRUCTURES.

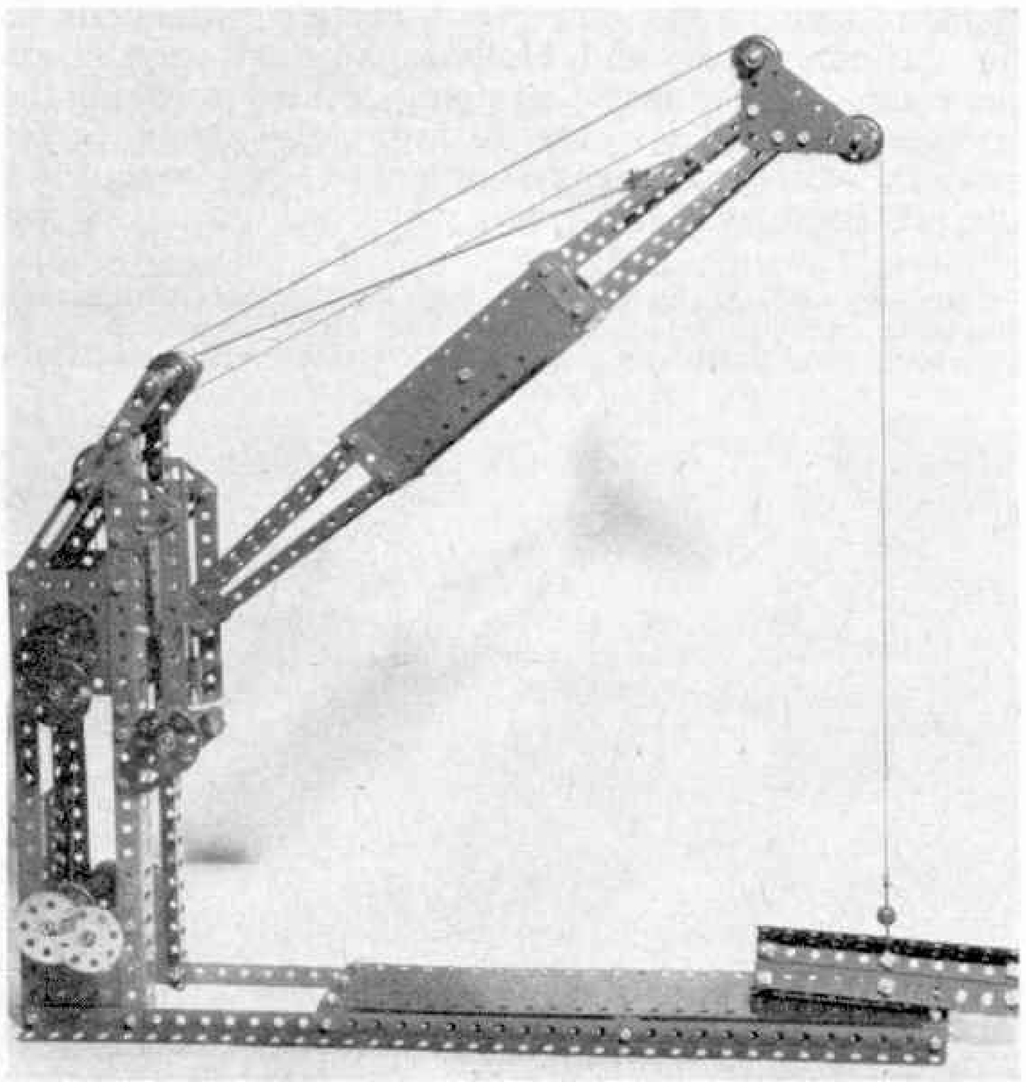


Fig. 7. Demonstration model of a Toplis Level Crane. The long "foot" at the base gives stability to the model and provides a level platform for observing the constant level of the load when the jib is luffed.

TRANSPORT TOPICS by Mike Rickett

Dover Marine is one of the stations affected by the May 1970 time table alterations, and it is pictured here on Easter Monday 1962 shortly after the "Golden Arrow" had arrived. The locomotive is Bo-Bo No. E5015.

MANY CHANGES have recently been announced to railway timetables, primarily affecting the Southern and Eastern Regions of British Rail. The Southern, in particular, is to introduce a new pattern of services on the main Portsmouth line which will come into effect from Monday, May 4, 1970. Instead of having one semi-fast and two stopping services each hour, there will be two semi-fast and one stopping service, and in future the new semi-fast will leave Waterloo at 20 minutes past the hour and call only at Guildford and Havant, while the present day semi-fast will continue to leave Waterloo at 50 minutes past the hour but will call additionally at Godalming and Petersfield, connecting with Isle of Wight boats. The third train, stopping at all stations from Woking, will leave Waterloo at 22 minutes past the hour instead of 13 minutes past, and the other stopping service—now at 23 minutes past from Waterloo—will go only as far as Guildford. It will leave at 52 minutes past and connect with the new train to Portsmouth at Guildford.

With the introduction of the five-day week by the Banks, Southern Region report a decline in the demand for Cannon Street and Holborn Viaduct services on Saturday. They have therefore, decided to close the stations on that day so that in future all Cannon Street services will terminate at Charing Cross—except for the two Bromley North trains which will go to London Bridge—and all Holborn services at Blackfriars.

In the days of steam, this is what the Victoria-Folkestone Harbour main line looked like. The 12.30 is seen here in February 1960 pulled by "Battle of Britain" class No. 34066 "Spitfire."

An additional morning train to Southampton and Bournemouth is to be run on Mondays to Fridays from Waterloo, and also, an afternoon train to London. This will fit into the popular fast service at 09 30, bridging a two-hour gap. The new train will leave Bournemouth at 15 40 and call at Southampton (16 10) before arriving at Waterloo at 17 26. Services on the Alton line are to be improved on weekdays and in future, instead of having one semi-fast and one stopping train every hour, there will be two semi-fast services each hour, and in the other direction they will leave Alton at 20 and 50 minutes past.

On Sundays there will be a fast train at 10.45 from Brighton to Victoria but the 13.45 will be cancelled. Also cancelled is the 11.56 London Bridge-Brighton train on Saturdays. The 40 minutes past the hour Victoria-Dover Priory service is to be extended to Dover Marine, giving travellers in the Medway area a through service for cross-channel boats.

Space will permit mention of only a few of the many planned changes and there will, in addition, be many more affecting suburban services in the South East, South West and Central Divisions of the Southern Region.

On the Eastern Region of B.R. advance notice of the May 1970 timetable suggests that they are anything but complacent about the 10 per cent increase in Inter-City business recorded over the past year. The timetable improvements are an "all-points-of-the-compass" affair with the east being brought closer to the west, and the great passenger "conveyor belt" between north and south already served by one of the fastest and the most frequent diesel main-line services in Europe, also enjoying a fillip in standards.

Encouraged by the traffic figures and by market research into future traffic trends, B.R. have invested more capital in track and signalling improvements and in new rolling stock, especially on the "blue riband" East Coast main line where nearly 200 miles will be upgraded to a 100 miles an hour standard by next spring.

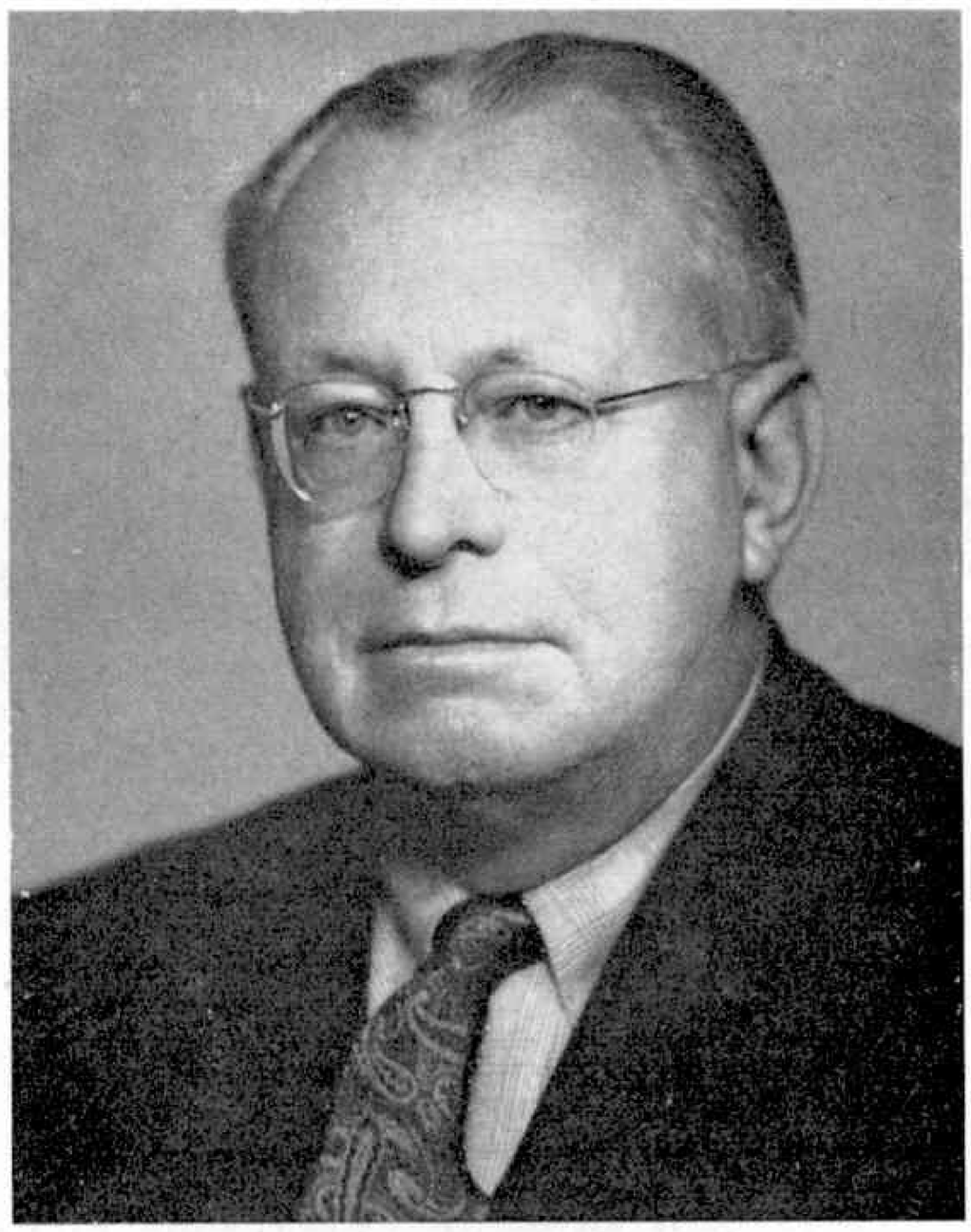
Trains using the East Coast main line will have their journey times cut by up to 23 minutes. The fastest trains between Newcastle and London, which now take 3 hours 50 minutes, will spend only 3 hours 35 minutes on the 269-mile run, and businessmen will have a 10-minute later start on the present 07.25 from Newcastle which will reach London at 11.11, four minutes earlier than now. The return service at 18.00 will get into Newcastle 15 minutes earlier than now and other services on the East Coast route between Edinburgh, Newcastle, Darlington and King's Cross will have journey times reduced by up to 13 minutes. One overnight train, "The Aberdonian" sleeper, will leave King's Cross 15 minutes later but will still arrive in Aberdeen at the same time as at present.

GREAT ENGINEERS No. 26

JOHN DUDLEY NORTH

(1893—1968)

by A. W. NEAL



A DESIGNER and maker of aircraft, John Dudley North was a portent of the modern world, his work forming a major part of the foundations of the aircraft industry of today.

He received his education at Bedford School and served an apprenticeship to marine engineering. But he anticipated that flying would become an important factor in travel, and he transferred to aeronautical engineering.

Setting his course in that direction he joined Horatio Barker's Aeronautical Syndicate at Hendon, a concern that produced the Valkyrie, tail-first monoplane. On the demise of the Syndicate he joined the Grahame-White Company and soon became Chief Engineer. Grahame-White, it will be remembered, was a great flying pioneer. During the early 1900's North was responsible for the design and construction of various aeroplanes, including a tractor " sesqui " plane which was the first British machine to loop-the-loop. Another of his designs was the G.W. Char-a-banc which, carrying nine passengers and the pilot, made a record which stood for many years.

In 1915 he moved to Austin's of Longbridge as Superintendent of their aeroplane section. Austin's were then manufacturing RE.7 and RE.8 aircraft for the then Royal Fying Corps, now the Royal Air Force.

Two years later he was appointed Chief Engineer to the experimental aircraft department of Boulton and Paul of Norwich. His first machines were the *Bobolink* fighter and the *Bourges* bomber.

North's next step upwards occurred when the aircraft section of Boulton and Paul was incorporated as an independent company in 1934 as Boulton Paul Aircraft, and he was appointed Chairman and Managing Director.

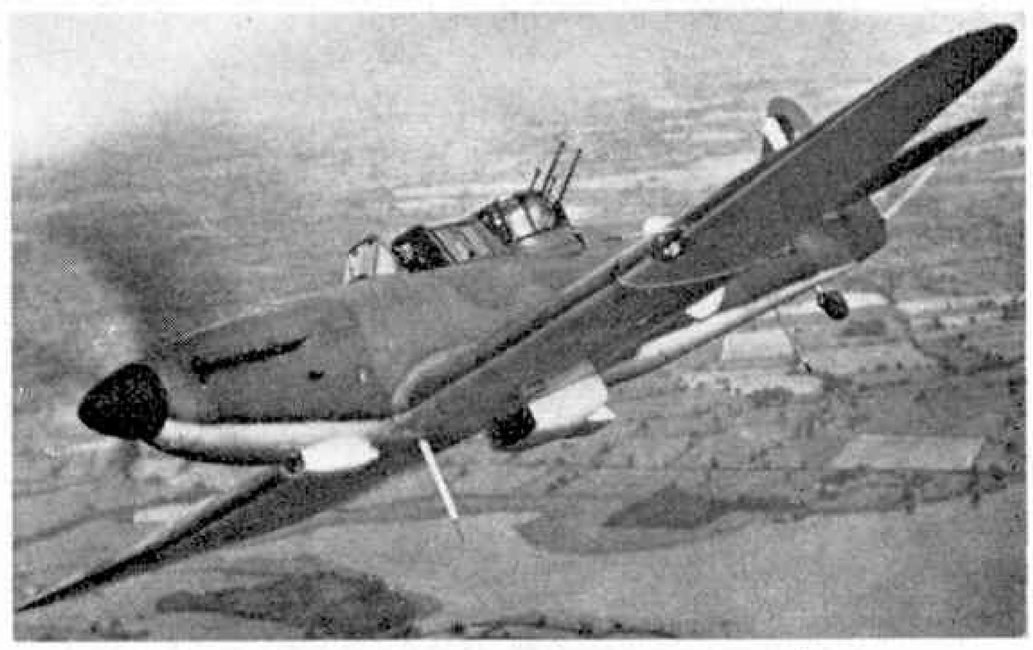
With the collaboration of Armand de Boisson, a French engineer, he designed a number of power-operated gun turrets for war aircraft, and one machine fitted with these was the *Defiant* fighter, of which he was also the designer. The *Defiants* operated with considerable success during the Dunkirk evacuation when eleven of them shot down 38 German 'planes in a single day. Similar successes were achieved during the initial stages of the Battle of Britain. But eventually the fixed, forward firing guns, were found to have advantages and the *Defiants* were withdrawn from service.

After the war North was active in the development of servo-mechanism, and in particular aircraft power controls.

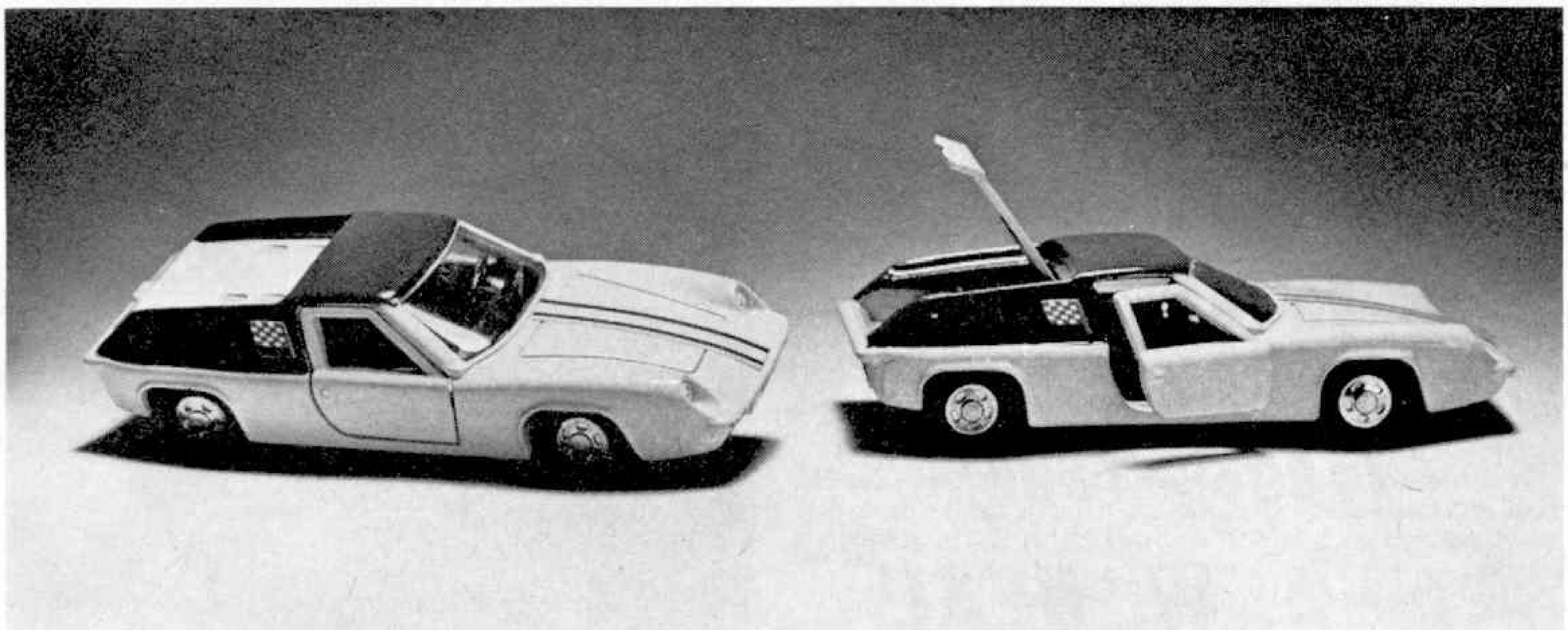
For many years he was a member of the Air Registration Board and Chairman of its Requirements Committee, a Member of the Board of Governors of the College of Aeronautics and Chairman of the Techanical Committee of the Society of British Aircraft Constructors. He was also a founder member of the Operational Research Club later transformed into the Operational Research Society.

Between 1948-53 he conducted a large scale investigation into the reliability of military aircraft, the results of which are incorporated in a 13 volume report called " Design for Reliability."

John Dudley North was elected an Associate of the Royal Aeronautical Society in 1918 and an Honorary Fellow in 1961, the highest honour the Society can confer. In the 1962 Queen's Birthday Honours List he was awarded the C.B.E. The Birmingham University awarded him the Honorary Degree of Doctor of Science in 1967.



The Boulton Paul *Defiant* Aircraft



DINKY TOY NEWS

'Three from six' by Chris Jelley

SNEAK PREVIEWS of new models might be O.K. for whetting the appetite, but it takes the actual models themselves to really satisfy the curiosity! In these pages last month we published artists' impressions of no less than six Dinky Toys that were scheduled for production " in the near future " and I don't mind telling you that sight of those drawings set my curiosity working. I had not seen any actual models at the time, but luckily I didn't have long to wait before something came my way. Only two weeks after I wrote my last article, in fact, the three models described here appeared on my desk—and they were well worth waiting for!

Heading photograph: A beautiful little model packed with action features is the Dinky Lotus Europa, No. 218. Above: Straight from TV.'s "The Secret Service," Dinky Toy No. 109 Gabriel Model T. Ford, seen here mounted on the illustrated display platform with which it is packed.

Of particular interest to younger readers, as well as to veteran car collectors, will be No. 109 Gabriel Model T Ford. Like the existing Dinky " Thunderbirds ", " Captain Scarlet " and " Joe 90 " models, this new Dinky is taken from a Gerry Anderson television puppet series produced by Century 21, the series in this case being " The Secret Service " which is screened on commercial TV. Star of the show is Father Unwin who, on the surface, is just an ordinary priest, but who also has another, more sinister role—as top secret agent to British Intelligence Service Headquarters!

In his capacity as secret agent, Father Unwin has all sorts of fantastic electronic gadgets to assist him, yet one of his most treasured possessions is a beautifully-preserved Model T Ford with the angelic name of " Gabriel " (very fitting for priestly transport!). It is this trusty old tin lizzie which serves as the inspiration for the new Dinky—and a beautiful little model it is, too. Modelled closely on an early Ford T, it captures all the atmosphere of its period and, at the same time, fits in perfectly with the TV. show by being finished in the correct colour-scheme of black chassis, bonnet and boot with orangy-yellow body and wheels. Mind you, TV. identification is helped along a good deal by the word " Gabriel " in black lettering on each side

of the body and the figure in black priestly garb sitting sedately at the steering wheel!

Besides being a first-class toy, the model makes an excellent ornament, helped along by authentic-looking imitation " brass " headlamps, radiator-grille and windscreen frame, the latter enclosing a glazed windscreen. It certainly catches the eye.

In real life, the Model T could not, under any stretch of the imagination, be called a fast, high-performance job, but a car which does fit this description is the full-size version of the second new Dinky to appear—No. 218 Lotus Europa. British designed and built by the world-famous company, Lotus Cars Limited of Norwich, the Europa is actually powered by a highly-tuned French Renault 16 4-cylinder in-line engine with a capacity of 1,470 c.c. which develops a power output of 82 B.H.P. at 6,000 r.p.m. Rear-mounted just aft of the cab, it gives the car a top speed in excess of 110 m.p.h., drive being to the rear wheels via a Renault 4-speed, all-synchromesh gearbox. What, with a French engine and drive system in a British body, the Europa really is " European ", wouldn't you say ? If the real car is European, however, the Dinky Toy model is all-British—and a credit to the country! It's a beautiful little thing with instant appeal, thanks not only to the fact that it captures all the attractive lines of the real car, but also to a really excellent paint finish: smooth and hard, and with a general look of quality about it. The colour, itself, automatically pulls your eye straight to it—you simply cannot overlook a royal blue roof and engine compartment sides over a bright yellow body with black stripes on a fluorescent red band running from windscreen to nose!

The model, of course, is not just something to look at. Being a Dinky Toy, it carries plenty of Dinky features such as opening doors giving access to an interior equipped with highly-realistic black seats, black facia panel and contrasting silver steering wheel. Outside, an opening engine compartment is provided, this containing a very highly-detailed representation of the real car's engine, finished in a golden colour. A windscreen is of course included, plus jewelled headlamps and number plates. The windscreen moulding incorporates the usual windscreen wiper and rear-view mirror detail.

Last, but by no means least, the model is fitted with a feature which is just right for a model based on a fast, high-performance car—Speedwheels. These, coupled with the weight of the strong metal from which the basic toy is made, result in a really fast Dinky!

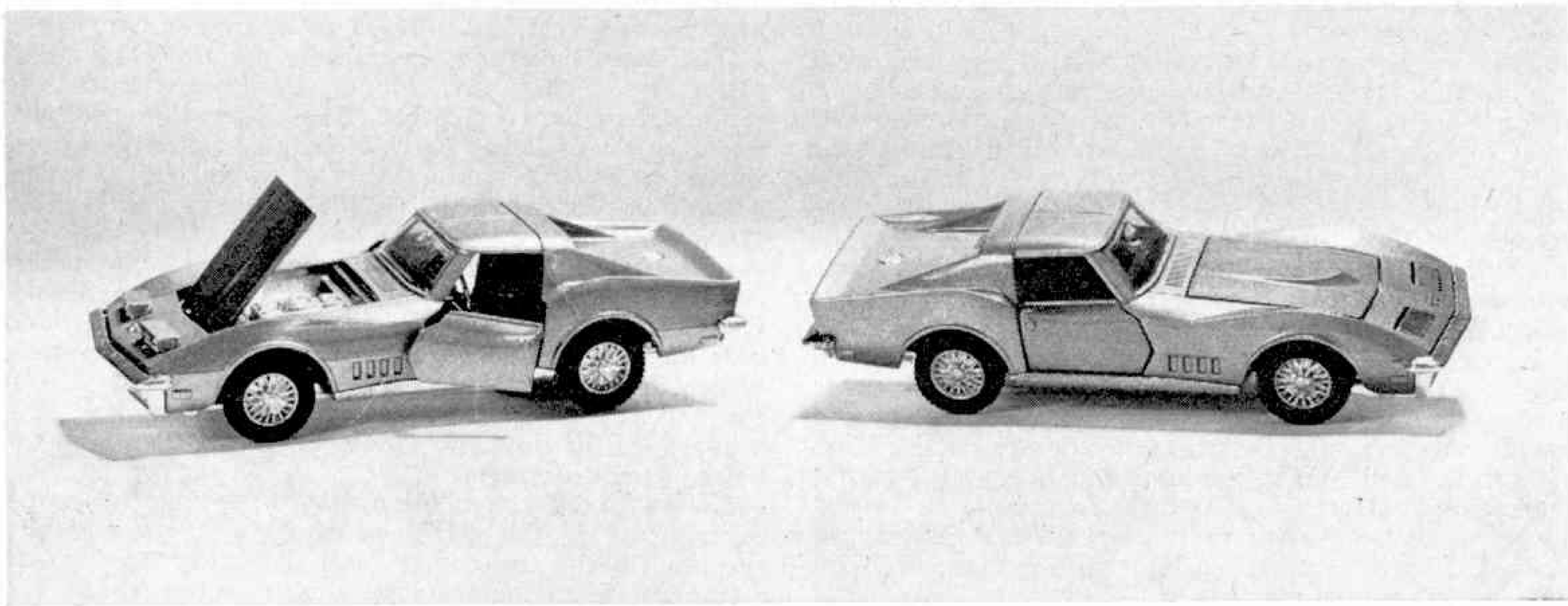
Another new Dinky which qualifies as fast through carrying Speedwheels is No. 221 Corvette Stingray. This, again, is a first-class model bang up to top Dinky Toy standard, although I must confess that there is something about the look of the real car which does not appeal to me greatly. The model does appeal, though, especially because it is the first ever Dinky Toy to be fitted with another—yes, *another*—brand new feature for Dinky: " pop-up " headlamps! At first glance there doesn't appear to be any headlamps fitted to the model at all, but, when a tiny lever projecting through the front underside of the baseplate is pushed forward, two small, silver-plated panels in the nose rise up and, with them, twin headlamp assemblies. It's fascinating!

Naturally, nobody expects a modern Dinky Toy to be fitted with only one special feature, and the Stingray undoubtedly lives up to expectations. Also present therefore are opening upholstered doors, opening bonnet, covering a massive imitation engine, Speedwheels, and American-style number plates, plus windows, seats and steering wheel. As with the Lotus, the Stingray's seats are black and the steering wheel silver, but the body is finished in a beautiful metallic orange colour that shines so much that you'd swear the model was highly polished! It really looks good.

In real life, the Corvette Stingray is produced in Detroit, Michigan, U.S.A. by the Chevrolet Motor Division of General Motors Corporation, one of the world's biggest automobile manufacturers. Like many American cars, it is available powered by a choice of engines—in this case no less than six, ranging from the basic 300 H.P., 350 cu. in. capacity V-8, through 350, 390 and 400 H.P. versions to the enormous 435 H.P., 427 cu. in. capacity V-8 unit. There is even a choice of transmissions, namely automatic or either 3-speed or 4-speed manual-change gearboxes. Inside, comfort and elegance are the keynotes, even though the vehicle is classed as a sportscar, and it's chock full of useful gadgets and instruments. Corvette, in fact, claim openly that, " If it has anything to do with the engine, there's a guage for it." It's even got remote-controlled washers for the pop-up headlamps! (On second thoughts, I wouldn't mind one myself, but all I can afford is the Dinky Toy!)

More news as the new models reach me.

First ever Dinky Toy to be fitted with " pop-up " headlamps is the Corvette Stingray, No. 221, but the headlamps account for only one of the model's many interesting features!



Sikorsky SH-3 modified for noise reduction experiments.

AIR NEWS

By JOHN W. R. TAYLOR

Flying for fun

One of the most depressing features of the 'sixties was the drift of young British pilots away from flying once they had earned their licences. Often they found it too expensive to train to higher standards, and the possibility of ever buying their own aeroplane seemed negligible.

A new company named Airmark Ltd. hopes to change all this. Founded by Tom Storey, a young man who built his own racing 'plane in 1968, it has begun by putting into production a slightly modified version of the American single-seat Cassutt Racer. With a price tag of £2,900, this might seem beyond the reach of most people; but Airmark expects groups of pilots to club together to buy a Cassutt which they can then share for " fun flying ".

This makes sense. Despite its small size and high performance, the Cassutt is immensely strong and not at all difficult to fly. The prototype was designed and built by Captain Tom Cassutt, an airline pilot, who used it to win the 1958 U.S. air racing championships. Since then, at least 40 similar aircraft have been built and flown by amateurs, and Airmark is offering a whole range of parts to people in Europe who would prefer to save money by assembling their own Cassutt.

Fuselage and tail unit are of steel tube, covered with fabric. The wing spans a mere 15 ft. and is made entirely of wood, with full-span ailerons that give a terrific rate of roll. On the ground, the combination of spring steel main undercarriage, hydraulic disc brakes and steerable tail-wheel makes the Cassutt almost as manoeuvrable as it is in the air. Its weight is only 530 lb. empty, with a maximum of 820 lb. fully loaded at take-off.

Power plant of the Airmark version is the 95 h.p. Rolls-Royce Continental C90-8F four-cylinder piston-engine, which means that the aircraft conforms to the American Formula One racing requirements. Top speed is nearly 200 m.p.h. and, as the makers say, things happen fast in a Cassutt.

Thirty seconds after opening the throttle for take-off a pilot can pass 1,000 ft. In just over two minutes more, he can be at 5,000 ft., yet the little aircraft is surprisingly economical. At cruising power, a mile shrinks to less than half a minute, yet the Cassutt burns only five gallons of 80-octane petrol an hour, giving an average of over 30 miles per gallon. Many family cars cannot do better than this, at much less than half the speed.

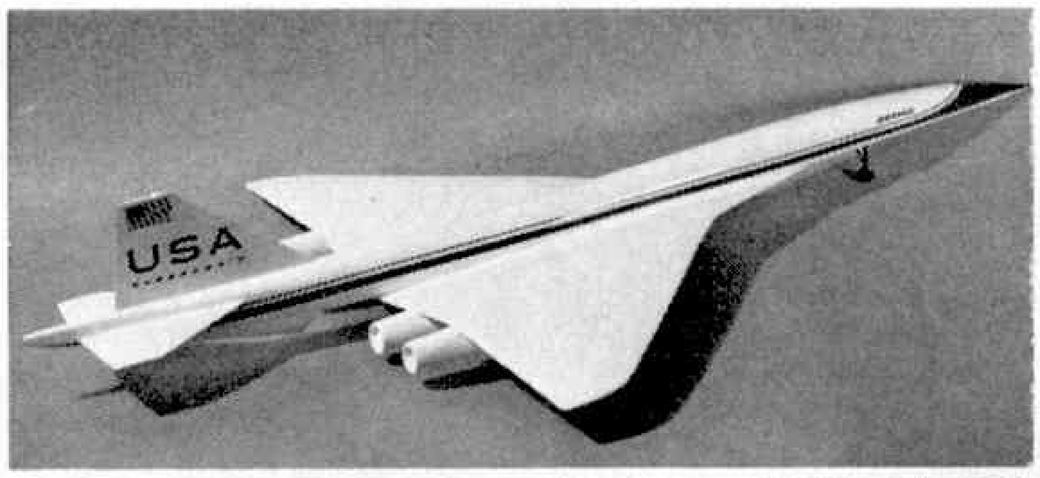
Quieter choppers

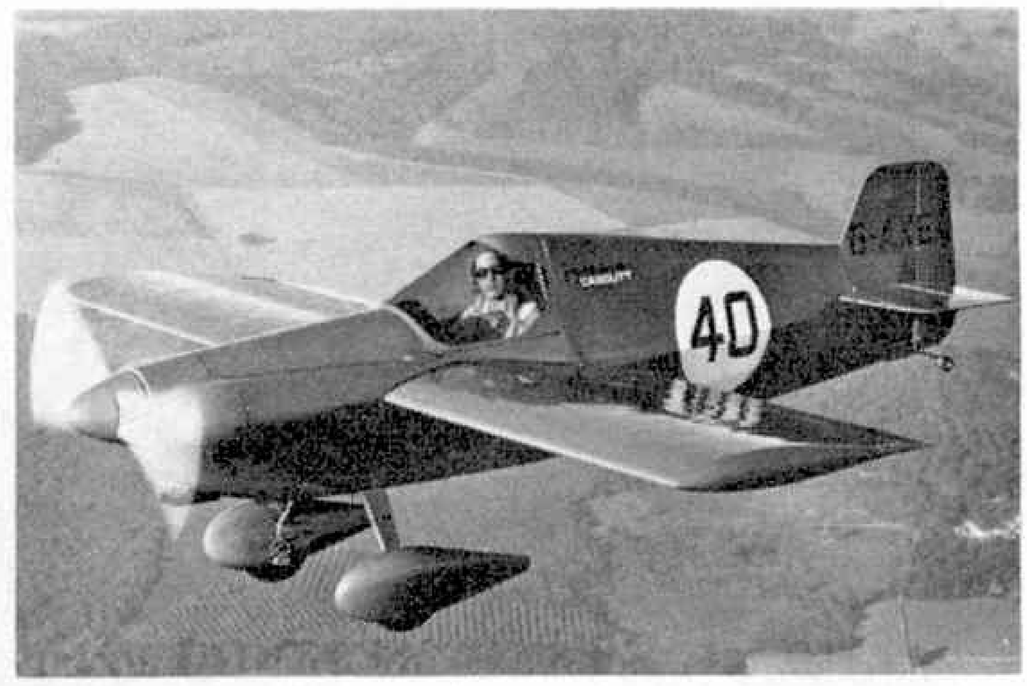
We hear quite a lot about losses of American helicopters in Vietnam. It was, therefore, enlightening to learn that in 1968 the U.S. Army lost an average of only one " chopper " for every 12,716 sorties flown. There could be no better proof that the helicopter is a pretty tough bird and difficult to destroy.

The most hazardous operations are those in which pilots are picked up behind the enemy lines and wounded soldiers evacuated from front-line positions to the safety of hospitals. Yet only 48 helicopters were lost on such work over a period of several years, during which they carried over 300,000 military and civilian casualties, saving countless lives.

One of the problems with present-day " choppers " is that they cannot approach a pick-up point silently. Even if they fly low, enemy snipers on the ground hear their engines and the beat of their rotors long before they are overhead, and can lie in wait for them. For this reason, helicopter manufacturers are spending a great deal of time and money on trying to reduce the noise of their aircraft.

Latest Sikorsky machine modified for noise reduction experiments is the SH-3 illustrated. It is basically similar to the helicopter used to pick up Apollo astronauts from the sea after flights to the Moon, but





Above: Model SST Boeing 2707—300. Right: Airmark Cassutt—first of three prototypes. Bottom: Armament display from FMA 1A—58 and the aircraft itself having its first engine run.

has special rotors, a redesigned tail rotor pylon, and lightweight mufflers over the intakes and exhausts of its two turbine engines.

Instead of the usual five-blade main rotor, this SH-3 has six blades with reduced angle of attack and twisted trapezoidal tips to improve vortex flow. These changes enable the rotor to develop all the required lift when operated at only 90 per cent of the usual speed, so reducing the airflow disturbance which create rotor noise. The tail rotor has ten blades instead of the usual five, permitting a 33 per cent reduction in rotational speed.

Supersonic problems and progress

Noise presents even more of a problem for designers and future operators of supersonic transport aircraft (SST's). America, for example, has announced officially that airliners will have to fly over its territory at below the speed of sound until some way has been found of eliminating the sonic boom. This is a sharp, short-duration sound, like a thunderclap, caused by the shock-waves trailed by an aeroplane travelling at supersonic speed and heard at every point over which it flies.

Despite this ban, which will be copied in other countries, the U.S. government decided last September to order two prototypes of the Boeing 2707-300 delta-wing SST, at a total cost of about $1,500 million (£625 million). Of this immense sum, Boeing and General Electric, who will supply the four engines, are to put up nearly $300 million, with a further $80 million coming from 12 U.S. and 14 foreign airlines as " risk money " and to reserve delivery positions for the 122 SST's they have ordered so far.

The U.S. government estimates that the SST programme will provide jobs for 50,000 people and will repay all the " official " money invested in it, through royalties, after 300 aircraft have been sold. It hopes to show a profit of $1,000 million (£417 million) on the total sale of 500 SST's by 1990. The first prototype is expected to fly in 1972, and the Boeing 2707 will enter service in 1978, five years after the Anglo-French Concords and Russia's Tu-144. It will be bigger and faster, with the ability to carry up to 300 passengers at 1,800 m.p.h. Wing span will be 141 ft. 8 in., length 280 ft., and take-off weight about the same as that of a 747 " jumbo-jet ".

Meanwhile, the Concorde continues to progress well in its flight trials. Supersonic flying by airline personnel began last November, when pilots from BOAC, Air France, Pan American and TWA all handled the French-built prototype at speeds up to Mach 1.2 (800 m.p.h.). They practised flying the aircraft after an engine cut at supersonic speed and ended with four separate approaches to the airfield—two overshoots, a " touch-and-go " with an engine cut at take-off, and the final landing.

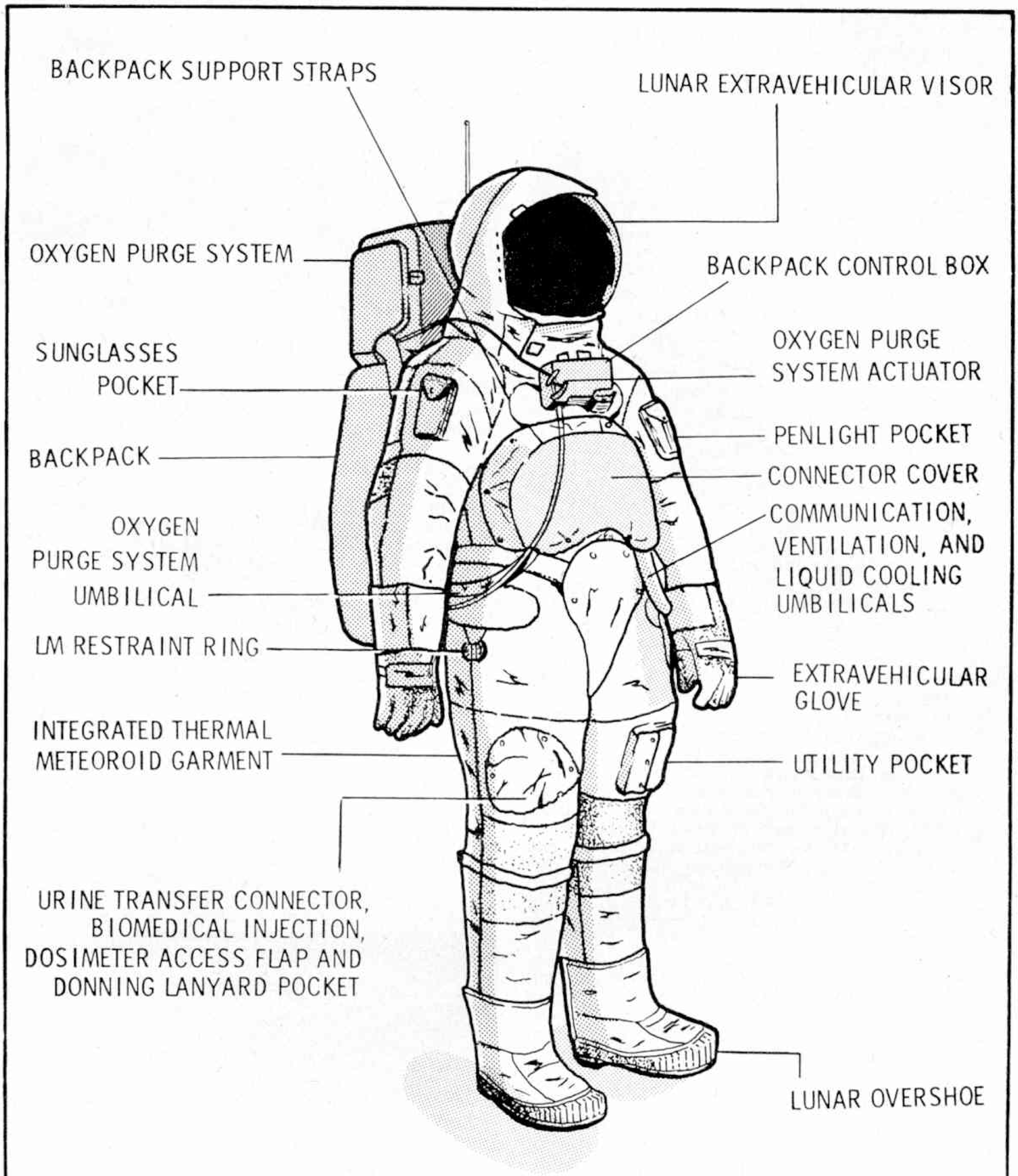
Verdict of all the pilots was that the Concorde is pleasant and easy to fly, imposes no problems even after an engine failure and should present no difficulties in training airline pilots and engineers to handle it.

New COIN from Argentina

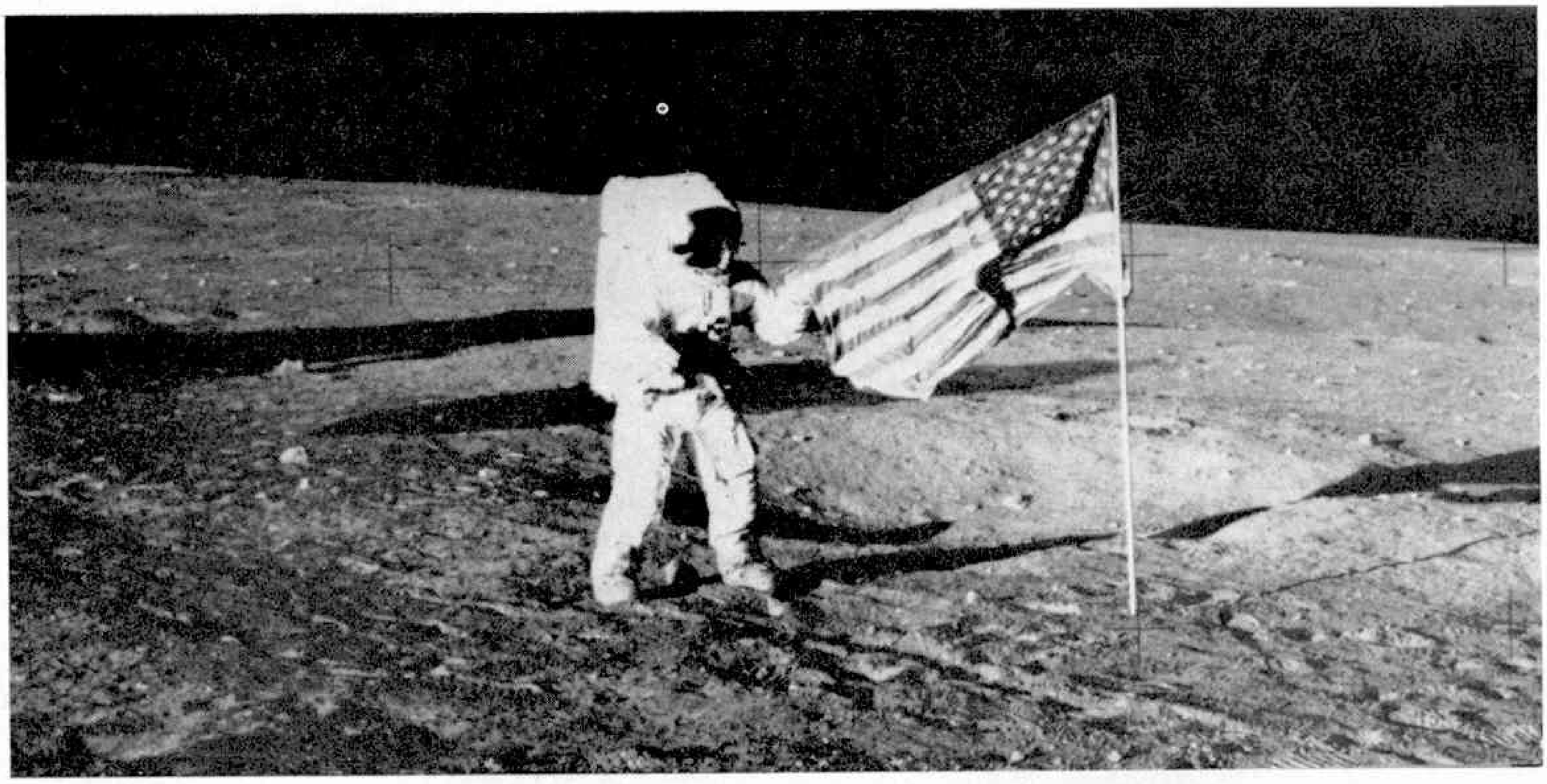
Following the success of the North American OV-10A Bronco light armed reconnaissance aircraft in Vietnam, the Argentine's state-run Military Aircraft Factory has produced its own aircraft of this type. Known as the 1A-58, or A-X2, the prototype is powered by two of the same AiResearch turboprop engines as the Bronco, but is a more conventional design, without twin tail-booms.

Each of the TPE 331-U-303 turboprops is rated at 904 h.p., giving the 1A-58 a top speed of 308 m.p.h. and range of well over 2,000 miles. It is a two-seater, with two 20 mm. cannon and four machine-guns installed in the fuselage and three attachment points under the fuselage and wings for bombs, rockets, fuel tanks or other external stores.

The Argentine Air Force needs at least 80 COIN (counter-insurgency) aircraft to replace obsolete types currently in service. The IA-58, which flew for the first time on 20th August 1969, looks like an excellent home-produced answer to the requirement.



EXTRAVEHICULAR MOBILITY UNIT



THE APOLLO PROGRAMME MOON SUIT—described by Mike Rickett

EVERYONE WITH an interest in the exploits of the Apollo 11 and 12 missions will have regretted the failure of the colour television camera when Al Bean accidentally pointed it at the Sun a short while after the recent Apollo 12 EVA—extra vehicular activity—had begun. Because of this both viewers at home and scientists at Mission Control in Houston, Texas, were unable to watch the two 3½ hour Moon walks, or see Charles Conrad and Al Bean working on the removal of the TV camera and other parts from the Surveyor vehicle in a crater on the Ocean of Storms.

In fact, a TV camera was not strictly necessary for the complete success of the mission, since information will eventually reach scientists from the experiment packages left on the Moon, and part of the mission's purpose was also to bring back many rock and core samples for analysis. In perhaps the next issue of the magazine we will show a few photos taken on the Moon's surface, but meanwhile I give a little more information on the space suits worn by all astronauts during Moon walks.

On all present and future Apollo missions, crewmen will wear two versions of the space suit; a pressure garment assembly for use inside the space craft, worn by the Command Module Pilot, and a suit for extra-vehicular use by the Commander and Lunar Module Pilot. Together with a liquid cooling garment, portable life support system, oxygen purge system, and lunar extravehicular visor assembly, the suit provides an astronaut with life support for a four hour mission outside the lunar module.

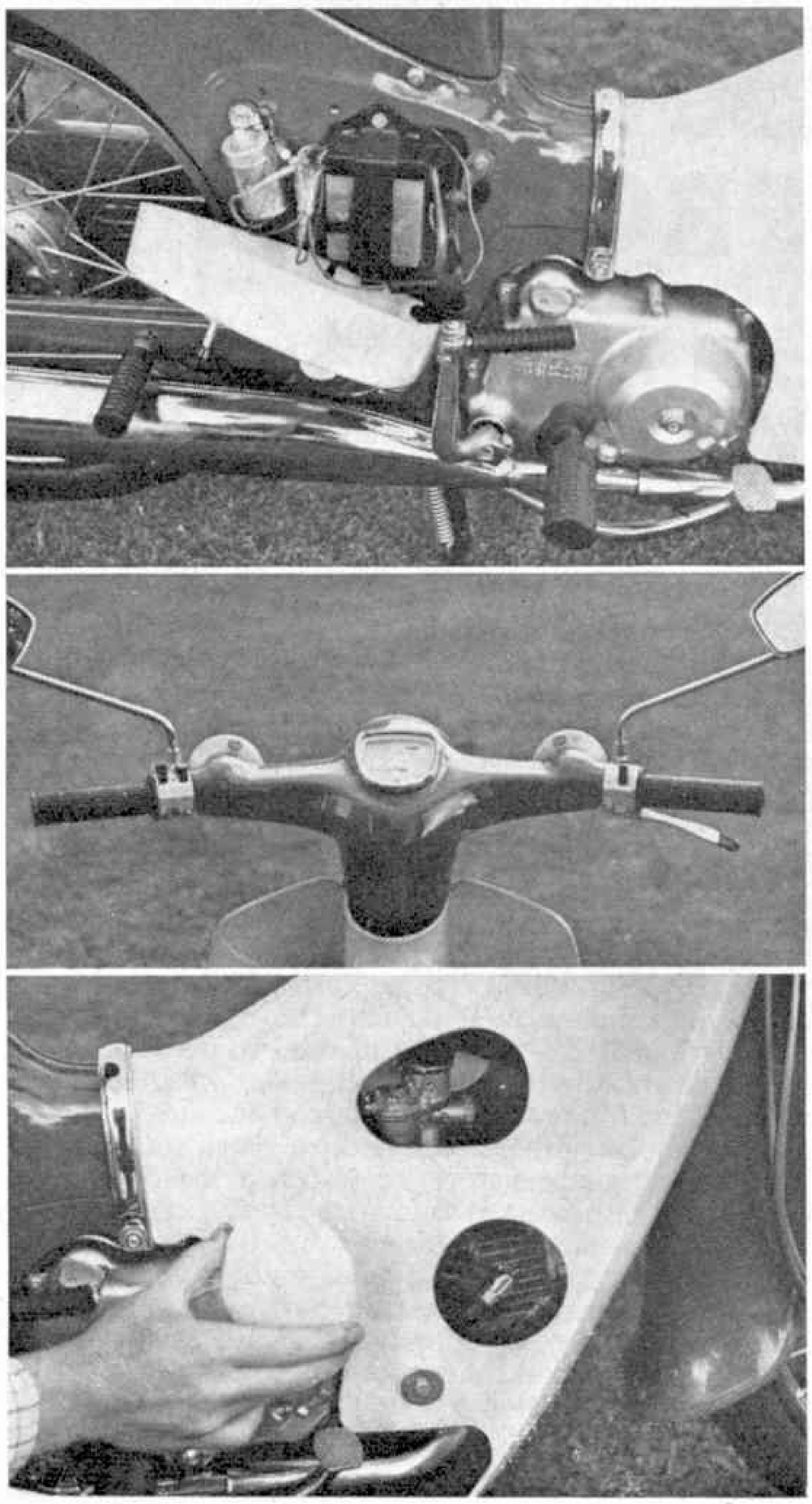
Worn next to the skin is a liquid cooling garment, knitted in nylon-spandex with a network of plastic tubing used for circulating cooling water. More important still is the portable life support system in the backpack, which supplies oxygen at 3.9 lb. per square inch, and also cooling water for the cooling garment. Used oxygen is cleansed of solid and gas contaminants and the back pack also includes communications and telemetry equipment, displays, controls, and a main power supply. On top of the PLSS is an oxygen purge system, which supplies a contingency 30-minute supply of gaseous oxygen in two 2-pound bottles.

On the astronaut's head goes a visor assembly, attached over the pressure helmet to provide protection against micro-meteoroids, heat, and ultra-violet and infra-red light. Gloves for use on Moon walks are also provided and these give protection against extremely hot or cold objects. Communications carriers—called "Snoopy hats"—are worn with the pressure helmet and these have both microphones and earphones.

Finally, the astronaut has a one-piece underwear garment which he wears with the space suit during long periods inside the space capsule. Resembling the old Victorian "long Johns," these have a harness for the monitoring of medical details to the flight surgeon at the control centre. "Getting dressed to go out" has a very real meaning on the air-less, waterless, and pressure-less Moon. Without this space suit a Moon walk would be impossible, because even though the Moon has no air, moisture, or water, if the Sun's rays touched the unprotected human body during the two-week long lunar day, they would kill instantly. Similarly, the two week long lunar night is cold enough to freeze even air, and in temperatures of minus 279 degrees below zero, no human life could exist without substantial protection. Added to these problems is that of micro-meteoroids—very small grains of rock—that constantly hurtle to the Moon's surface. On Earth, they are burnt up by the atmosphere, and the deadly radiation pouring out of the Sun is safely absorbed. All these problems have been taken into account when this highly efficient space suit was designed.

ON TWO WHEELS

Meccano Staff test Scooters, Mopeds, and Motorcycles



Top: Removal of a small plastic cover gives access to the battery. Centre: Handlebar layout is neat and well finished. Lower: A small plastic plug when removed gives access to the spaiking plug.

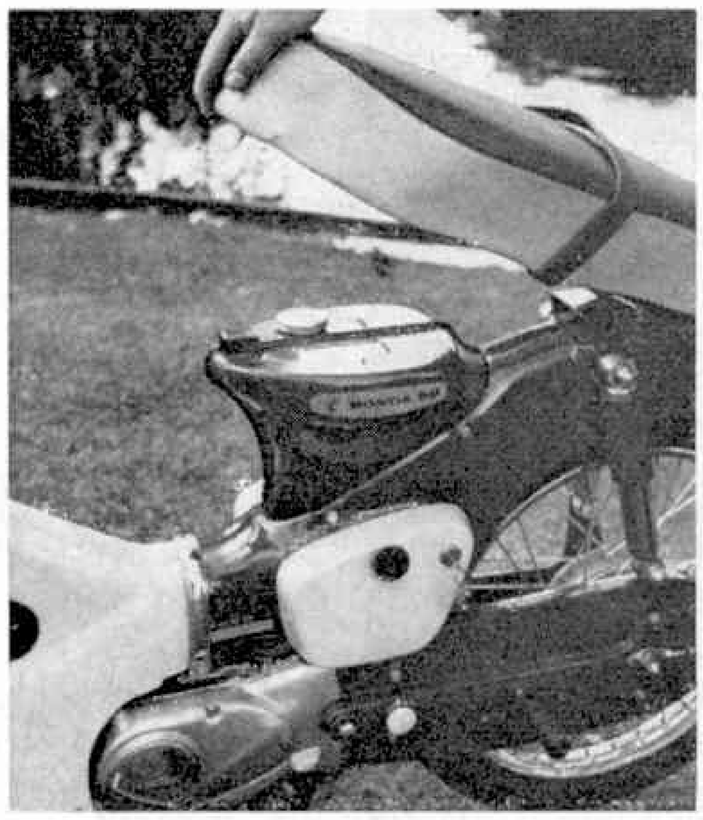
MOST popular of today's two-wheelers, and the latest type, is the small motorcycle, and of these the Honda C50 is probably the most well known. Our sample was brand new on arrival, with only 1 mile on the speedometer so we were naturally unable to try it out for speed or acceleration through the gears. One of the nicer points of the machine is the inclusion of direction indicators and wing mirrors, which are fitted as standard. The riding position is comfortable, all instruments and switches easily reached when required. This model is fitted with an automatic clutch which is very smooth in operation. Another nice feature is the inclusion of a low powered light in the headlamp for town riding at night. Main and dipped beam were good, both giving out a reasonable " spread ". Whilst on the subject of lights, a stop light is also included as standard fitting. With regard to switches, all are well placed, but the direction indicator switch is rather misleading. It operates up and down, we would have preferred a side to side, but our main criticism was in the way it operated. One would have expected to move the switch up for the left indicator, and down for the right, but on the machine the reverse is the case. It took some time to get used to, especially our riders who drive cars, but for a beginner, it should create no problems.

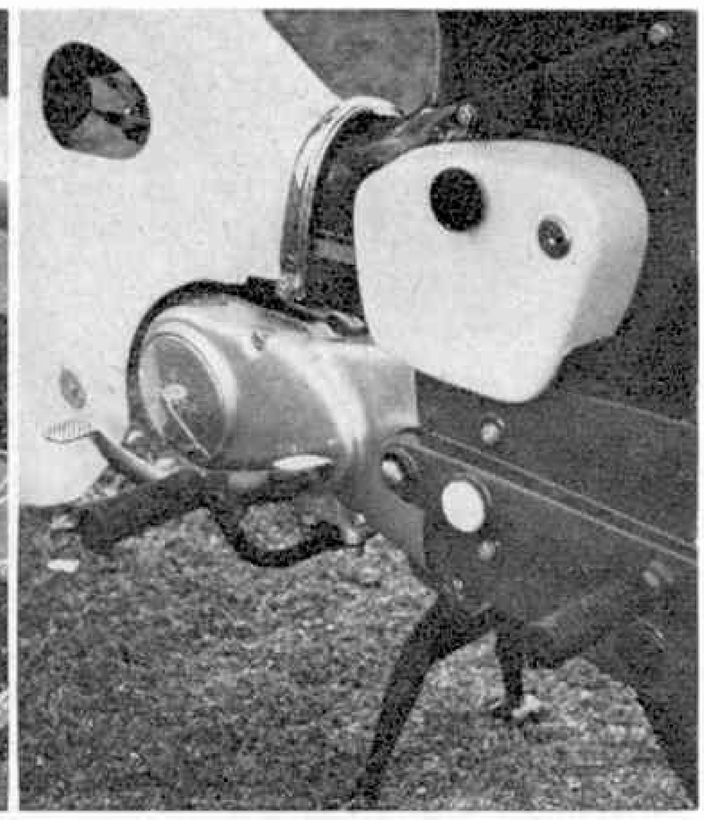
The Bodywork

The latest trend of using plastics in increasing quantity is very evident on the C50. Legshields, front mudguard, tool box and battery box are all formed in unbreakable resilient material of this type, all of which is well matched in colour to its metal counterparts.

The front mudguard, wide and deep, keeps the water thrown up by the wheels well clear of the rest of the machine, and being constructed of plastic will spring back to its original position in the event of a knock. The legshields are wide and high enough to protect the rider's knees in bad weather, and extend rearwards over the engine, completely covering it and effectively preventing oil from getting on the clothes.

The dual seat is wide but a little on the hard side, and lifting it provides access to the fuel tank. Two boxes, one either side of the rear panelling house on





Far right: The "heel-and-toe" gear-change is simple to use, although the necessity to press twice to change from 1st to 2nd gear was a point some riders did not care for.
Right: Lifting the dual seat gives access to the fuel tank.

the left, the toolkit, and on the right the battery and direction indicator relay.

The bodywork on our test model was finished in red and white, a pleasing combination.

The Engine

Power for the Honda C50 is 50 c.c. overhead crankshaft four stroke, remarkably quiet at low speeds, although as with all these small engines, it tended to become rather noisy and vibrated (felt mainly through the handlebars) at speeds in excess of 35 m.p.h. At idle the unit is very quiet indeed and response to throttle was good. The engine unit is mounted underneath the engine frame and hidden from view. Access to the sparking plug is gained by removing a small plug from the right side of the legshields.

The Gearbox

The gearbox unit is a 3-speed type operated by the left foot on a rocker type lever. First gear is obtained by pressing the rear arm down with the heel, and subsequent changes pressing the front arm down with the toe. Neutral is situated between 1st gear and 2nd which necessitates pressing the lever twice to change gear. We would have preferred neutral to be before 1st thus avoiding the need for two changes to move from one gear to another. The gearchange was easy to use and it was impossible to miss out a gear by errors on the rider's part.

Summary

The Honda C50 creates the impression of reliability and, apart from the indicator switch, good design. It is easy to master the controls after only a short time, and is reasonably comfortable. We would like to have seen a shock absorbing handlebar mounting, as part of the vibration is felt at the point, but our overall impression was favourable, and at £96 17s. 6d. including tax, it is competitively and reasonably priced.

Accessories

A wide range of accessories are available for this model, and include a windscreen, pannier bags and two types of luggage carrier.

Our thanks to Hummingbird Motorcycles of Watford for loan of our test machine

FOR THE TECHNICALLY MINDED

Cubic capacity	**49 ccs**
Maximum power	**4.8 bhp at 10,000 rpm**
Consumption (per gallon)	**120 miles**
Weight	**152 lbs**
Tyres	**2.25 × 17**
Lubrication	**Petrol mixture**
Common dimensions:	**Length 70.7 inches; Width 25 inches; Height 38 inches**
Available colours:	**Red/White, Grey/White, Green/White**

The Honda C50 is a very attractive machine as can be seen in this "lowdown" photograph.

HORSES ON STAMPS

by James A. Mackay

THE ARABS have a saying that paradise on earth is to be found in three places, and one of these is on the back of a horse. The Arabs certainly knew a thing or two about horses and centuries ago they bred the finest horses in the world. When Charles II married Catherine of Braganza in 1662 she brought three things as her dowry—the seaports of Bombay and Tangier and an Arab stallion. Bombay and Tangier have long since ceased to belong to Britain but most of the finest race-horses in Britain, the United States and much of Western Europe can trace their ancestry back to Catherine's horse. Perhaps the mares and foals painted by George Stubbs two centuries ago, and reproduced on a British stamp of 1967 were closely related to the Arab breed; Stubbs, who made a fortune painting Derby winners rather than backing them, certainly had an eye to fine horseflesh.

The Assyrians were the first people in recorded history to breed horses for racing purposes. A bas-relief showing a horse formed part of the Asarte Gate, one of the treasures of Babylon featured on an East German stamp of 1966. The Persians, in the century before the birth of Christ, invented the game of polo and the ancient version of this popular game was depicted on a Persian stamp of 1953.

The first country to show race-horses on stamps was Germany which featured a steeple-chaser on the top value of the Olympic Games series of 1936. Later the same year a 42 pfennigs stamp was released in honour of Germany's most famous event of the racing calendar, the Brown Ribbon. The stamp showed jockeys in what would today be termed a photo finish. This stamp was released in a miniature sheet sold at 1.50 marks, the premium going to the Hitler Culture Fund. This sheet was only sold at the post office attached to the Munchen-Riem race-course and a few other head offices. The following year the sheet was re-issued with a German eagle and ornamental overprint in red. A horsewoman (1938), a horse trainer (1939), a charioteer (1940), two mounted Amazons (1941), a trio of thoroughbreds (1942), a huntsman (1943) and a race-horse with foal (1944) were the subjects of the stamps issued for the Brown Ribbon in subsequent years. During the war other racing events were honoured with stamps. In 1940 a horse and jockey were shown on a stamp publicising the Hamburg Derby, a race held at the end of June each year for three-year-olds. The head of a race-horse and a horse and jockey were shown on the stamp sissued in 1941 and 1942 respectively. Two stamps were issued in both 1943 and 1944 to mark the Vienna Grand Prix and race-horses were shown in each case.

West Germany has not issued stamps in this theme since the end of the war, but in the post-war years Austria has continued this tradition with a number of attractive issues. In 1946 a set of five stamps marked the Austria Prize race and the following year a single stamp honoured the Vienna Grand Prix; both issues featured race-horses in various poses. In 1968 a 3.50 schilling stamp was released to celebrate the centenary of the Friedenau Gallop Races and two jockeys on their mounts were depicted.

Other countries which have featured race-horses on their stamps include Hungary and Poland. In 1965 Hungary issued a set of stamps honouring Olympic medallists and the 20 filler value showed the horse and rider which won for Hungary a gold medal in the Tokio Olympics. Horse-breeding was the subject of a long set of 1968, the 60 filler stamp showing grooms racing their horses. Poland issued eight stamps in 1967 to mark the 150th anniversary of horse-racing in that country. The subjects depicted included flat-racing, steeple-chasing, polo and horse-trotting. The highest values in the series showed two famous race-horses, " Ophir " and " Skowronek ".

Famous race-horses of the past and present have been portrayed on Commonwealth stamps. The stallion " Archer ", which won the Melbourne Cup in 1861, was shown on an Australian stamp released to mark the centenary of this race in 1961. Now New Zealand has released a 10c stamp showing its best-known race-horse, " Cardigan Bay ". This stamp was issued in January to mark the return of this horse to New Zealand after a successful five years in the United States. " Cardigan Bay " was the first standard bred light-harness horse in racing history to win a million dollars in stake money. After winning many races in Australia and New Zealand, he was purchased by an American syndicate in 1964. For the next few years he was the dominant figure in American horse-trotting—a feat which was all the more remarkable since his hip was badly injured in an accident in 1962, as a result of which he walks with a pronounced limp. A condition of the sale to the Americans was that " Cardigan Bay " was to be returned to New Zealand when his racing career had ended. Such is the esteem with which this horse is regarded in his home country that New Zealand is proud to issue this stamp. As New Zealanders are fond of telling me, " Cardigan Bay " always beat the Australian horses on their own ground.

BATTLE By Charles Grant

Part XXIII

Reconnaissance in force—Conclusion

ON MOVE 3, then, RED decided to winkle out the troublesome FOO in the ROUND WOOD, and to this end directed two of 'B' Coy.'s half-tracks in this direction, one directly along the road, the other off the road and towards the wood's eastern side. BLACK saw little point in chancing his arm by bringing his vehicles unnecessarily into the range of the BLACK tanks at BRIDGE FARM. 'A' Coy.'s second and third half-tracks advanced to join the first which had preceded them towards the COPSE. It seemed that this company's task—when support had arrived—was to be an advance directly against BRIDGE FARM. The said support was the troop of T.34's, which now rumbled onto the table at 'y', and swung westwards behind LONG FARM. 'C' Coy. continued up East Road and was now in sight of the northeastern group of buildings—so far nothing could be discerned in this quarter. A final important move—RED's F.O.O. followed up 'B' Coy., RED deciding that the sooner his own guns were in action, the better.

As RED expected, the firing on Move 3 included BLACK's field artillery—and to this individual's joy, he finally threw a '6' and scored his ranging shot. Promptly the perspex burst pattern was placed on two half-tracks at LONG FARM, one being in the centre section (5 or 6 to hit) and one in the section requiring a '4'. He threw a '3'! (Muttered threats to demote and disgrace his artillery commander were heard at this point.) However, he was not finished, and he decided to have a crack at one of RED's half-tracks, the one on the road south of ROUND WOOD. This was to be done by the tank stationed in BRIDGE FARM. Range being in the 30 in. to 45 in. bracket, a '9' was required to register a hit (with two dice of course) and he threw a magnificent 11! To destroy the half-track, with a Defence Value of 11 and with the Mark IV's Strike Value of 4 at this particular distance, he had to throw a minimum of eight, not by any means impossible, to make the 'killing' total of 12. What he got, in fact, was a miserable 3! Luck, so far, had been conspicuously absent from BLACK, not that RED was perturbed about this, being anxious to get on with Move 4.

On this move BLACK showed considerably more activity than previously. The tank on the road moved quickly southwards, nearly reaching the junction south of BRIDGE FARM, more infantry moved into sight from the farm buildings to line the stone walls, and, at ROUND WOOD, two heavy machine guns, previously concealed in the trees, moved forward to take up a position on the fringe of the wood. Having moved, of course, they could not fire on this move. For his part, RED 'debussed' 'B' Coy. from their half-tracks —wisely enough on the side further from the enemy— and, thinking to make use of the mortar in the third half-track, brought this one forward to join the others. 'A' Coy. vehicles drew together behind the COPSE, not liking the look of the approaching Mark IV. RED's T.34's moved northwest towards the COPSE, the move bringing them into extreme range of the Mark IV on the road. Away to the east, 'C' Coy. was now approaching the buildings in the northeast. There was still no reaction in this quarter.

Firing for the move was now carried out. BLACK decided to switch his artillery fire to RED's 'B' Coy. vehicles south of ROUND WOOD, but he failed with the ranging shot, scoring only 4. (As he had changed target from the previous moves, this second ranging shot was obligatory). He was also unsuccessful in an attempt to hit one of the same half-tracks with the tank at BRIDGE FARM. An exchange of fire between the other Mark IV—on the road—and the two T.34's, which were in echelon to the right caused no damage to either side. BLACK registered a hit, but his effect throw was insufficient, while RED failed to hit at all.

The astute reader and student of the military art will doubtless have seen the change of names between the first and second maps for Reconnaissance in Force. This was due to interrogation of local peasantry which corrected faulty intelligence initially supplied to RED by his commanding general.

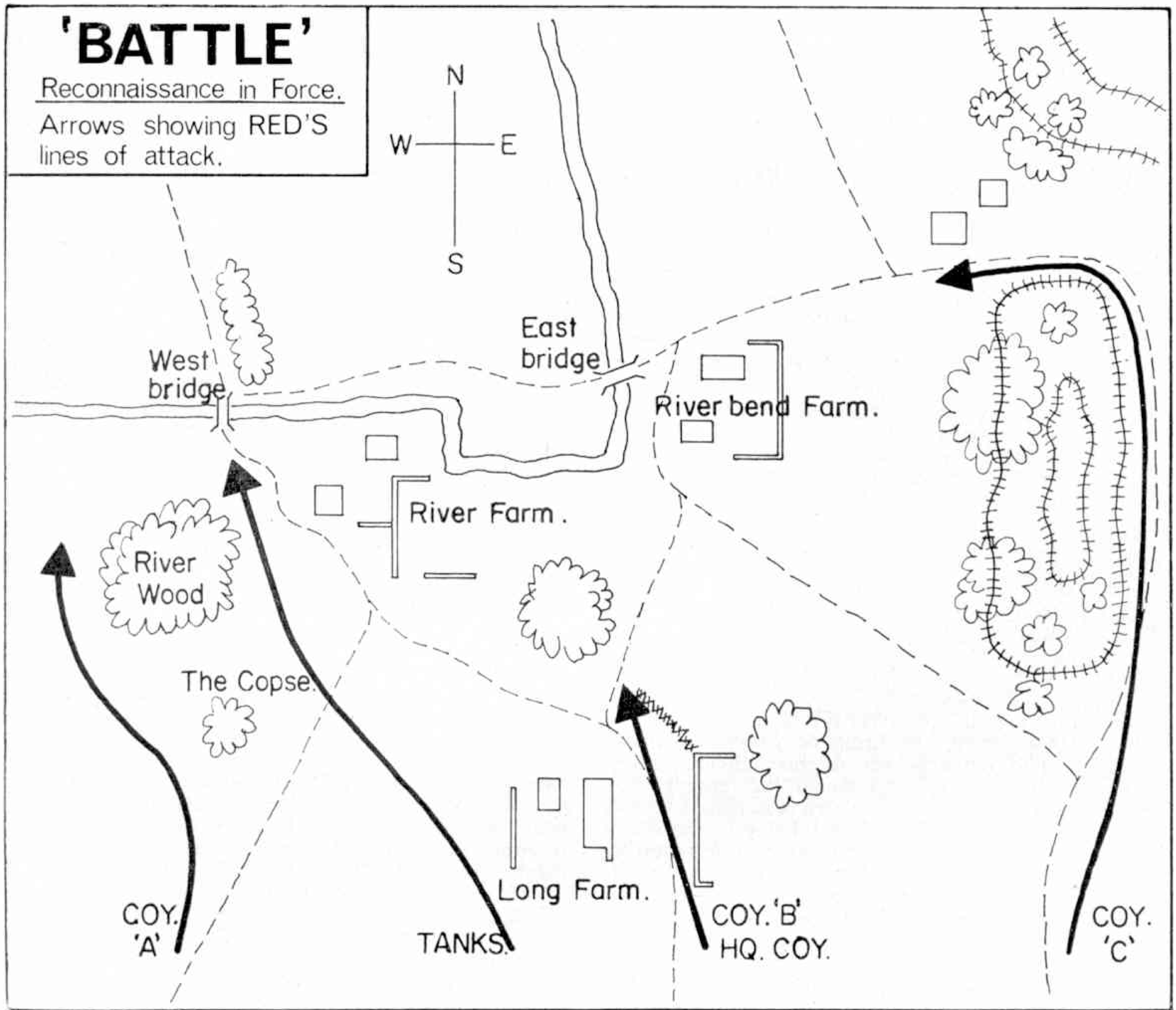
Deciding to make sure that the COPSE was not concealing any lurking enemy, RED 'debussed' one of the infantry sections of 'A' Coy. with the intention of clearing the said COPSE, and at the same time he moved his 'B' Coy. men forward—in open order, needless to say, towards ROUND WOOD. The half-tracks of Coy. 'C' carried out another road move of 15 in., while RED also brought forward the F.O.O. of his Headquarters Company, having in mind that it might be necessary to employ the Mortar Section against ROUND WOOD, and simultaneously two of the section's mortars were brought into firing position in the walled enclosures to the right of LONG FARM. The T.34's moved a further 8 in. in a northwesterly direction, but BLACK's tanks remained stationary.

The RED advance in the northeast, however, caused BLACK to expose a 50 mm. A/T gun at RIVER BEND FARM, and some infantry could also be seen thereabouts.

As might have been expected the tank duel continued when firing took place on this move, but although both RED tanks scored hits on the nearest Mark IV, neither of the ' effect throws ' was sufficient. One did get a total of 15, but as this was on the front of the Mark IV, it merely equalled the Defence Value, but did not exceed it. At the range, though, the reply of the Mark IV was also not enough, the score of 7 not constituting a ' hit '. Still, the other BLACK tank—the one in the farm buildings—did have a successful ' shoot '. Firing at one of RED's half-tracks south of ROUND WOOD, it got a hit, then, with a splendid score of eleven, well and truly destroyed the target vehicle. No personnel were involved, however, all having previously left the half-track to take part in the infantry advance against ROUND WOOD. BLACK's 50 mm. gun at RIVER BEND FARM also opened up on the approaching half-tracks but its first round did not register a hit. Things were hotting up at ROUND WOOD, where BLACK's machine guns accounted for two RED infantrymen, but they—the machine guns—were in turn put out of action by RED riflemen (RED threw two 6's in succession!). BLACK's ill-luck continued, when his F.O.O., throwing for a ranging shot on the RED infantry, made only a 1 (This throw was necessary because of a target change).

This ending the firing, the players now carried on with Move 6. BLACK now brought his advanced tank back towards RIVER WOOD, and from the depths of ROUND WOOD, brought out masses of infantry to line its edges (He was evidently determined to hold this position, considering it a key one). Other infantry, well equipped with bazookas, machine guns and a mortar, came into view at RIVER BEND FARM. RED's tanks continued their steady advance, their 8 in. move bringing them up to a point level with the south side of the COPSE (and on its east side, of course). In the centre RED's Coy. ' A ' advanced towards ROUND WOOD, and to the northeast, the half-tracks of Coy. ' C ' spread out somewhat, apparently preparatory to the infantry's ' debussing '.

Now for the firing; BLACK's guns now came into their own, his F.O.O. finally throwing a successful ' ranging shot '—a 6—on the RED infantry moving towards ROUND WOOD, and the resulting ' effect throws ' disposed of an officer and one rifleman. To



the west, RED infantry advancing into the COPSE found no enemy therein, while to their east, the armoured battle went on, both Mark IV's slugging it out with the T.34's. One of the BLACK tanks did score a hit, but failed with the 'effect throw'—the other missed completely. The right-hand T.34 similarly failed, but—to RED's unfeigned glee—the other first scored a hit, then throwing a total of 9 for effect, destroyed one of the Mark IV's (total being 9 plus Strike Value of 8, giving 17—more than enough). All was not to RED's liking, however, no less than ten of BLACK'S riflemen lining the southern fringe of ROUND WOOD, and they brought a devastating fire against the RED infantry advancing in the open, accounting for no less than seven of them. With BLACK in 'soft cover', RED's reply was only a moderate one, only three of the BLACK riflemen being removed as casualties. This proceeding really rocked 'B' Coy., as it had already lost an officer and another rifleman. The company mortar was now in action, but its first ranging shot—3—was not good enough. To the northeast, BLACK's A/T gun failed to hit one of the enemy half-tracks, and the move was over.

On Move 7, while one of their infantry sections continued its advance through the COPSE, the two others belonging to RED's Coy 'A'—in their half-tracks, of course—moved round the west side of the COPSE, doubtless heading ultimately for RIVER WOOD. On the east side of the COPSE, the T.34's continued their forward progress, and were now past that small patch of trees. In the centre, however, RED pulled back his somewhat shattered 'B' Coy. towards the shelter of their two remaining vehicles. The dispersal of 'C' Coy.'s half-tracks continued, one moving south to the edge of the wooded hill, the other swinging northwards to outflank RIVER BEND FARM. RED's mortar section F.O.O. was now up with 'B' Coy., ready to bring much needed support to this unit by laying fire down on ROUND WOOD.

Firing for this move now proceeded, beginning with BLACK's F.O.O., who again failed to get the range of the RED infantry retreating from the attack on ROUND WOOD. A BLACK mortar in RIVER FARM opened up on the RED infantry just emerging from the north edge of the COPSE, but its first shot was a failure—BLACK threw a 2 only. A heavy machine gun also fired from the farm but at long range its fire was ineffective. With two tanks to his adversary's one, the advantage in the tank fight was now squarely with RED, but this availed him nothing on this move, neither of his T.34's scoring a hit. The solitary Mark IV's shot did register, but the succeeding effect throw was not good enough. The A/T gun at RIVER BEND FARM did make up for this, however, hitting and destroying one of the Coy. 'C' half-tracks. Not only that, but when dice were thrown to decide the fate of the men inside, it was seen that no less than a rifleman, the N.C.O., a sub-machine gunner and the bazooka team had all bitten the dust! This was a pretty severe blow. RED's support section mortars—the two in position—now fired, the F.O.O. getting the range, but the bombs both fell in area '3', just in front of the target, and as this was empty, no casualties were therefore inflicted. However, the F.O.O. *had* established the range.

On we go with Move 8, RED's two Coy. 'A' half-tracks continuing round the west side of RIVER WOOD, the third picking up its personnel on the north side of the COPSE. The T.34's advanced once more, and they had now pretty well reached the road junction south of RIVER FARM. Coy. 'B', however, seemed to have had enough, for the moment at least, and stayed where they were. Coy. 'C'—or the two remaining half-tracks—remained stationary as well, apparently awaiting events. BLACK, for his part, made no move, but a panzerfaust team made its appearance from RIVER WOOD and two more emerged from RIVER FARM to threaten the nearest of the RED tanks.

Beginning his firing, then, BLACK failed with his artillery ranging shot, and his Mark IV was also very unlucky, the throw just falling short of what was needed to write-off one of the T.34's. These, however, made no such error, and the second of BLACK's tanks went up in smoke—and the end of his armour. The two panzerfaust teams from RIVER FARM did no better, neither being able to score a hit—really bad luck, this, and no mistake—but the one from RIVER WOOD rather redeemed this, first scoring a hit on RED's leading half-track (of Coy. 'A', of course), and then polishing it off with a total throw (including strike value) of 14. Not only this, but of the troops inside, a rifleman, two sub-machine gunners, the bazooka team and the officer were wiped out. From the RED point of view, the two mortars of the support section, already having the range, both fired, accounting for two of BLACK's riflemen in ROUND WOOD. BLACK's 50 mm. A/T gun had another go at one of the 'C' Coy. half-tracks, but failed to secure a hit, and the Move was thus at an end.

At this point, with the aim of preventing any onset of tedium, we shall no longer deal with the engagement move by move and in the detail we have given so far—repetition does nothing to stimulate interest—but we shall continue with the narrative of what happened in a much more general way, since we have already shown, it is hoped, just how we carry out a large-scale operation involving all arms, and doubtless the tactically minded reader—placing himself in RED's shoes—will have already decided on what he should do to exploit the position as it stands at the end of the eighth game move. So far, then, the honours have fluctuated fairly evenly—as far as the infantry fighting is concerned—between the two sides, each having lost a fair proportion of their men, but the key to the situation is obviously the RED armour now poised to strike northwards towards WEST BRIDGE as possibly beyond. The full weight of RED's mortar section and field guns have yet to be brought to bear on BLACK, and his troops in ROUND WOOD particularly must be getting a trifle nervous and beginning to look back over their shoulders, nor can it be expected that the solitary A/T gun at RIVER BEND FARM can hold up Coy. 'C' for very long. It might be said, therefore, that a withdrawal of BLACK's advanced elements south of the river would be in order.

In the event, this was precisely what BLACK decided would be the most sensible thing to do, but alas, RED had other plans. In brief, he brought down a storm of fire, from his mortars and from his field guns, on ROUND WOOD as BLACK's men there were beginning their retrograde move. Not a few casualties were inflicted, but—most important—one was BLACK's F.O.O.,—a loss which effectively terminated his artillery fire. At the same time the tanks roared northwards and over WEST BRIDGE, well and truly cutting off of the BLACK units south of the river. The A/T gun and the infantry at RIVER BEND FARM did pull out—in rather indecent haste—and made a precipitate retreat to the north, leaving RED a total victory and undisputed possession of the battlefield.

HAVE YOU SEEN ?

Spacenik

This toy, aimed at younger boys is an intriguing model Spaceship which travels on its own special track; anywhere ! The Spacenik can travel along level track, climb vertically and even travel upside down !

The secret lies in a powerful electric motor (battery powered) ' cogwheel ' driving wheels which mesh with toothed rails running along inside each section of track. The rails have turned-in edges which enable the Spacenik to travel upside-down without falling off.

The track sections clip together easily and allow a wide variety of designs to be constructed. At each end of the track are turntables, cleverly operated by the spaceship when it reaches them.

There are at present two sets in the range costing 79s. 11d. and £6 19s. 6d. The latter contains two spacecraft, and a turntable and will be featured in next month's issue.

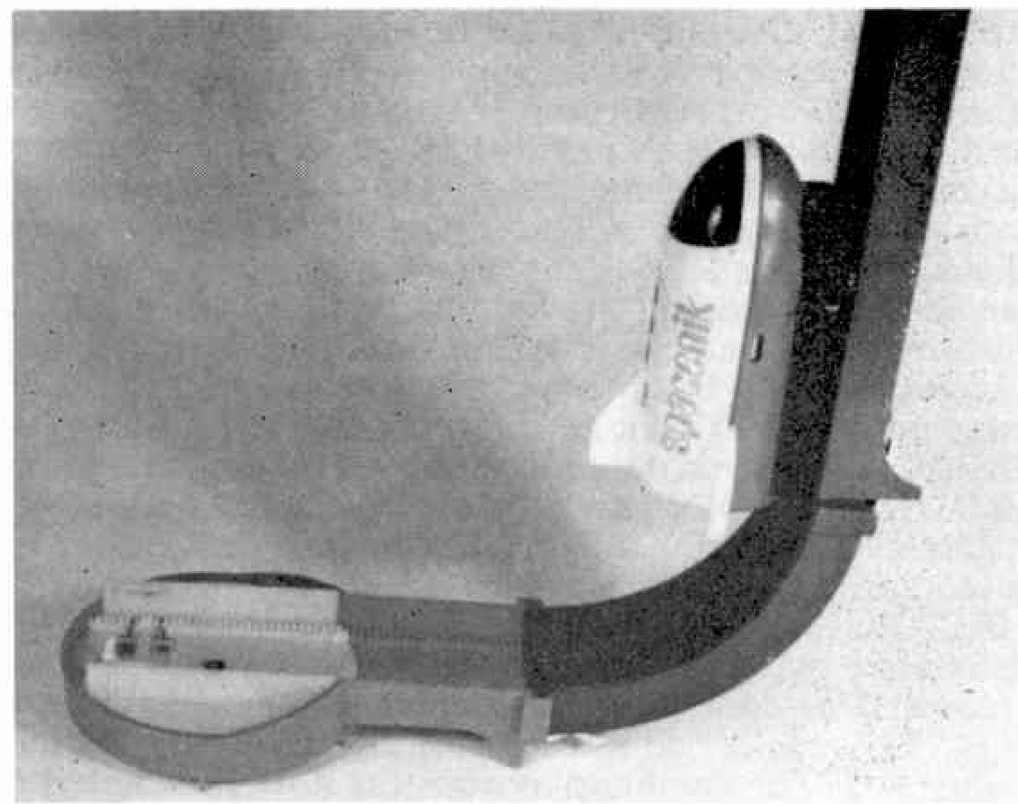
Manufacturer: Rovex Industries.

Rommel's Rod

Released at the same time as " Dragon Wagon " (reviewed last month) is yet another " Instant Fun Car " from Monogram. This particular one, entitled Rommels Rod is based on the popular World War II Mercedes Half-Truck Desert Car.

The vehicle itself has very little " Weird " parts to it and builds up in the usual straightforward Monogram manner into a very attractive vehicle, complete with the necessary German decals, which finish it off well. Perhaps the only outward sign that " Rommels Rod " is not all it appears to be is the helmeted skull that forms the radiator filler cap !

The crew of the car are however definitely way-out and consist of a driver and officer, the former with the



familiar German helmet and the latter with an officer's cap complete with goggles. They are, as can be clearly seen in the accompanying photograph without uniforms or skin ! They are in fact a pair of well detailed little skeletons ! The officer clutches a pair of binoculars and sports a good pair of boots, but the driver (poor chap !) only has the latter.

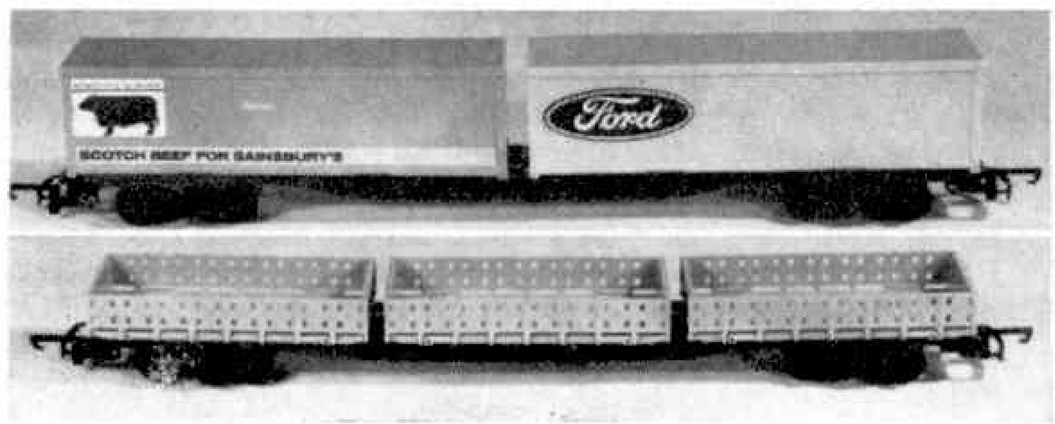
Monogram have the knack of making their simple-type kits of 50 parts or so look on completion like many built from upwards of double that number. This good design, complete with well fitting parts and detailed instructions make the series good value at approximately 30s.

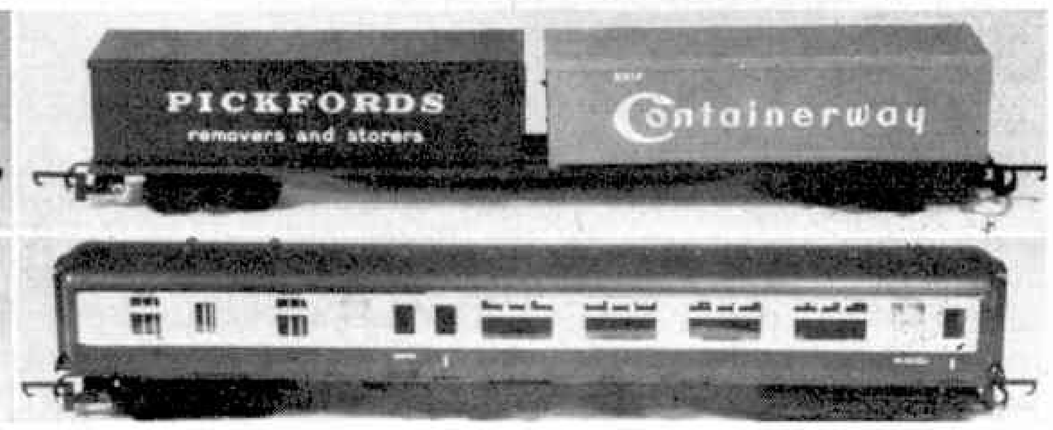
Manufacturers: Monogram.

Freightliner Containers

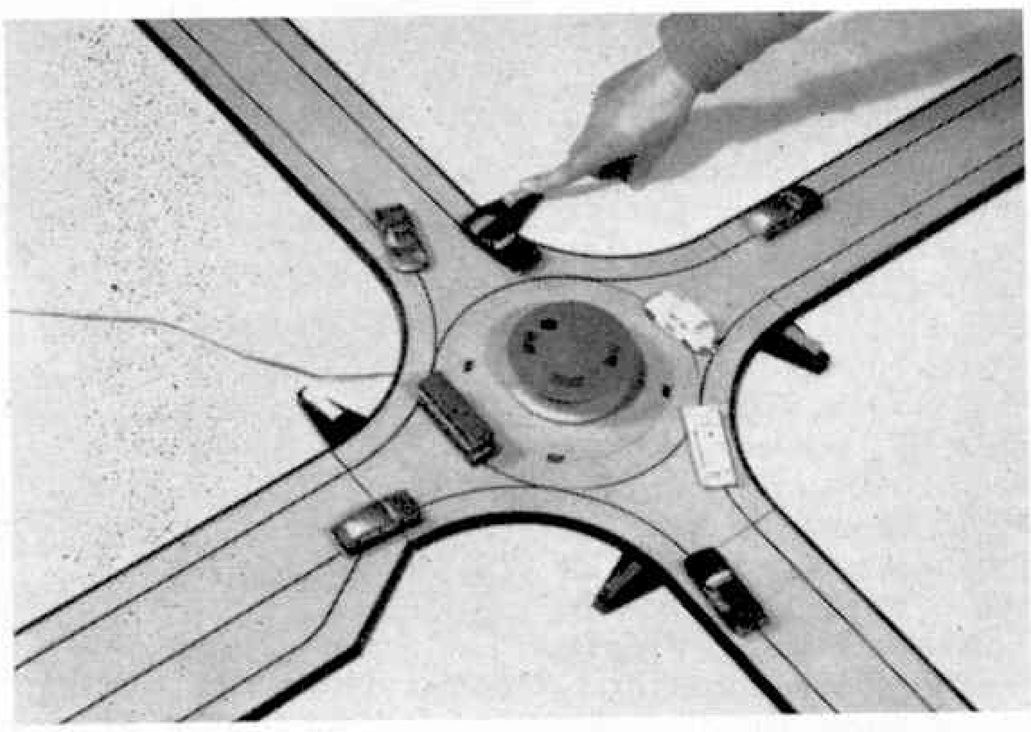
Tri-ang are adding some colourful new containers to their Freightliner range early in 1970. They are sure to be welcomed by enthusiasts who like to keep their layouts bang up to date, and they certainly do add brightness to the otherwise rather drab B.R. scene. Illustrated are: R634—Containerway and Pickfords (Containerway in red and white livery, Pickfords in grey and white). R719—Sainsbury's and Ford (yellow and grey, blue and grey respectively). R632—three 20 ft. open Freightliner containers (grey with red ends).

Also new are the British Rail Mk. II bogie coaches, of which we illustrate the Brake Second. The prototypes for these coaches are used on the London Midland Region 100 m.p.h. services from Euston to Liverpool and Manchester. Modellers with an eye for " period " should not use them with steam outline models. The models are well up to Tri-ang's very high standards, and are correct in all main dimensions. The bogies are of the new B4 type, and the side frames of these are really beautifully moulded. You can even read the letters " SKF " on the axlebox covers. The new blue and grey livery is well represented, but we think





that the bogies and underframe details should have been moulded in *brown* plastic instead of black, to be really accurate, a very minor point on otherwise excellent models.
Manufacturers: Tri-ang/Hornby Ltd.



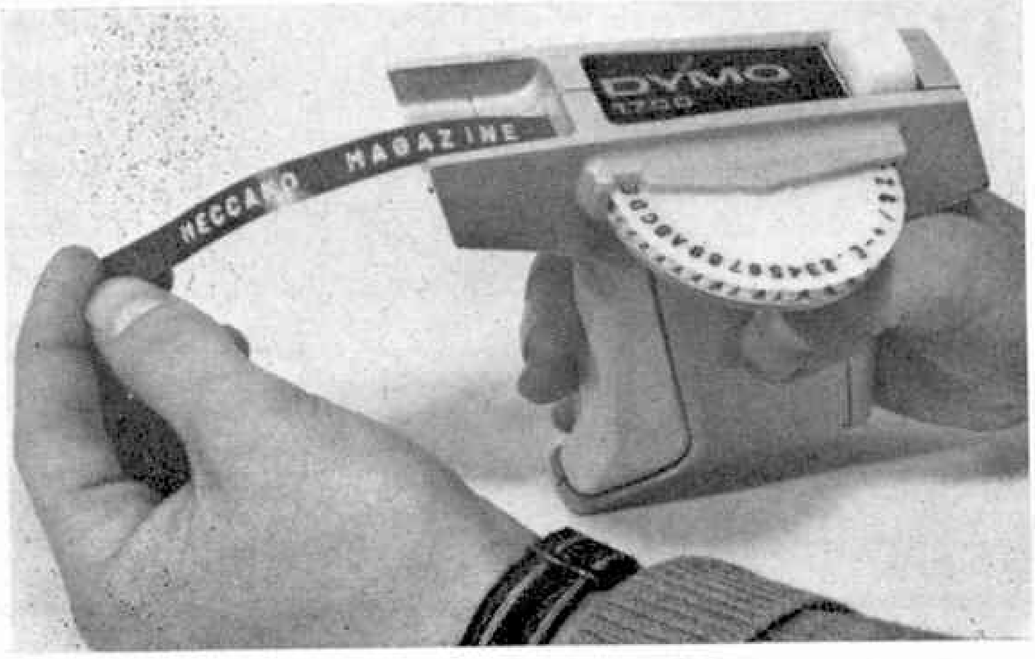
Switch-a-Track

When Lesney Products devised a way of motorising their small "MATCHBOX" cars, we were certain that different types of Motorised Motorways would shortly be appearing in the shops, and recently released is the new Switch-a-track, the third type of Motorway to arrive.

Packed with thrills and excitement, the main feature of the Motorway is the roundabout in the centre of the figure of eight layout, for it is here that the players gain control of the cars. By pressing a button the players can decide when a car can enter or leave the roundabout, and believe us it takes a great deal of skill to avoid crashes.

The track, consisting of eleven parts, slots together easily and quickly. In fact the whole thing, including connecting up the track, fitting in the 3 springs and then wiring it, takes only about 5 minutes (allowing for mishaps) to set up. On the island in the roundabout is a small button which switches the motor on and off, and also regulates the speed. The maximum speed is very fast indeed, making it difficult to control the cars with any accuracy, so it is best to have it on half-speed, which is still fast enough to cause chaos very easily.

The Motorway comes complete with 4 cars and 20 "conversion kits" to convert your other "MATCHBOX" cars into motorised vehicles. Costing a reasonable £5 19s. 6d. the "MATCHBOX" Switch-a-track Motorway will keep youngsters happy for hours.
Manufacturer: Lesney Products Ltd.

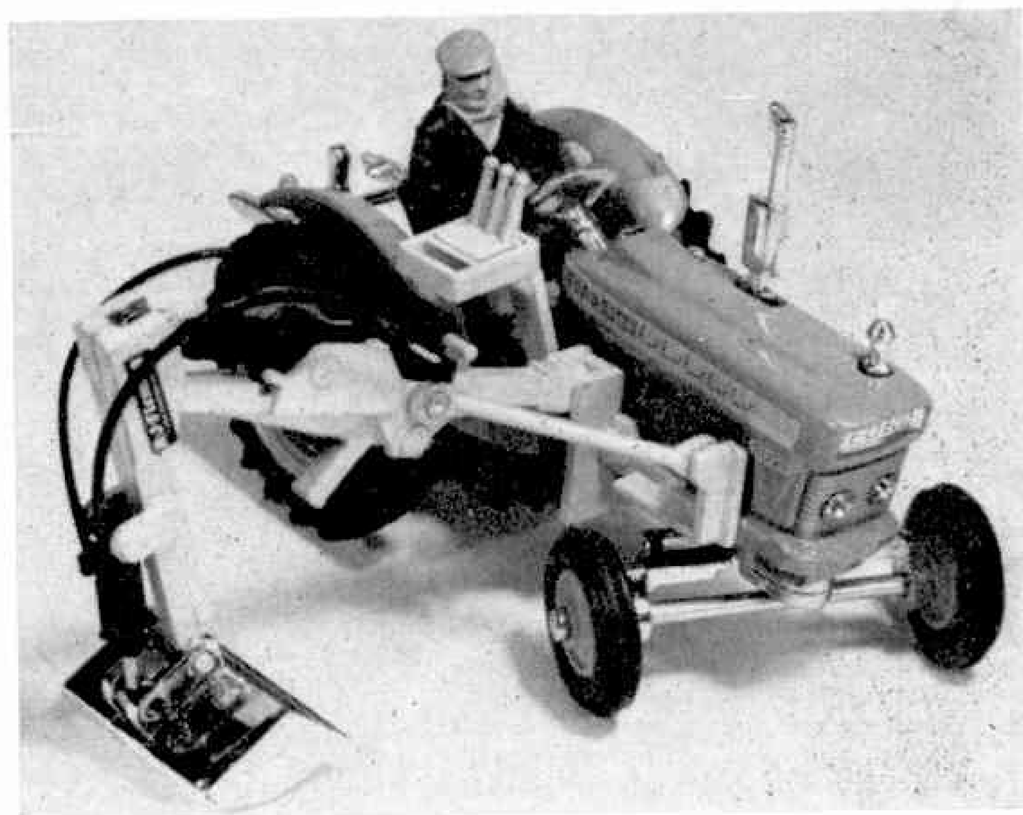


Labeller

Ideal wherever any sort of identification tag is needed, the Dymo 1700 label maker is simple and quick to use, and the self-adhesive labels stick to practically any smooth dry surface.

To use, first slip a label cartridge into the back of the handle, and thread some of the tape through the top. Select the letter that your require and then squeeze the trigger as far as it will go to print the letter. The tape moves on automatically after the letter has been printed, but if you want a space, as between words, squeeze the trigger until it clicks. When you have finished the label move it on a few spaces and then press the white button on the top. This cleanly cuts the tape and also scores it about an ⅛th inch in, so making it easy to peel the tape away from the backing.

The Dymo is very robustly built of thick plastic and will last for a very long time. At 49s. 6d. we think it is rather expensive, but is an extremely useful device that should last for many years.
Manufacturer: Dymo Ltd.



Tractor Operated Ditcher

Corgi's latest addition to their range of agricultural vehicles in this fine ditch clearer mounted on a Ford 5000 Super Major Tractor.

The ditcher, painted bright yellow, is an hydraulically powered boom and jib unit incorporating an articulated scoop. All the movements of the ditcher can be performed on the Corgi model, manually of course, although Corgi have included a dummy control panel for the appliance.

The tractor is well finished in Ford Blue with chromed exhaust stack and grey mudguards. The driver, well protected against the weather by boots, thick trousers, a jacket scraf and cap, sits behind the steering wheel, that when turned actually steers the front wheels.

There is another device, situated behind the driver's seat that looks very much like an arrester hook and coupling for a trailer, but as Corgi give no information as to what it is, we wouldn't like to commit ourselves by saying that the above mentioned is what it is for. The model is very attractive and well up to the normal high standard of Corgi, although rather expensive at 13s. 6d., it should not be ignored by collectors, young or old.
Manufacturer: Mettoy Playcraft Ltd.

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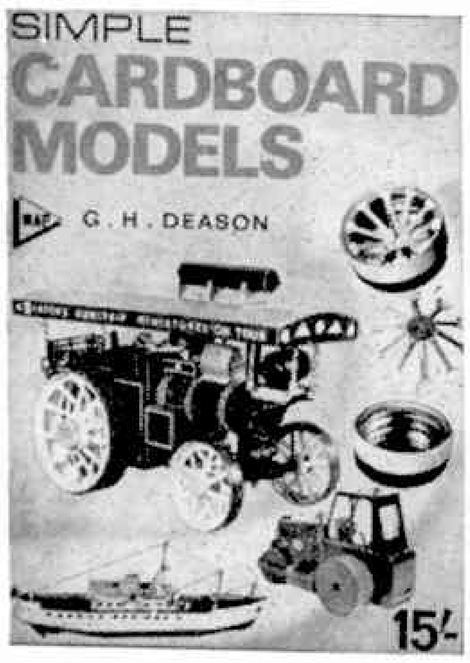

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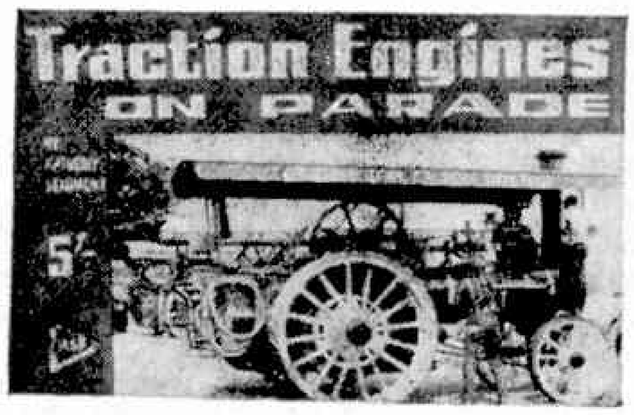

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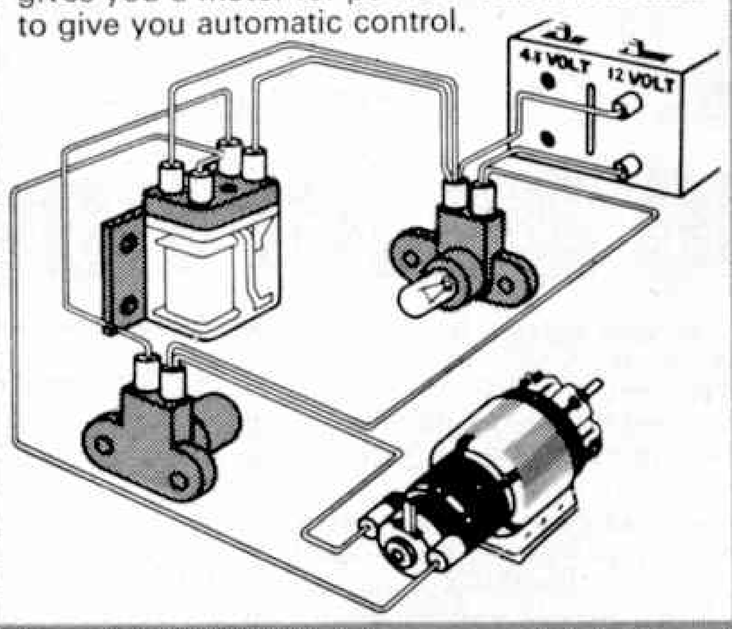

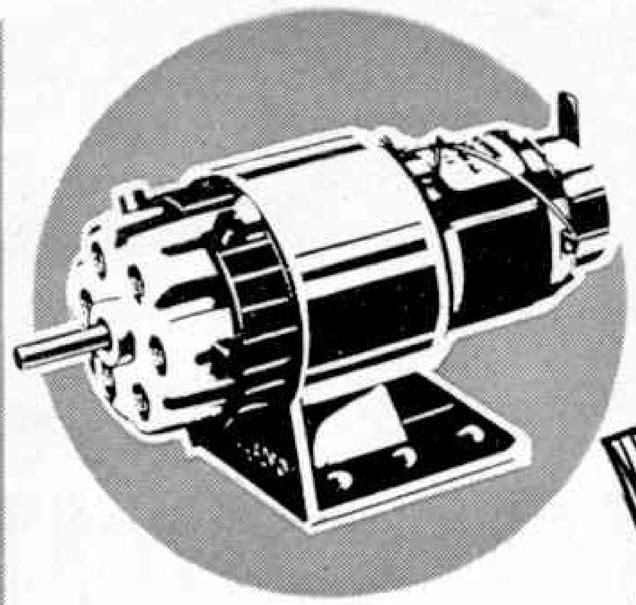

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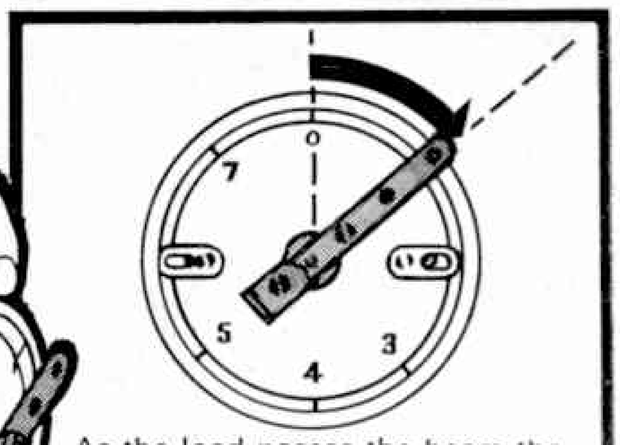
As the load is carried along the conveyor belt it interrupts the beam of light between the bulb and the electronic eye.



As the load passes the beam the counter moves on one unit automatically. The load is then carried along on the conveyor, the beam of light is restored and the counter mechanism is set to record the next load.

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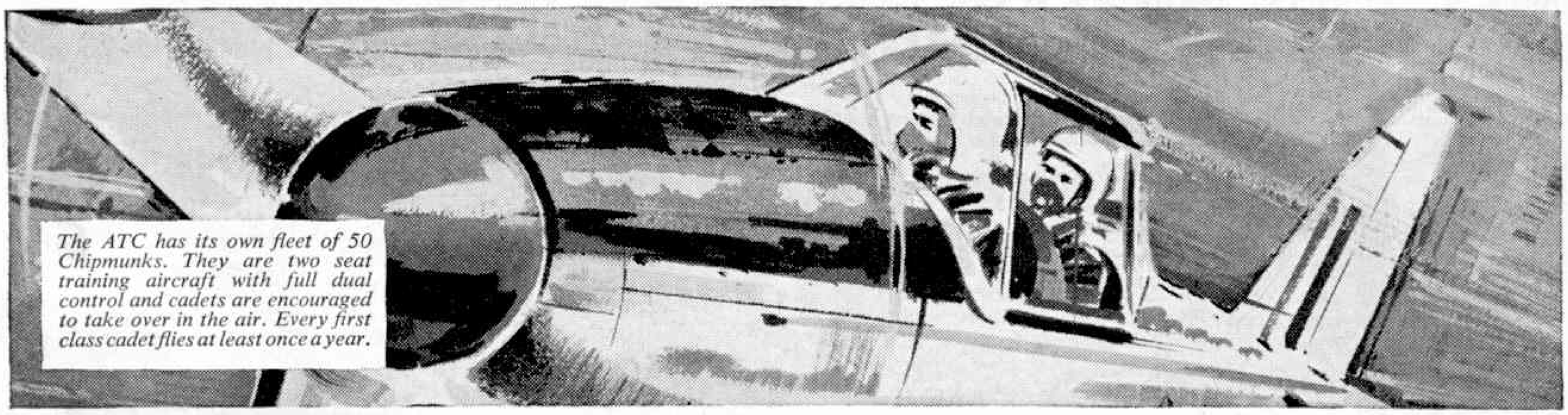

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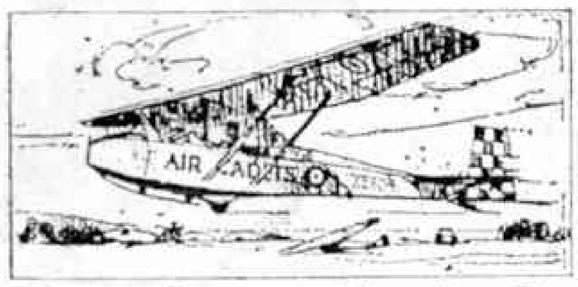

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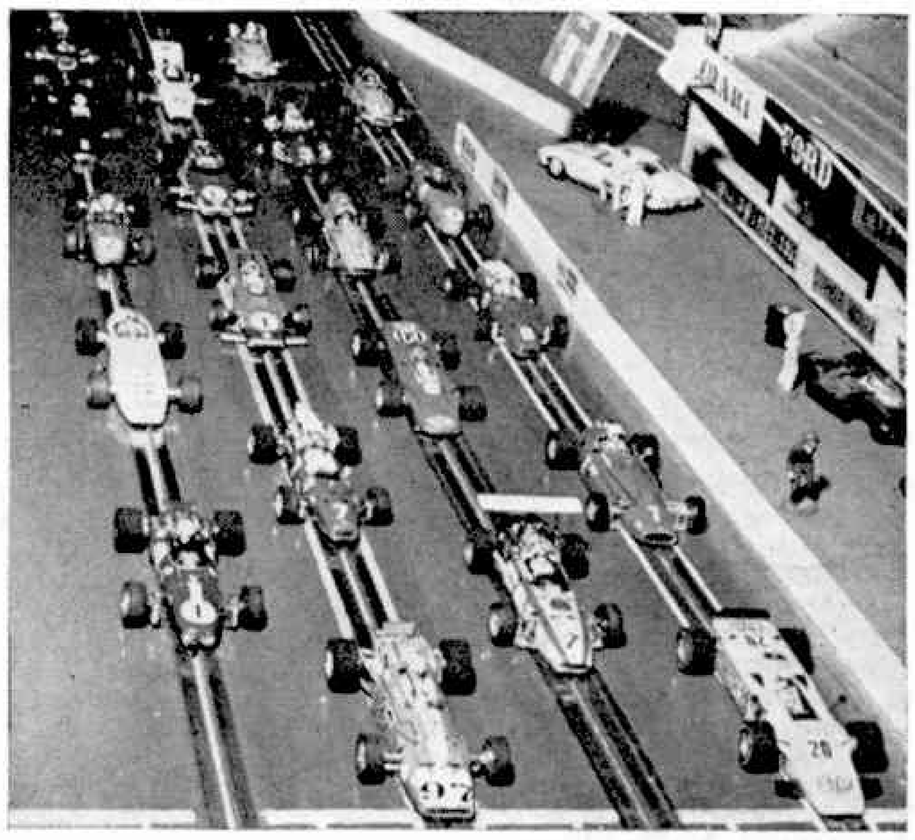

This month's plans will be for the Alfa Romeo type 158/159 in Super Plan form by Roger Taylor and John Wood; this, the most successful Grand Prix car in history, should be popular with scale fans and builders. Close-up returns and this month Formula 5000 receives John Wood's attention while David Windsor is back in his usual centre spread spot with plenty of action photos.

A bonus for collectors will be exciting material on chopping and modifying and this, added to the regular quota of Autominology with Reg Miles and Collectors' Corner with Cecil Gibson should provide plenty of interest; plenty more construction features for slot racers will be included and, a supplement to this issue and free with every copy of it is the 1970 E.C.R.A. Handbook.

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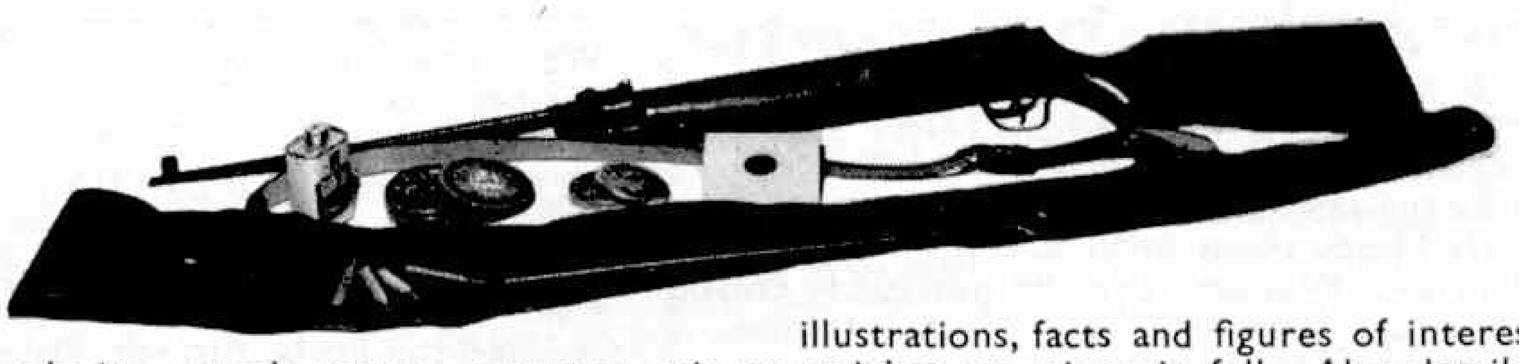

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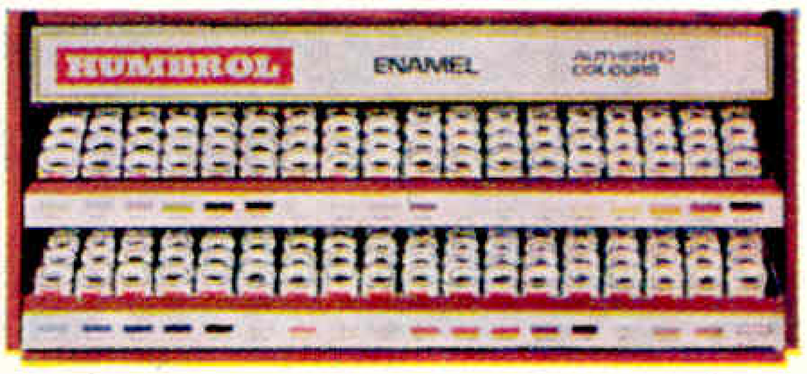

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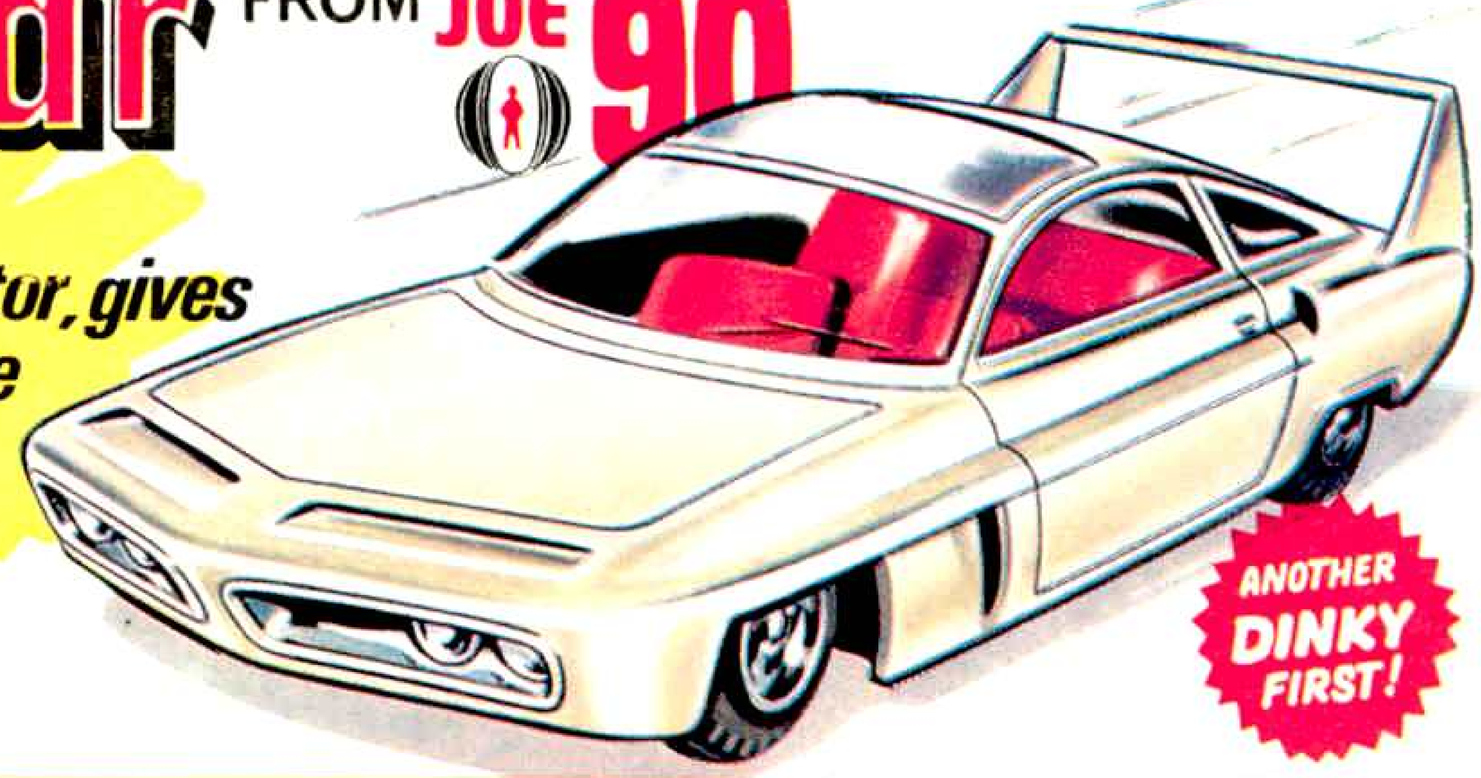

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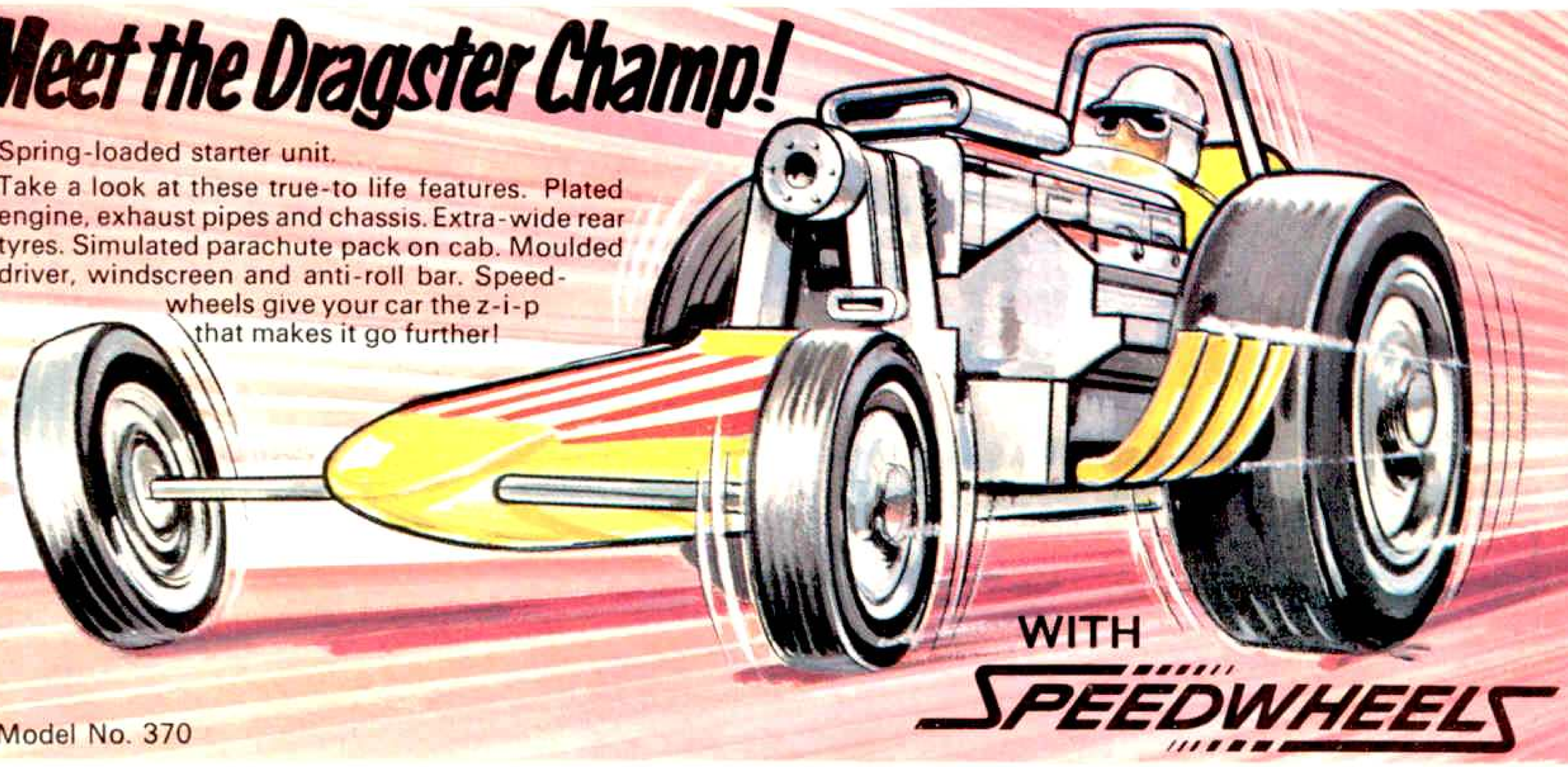

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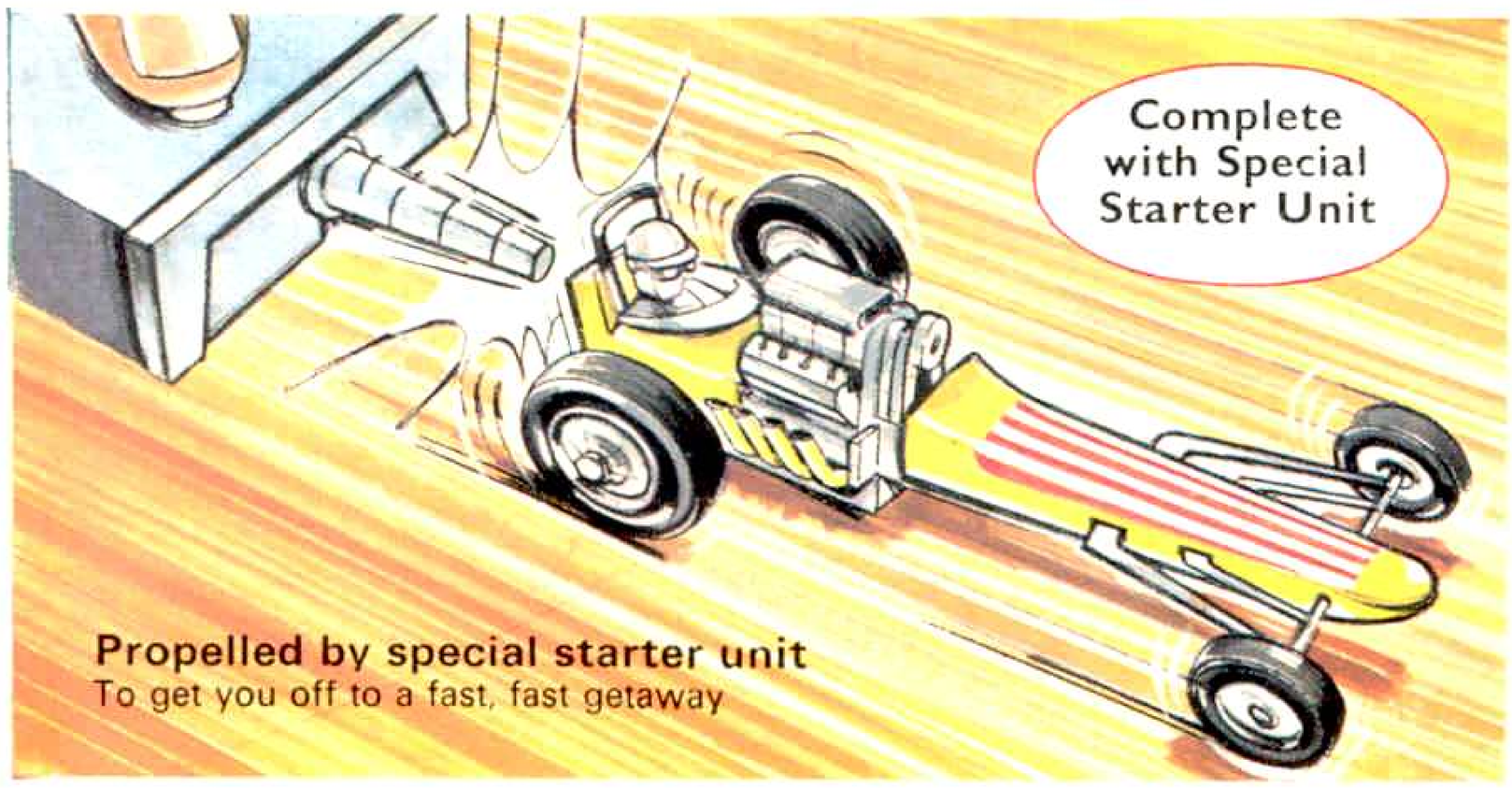

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