# MECCANO® Magazine

JUNE 1971

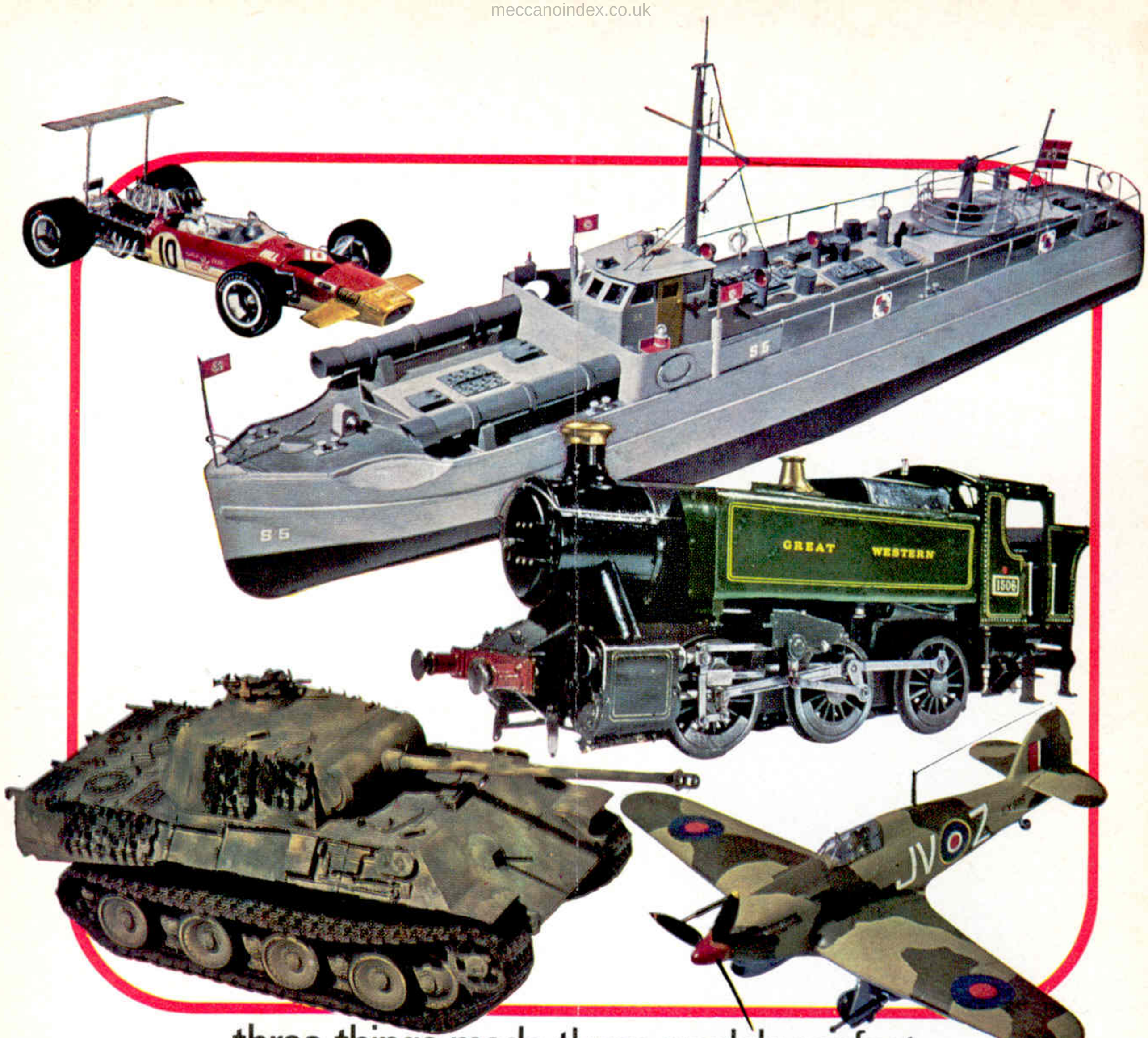
15p
(THREE SHILLINGS)

U.S.A. & CANADA
SEVENTY-FIVE CENTS

★ FULL-SIZE PLANS FOR A MODEL SAND-YACHT INSIDE ★

MAP HOBBY MAGAZINE

THE PRACTICAL BOY'S LEISURE TIME MAGAZINE




three things made these models perfect

# Skill, patience & Humbrol


**You've got to work at the first two but you can buy the third at any good modelling shop.** Your models deserve the best and you'll certainly get the best from Humbrol. Ask for these products by name—enamels (matt or gloss) for brushing or spraying; modelling adhesives of every kind; craft knives, dopes, thinners, brush cleaners, fuel proofers, authentic colours, metallics and poster colours. **Remember—Humbrol helps you make better models!**

**HUMBROL**

HUMBROL · HULL · YORKSHIRE

# MECCANO® Magazine

JUNE 1971 VOLUME 56 NUMBER 6

Meccano Magazine, founded 1916.

Editorial Director
**D. J. LAIDLAW-DICKSON**

Managing Editor
**V. E. SMEED**

Consulting Editor for MECCANO-Tri-ang LTD.
**J. D. McHARD**

Advertising Manager
**ROLAND SUTTON**

MAP HOBBY MAGAZINE

ABC


### FRONT COVER

Sand-yachts at Dunbar. The Scottish Championships are being held here on June 26-27. In yacht at left is Richard Smeed, whose scale model appears on page 284. (*Photo: W. A. Smeed.*)

### NEXT MONTH

Full-size plans for a super 24 in. glider for catapult or towline operation will appear next month. Also hydroponics—how to grow plants without soil, with experiments you can make yourself. The usual wide selection of interesting articles and Meccano projects will be there, plus a report on the first British meeting of the new and exciting radio control model car racing.


Advertisements and Subscription Offices: Model & Allied Publications Ltd., 13-35 Bridge Street, Hemel Hempstead, Hertfordshire. Tel.: Hemel Hempstead 2501-2-3.

Second class postage rates paid at New York, N.Y. Registered at the G.P.O. for transmission by Canadian Post. American enquiries regarding news stand sales should be sent to MECCANO MAGAZINE, Eastern News Distributors Inc., 155 West 15th Street, New York, N.Y. 10011, U.S.A. U.S.A. and Canada direct subscription rates $6 including index.





**Publishers of Aeromodeller, Model Boats, Model Cars, Model Engineer, Radio Control Models, Model Railway News, Scale Models, Woodworker, Military Modelling.**

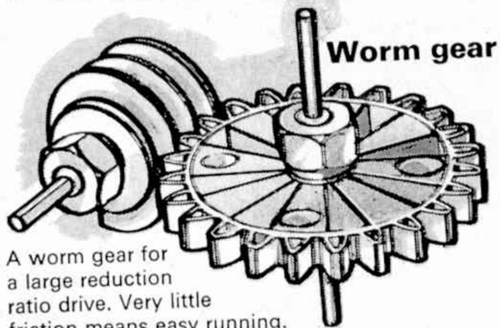

## CONTENTS




**MODEL & ALLIED PUBLICATIONS LTD.**
**13-35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTFORDSHIRE**

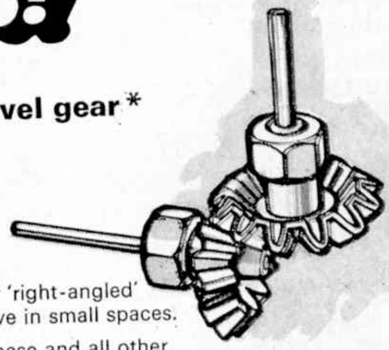
# NEW
# Plastic Meccano parts that extend the scope of Metal Meccano models

## 2 GREAT NEW GEARS!



### Worm gear *

A worm gear for a large reduction ratio drive. Very little friction means easy running. A Plastic Meccano 12, 18 or 22-tooth gear wheel is needed to transmit drive.



### Bevel gear *

For 'right-angled' drive in small spaces.

*These and all other Plastic Meccano gears fit onto metal Meccano by means of axle and coupling (metal Meccano Part No. 63).

**AND NOW - FOR EXTRA REALISM**

## FANTASTIC TRACK PACK!

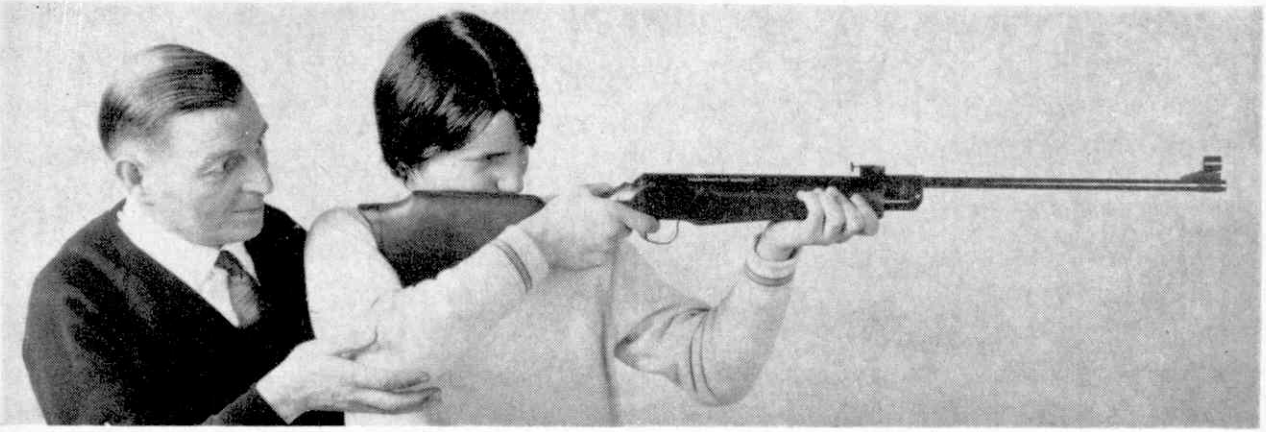
Now, for the first time ever, you have a ready-made working caterpillar track for your Meccano models. 125 individual pieces link together to form any length of track you require up to 46⅞" (1190 mm) long. Pack includes four 20-tooth and four 10-tooth sprocket wheels and collet nuts.

Sprocket wheels fit onto metal Meccano by means of axle and coupling (metal Meccano Part No. 63).*

*not included in Track Pack but available from Meccano dealers and included in certain Meccano Sets.


**AT YOUR TOY SHOP NOW**

# NEW FROM WEBLEY...



## The Hawk - for the men in the family

One rifle, two barrels—.177 for target shooting and .22 for field work. They interchange in seconds to give Father and Son the best of both worlds. Let's take the .177 calibre first. With it a youngster can learn to get his eye in and develop into a competent and accurate marksman. And a simple change of barrel turns the Hawk into a powerful .22 outdoor rifle, capable of bringing down a pigeon, crow or a rabbit.

Changing barrels. Nothing could be simpler. With the use of a coin, the locking and unlocking of the retaining nut is all that's required. A locking groove automatically ensures correct positioning of the changed barrels. Other Hawk features include adjustable foresight blade and fully click-adjustable rear sight. And a safety catch that operates automatically on cocking. The Monte Carlo type stock has a pistol grip cheekpiece and recoil pad. The Hawk has a grooved mounting for a telescopic sight.

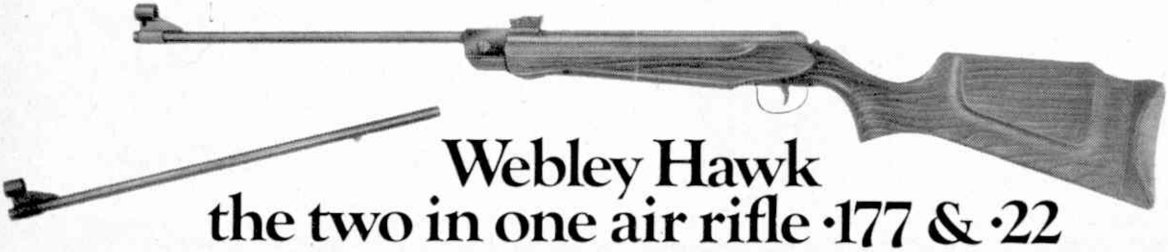
Available with either .177 or .22 barrels (£14.52) or with both barrels, target cards and pellets (£18.80).

See it at your Webley stockists or write for a leaflet, today, enclosing 2½p stamp, to:

**Webley & Scott Ltd.,**
(Inc. W. W. Greener Ltd.) (Dept. E51)
Handsworth, Birmingham B21 8LU.

WEBLEY

**with Webley you're sure of a great gun**



# Webley Hawk
# the two in one air rifle ·177 & ·22

# Announcing the BiC National Model Making Championship

Regd. Trade Mark

## If you have a few used ball pens and a creative mind . . . prove it!

Even when they are the world's finest ballpens, as Bic undoubtedly are, they have to run out of ink sometime! For years a further use has been sought for those empty barrels, destined after gallant service to end their days in sideboard or office desk, side by side with less worthy writing instruments.

**And here is the answer!**

Because Bic Crystals write first time every time there are far more sold in the U.K. than any other model. In fact, each year a Bic Crystal is sold for every man, woman and child in the Country with a few million more for good luck.

**Where do they go to?**

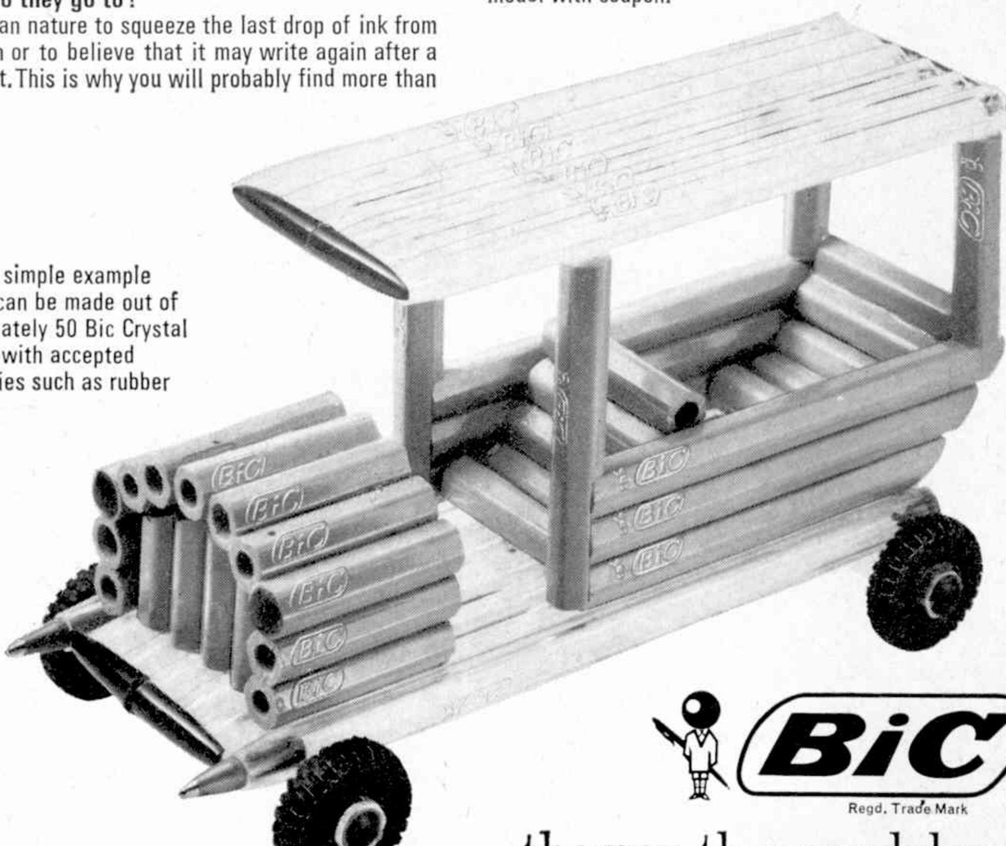
It is human nature to squeeze the last drop of ink from a ballpen or to believe that it may write again after a short rest. This is why you will probably find more than you expect in your own home. In offices and factories you should find them by the hundred.

**All you have to do . . .**

. . . is to start collecting used Bic Crystal medium and fine ballpens now so that you may complete a suitable model and enter the competition.

There will be cash prizes for the best models every three months, both senior and junior and finally the best modeller overall at the end of the year will be awarded a further cash prize of £250 and the handsome Bic championship trophy.

Take your time, read the rules overleaf, then send your model with coupon.



This is a simple example of what can be made out of approximately 50 Bic Crystal ballpens with accepted accessories such as rubber wheels!

BiC

Regd. Trade Mark

the pen they model on

BIC

Regd. Trade Mark

## Model Making Competition

**Start collecting your pens now but—**
**one word of warning—**

*make sure they are genuine Bic Crystal Medium or Fine Point ballpens carrying the Bic Registered Trade Mark because only these are eligible*

### RULES

1 The participants of the Bic Model Making Competition will be judged on their originality and technical model-making expertise.

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

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

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

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

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

PRIZES

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

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

9 Models winning any of the three prizes in either Junior or Senior levels of any of the quarterly competitions will automatically be entered in the BIC National Championship Competition and the individual competitor whose model is selected by the judges to be of greatest merit will receive an additional cash prize of £250 together with the 1971 BIC Model-Making Trophy.

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

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

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

RESULTS

13 The 1971 competition will be held during 3-monthly periods and results will be announced during August 1971, November 1971, February 1972.

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

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

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

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

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

I understand and abide by the Rules

Name ..............................
(BLOCK LETTERS PLEASE)

Address ..............................

..............................

.............................. Age ..............

WHERE DID YOU COLLECT YOUR BIC PENS? ..............................

MM 3

# BINDERS

## FOR YOUR COPIES OF MECCANO MAGAZINE

**PRICE INC. POSTAGE 90p.**

In handsome leather cloth with gold blocked name plate on spine to take 12 copies of your MECCANO MAGAZINE. Copies open flat and can be removed unmarked as required.

**MODEL & ALLIED PUBLICATIONS LTD.**
**13-35 BRIDGE ST. HEMEL HEMPSTEAD HERTS.**

NEW!

# PLANS HANDBOOK 2

## MODEL BOATS, SHIPS YACHTS, CARS

**96** PAGES comprising fully illustrated catalogue of famous M.M. and M.E. Plans, together with instructional articles to assist the beginner in building and operating better models. Models include Tugs, Workboats, Launches, Trawlers, Warships, Submarines, Paddle Steamers Cabin Cruisers, Hydroplanes, Period Ships, Class and Non-class Yachts, Hovering Craft, Space Models, Cars, Unusual Vehicles, Prototype Car Plans.

Trade advertisements to assist in choice of supplies.

NOW AVAILABLE
From your Model Shop or direct from; **15p**

**MODEL & ALLIED PUBLICATIONS LTD.**
**13-35 BRIDGE ST., HEMEL HEMPSTEAD, HERTS.**

# THEY'RE HERE!

## the first 3 fabulous

# DINKY ACTION KITS


## OF SPECIAL INTEREST TO ALL MODEL ENTHUSIASTS

You can finish the models to your own liking. A phial of HUMBROL Enamel has been supplied although you can paint your models any colour. See the kits at your toyshop NOW!

# ON THE EDITOR'S DESK

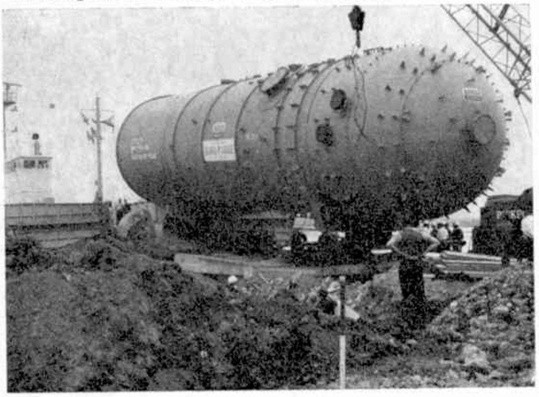
**Bressingham Museum**

Our article in the May issue on the steam collection at Bressingham, Norfolk, brought a 'phone call from Alan Bloom, who is the man behind the scheme, to draw attention to changed opening times. If you had noted this as a trip one day this summer, the times of opening to the public are now:

May 16 to Oct. 10—Sunday afternoons from 1.30 p.m.

May 27 to Sept. 16—Thursday afternoons from 1.30 p m.

Also open on May 31 and August 30.



**Weight**

How would you like to have to manoeuvre a 238-ton 101 ft. long load on to and off a small ship, then move it a quarter of a mile and lift it into place? That's the sort of job the heavy transport experts are likely to be faced with. The porcupine object in the accompanying photograph was the item in this instance—one of a pair of carbon steel chemical reactors used to produce acrylonitrile, the raw material for Acrilan, Monsanto's acrylic fibre. Read more about shifting these giant loads on page 293.

**Which is Which?**

The two Transits in the picture are interesting—one is the standard Dinky and the other built from a Dinky kit. The Hertz is the standard one, but as can be seen, structurally they appear identical.


**Full-size plan**

This month we again have a full-size plan for a simple model, this time a sand-yacht like the one in the picture. Next month we expect to provide a fine-performing glider, and other future projects will include boats, control-line aircraft, and other working models. Don't be too shy to let us know if there is something special you would like to see.

**Sand-yacht at right is on similar lines to our "Sand-fly" model.** *Photo by B. W. Davies, of the Gransden Land Yacht Club.*


**Car Competition**

Perhaps "car" is not quite the right term this month, but anyway there are 50 whatsits waiting to be sent to the first 50 correct identifications of the silhouette below. If you don't want to cut out the form, write it on a postcard, and remember to add your name and address.

**Competition Entry Form**

The vehicle illustrated is....................

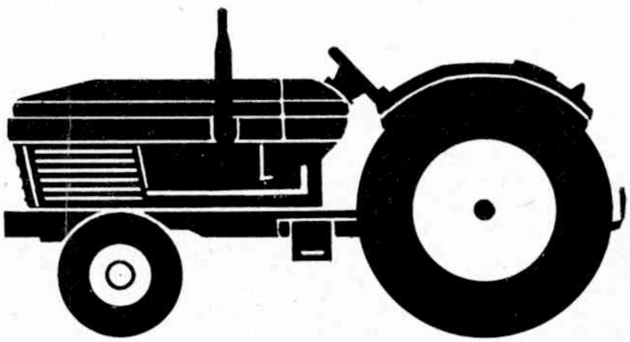
....................................................

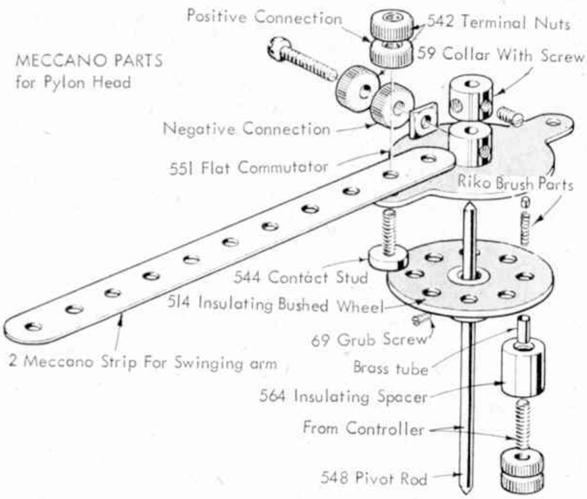
Name................................ Age.......

Address.........................................

....................................................

....................................................






# Electric R.T.P. Flying

### Part Two

## The Pylon Head and How to Fly

***This pylon head is necessary to fly the model drawn full-size last month***

Conveniently, a simple and very adequate pylon head can be made from standard Meccano electrical parts, and our original head made in this way has seen some hundreds of flights with never a falter.

The main spindle is a Rod (No. 548) to which is Grub-Screwed a 1½ in. Insulating Bushed Wheel (No. 514). An Insulating Spacer (No. 564) is glued to the wheel with epoxy resin, and at a later stage a Riko 3/32 in. square motor brush and spring will be inserted into the Spacer and retained by a short screwed Rod and Terminal Nuts (No. 542).

Above the Bushed Wheel is a Flat Commutator (No. 551) which has a copper printed circuit. The holes in the Bushed Wheel (through one of which the motor brush projects) register with a continual circle of copper, so that electrical contact exists all the time through the brush to the Commutator, even when the latter is rotated.

A Contact Stud (No. 544) or a bolt of the correct thread is fitted with two Terminal Nuts and a square nut. It is then introduced into the grub-screw hole of the Commutator boss and the square nut tightened up against the boss to secure the Stud or bolt firmly but not touching the Pivot Rod. The Terminal Nuts form one connector for the lines to the model.

A 5½ in. Flat Strip (No. 2) is now firmly clamped to one ear of the Flat Commutator by means of another Contact Stud and a Terminal Nut, and a second Terminal Nut screwed on. This forms the second connector for the flying lines.

Final assembly of the head entails dropping the spring and brush into the Insulating Spacer and slipping the Commutator assembly on to the Pivot Rod, retaining it in place with a Collar with screw (No. 59). Ensure that the brush is rubbing against the copper of the Commutator but that the Commutator rotates without too much drag. Screwing the rod in or out of the Insulating Spacer will adjust brush pressure.

Wiring is very simple. The Pivot Rod is "live", i.e. the negative lead from the transformer (or 12v battery) is connected to its lower end. The positive transformer lead goes to the controller, and thence to the Terminal Nuts on the Insulating Spacer. This wire should be insulated and taped to the Pivot Rod as shown in the photographs.

With the pylon in the photos, two heads were used so that two models could be flown together (much more difficult than it sounds) and to do this a slot had to be milled in the Pivot Rod so that the second positive wire could be passed through the lower head without interfering with its rotation.

Current passes to the flying wire terminals from the brush to the positive terminal on the Commutator ear (via the copper printed circuit on the Commutator) out along the positive wire to the model, back along the second wire to the negative terminal, and through the Commutator boss to the Pivot Rod and back to the transformer. The polarity is not important since the wires can easily be changed over at the model end if the model's motor runs backwards.

Quite a strong pull is exerted by the model on the pylon, so the Pivot Rod needs to be firmly fixed to a heavy base or to a base frame which can be fixed solidly to the floor. A Face Plate (No. 109) screwed solidly to a strong box which could be filled with bricks is one way of doing it. In our experience, a pylon head about 18 in. above floor level is best for lines up to 16-20 ft. long; the model will still fly 8 or 9 ft. high.

The lines to the model should be .030 shellacked copper wire, fitted with the male halves of No. 2 dressmaker's press-studs at the model end. Scrape the shellac off before soldering, and also at the terminal ends. A third line of, preferably, Terylene thread should be tied to the end of the rotating Flat Strip and fitted with a wire hook on to the model's tethering eye. This takes the strain off the thin copper wires, acts as a safety line, and also makes starting from a standstill easy, since the model will pull the head round via the leverage of the Flat Strip.

Any transformer/rectifier giving 12-16v. D.C. at 1½ amps or more can be used, in conjunction with a model slot car hand controller; we have found the Riko " Giant " controller extremely good. Better is a model railway transformer with a control knob, which allows smoother control. There is quite a high resistance in the copper wires, so that current actually reaching the model shows quite a drop, and a transformer giving only 1 amp at just 12 volts won't be likely to give 100% results. A car battery at 12v is satisfactory on shortish lines (up to 20 ft.) because of the amperage that it can deliver; this form of power needs a hand controller.

The circle described by the model needs to be smooth and unobstructed all the way round, since at least early flights will need a full lap or more to take off. On a normal floor the wires out to the pylon will lie across the flight path, and should be covered by a sheet of thin card or thick paper, preferably taped to the floor so that the model can taxi smoothly over.

Set up the pylon in the centre of the space and position the transformer convenient to a mains socket. Ordinary multi-strand household flex is best for taking the current from the transformer (or battery) out to the pylon; it is best to have the pylon ready wired and to connect the flex carrying the power supply to the pylon wires by means of a connector block. This enables reliable joints to be made—the positive terminal will not run the risk of altering the brush pressure and the negative wire can be wrapped round the pivot rod and soldered.

Cover the flex with card, as mentioned, then snap the flying wires (studs pre-soldered on) on to the model, and placing the model at the point of minimum clearance, cut the wires to length and connect to the pylon. Hook the tether line to the model, cut to length, and tie to the Meccano strip. Now pick up the model and, keeping the lines reasonably taut, walk round the flying circle and check that no obstacle has been overlooked. It is amazing how something obvious, perhaps a shelf on a wall, can be missed in the excitement of preparing for the first test.

Switch on the power and give a touch on the controller to check that the propeller is turning the right way. If not, reverse the press-stud connections on the wingtip, or if you are using a sophisticated transformer with a changeover switch, simply switch over.

Now slowly increase the power until the model starts to roll. Free-running wheels are essential, and there should be no tendency for the model to roll towards the pylon. If this happens, twist the undercarriage legs gently with a pair of pliers until the wheels point straight ahead or even track outward (both) very slightly.

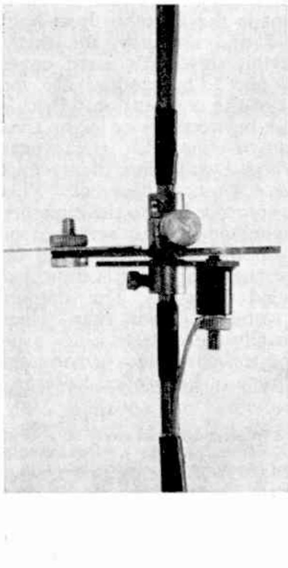
Slowly is the watchward on the tests; once the model is rolling increase power slowly until the tail comes up. Just a fraction more power and the model will take off. If the trim is right it will fly more or less level only a few inches off the ground; more power will cause it to accelerate to climb, but try to keep it not more than four feet up until you have learned a little about flying it. It should fly at this height on 3/4 power or less, but the motor will not give its maximum power until it is run in, which takes half an hour or so, so you may need slightly more than 3/4 power when the motor is new.

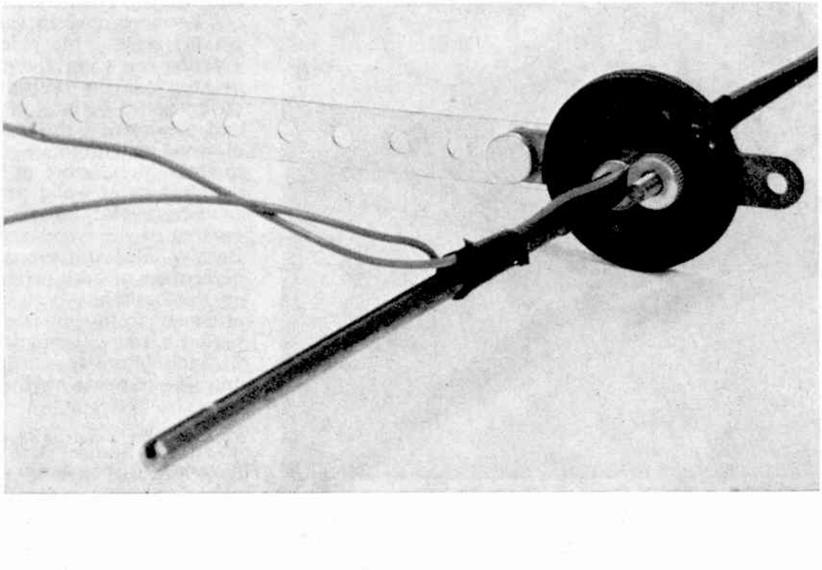
You may think that there is little to learn about flying such a model, but it is by no means so easy as it looks. The problem comes when the model flies higher on one side of the cirle than the other, when it will slowly get higher and higher and correspondingly lower and lower until it hits the floor. This can be started by a draught, by taking off too quickly, by a build up of power variations, or by changing power too quickly. What makes it difficult is that to stop the model climbing you have to take power off about half a lap early, and to stop it diving you increase power about half a lap ahead. The amount of increase and decrease, and how far ahead you make it, varies from model to model, so to be able to control a model you have to learn its characteristics.

The model flies clockwise, because this way the torque reaction from the propeller tends to want to bank the model outward. This keeps the line tight and in some measure offsets the weight and drag of the wires. However, there is an unwanted effect, since flying this way round tends to make the model less willing to take off. This is because of gyroscopic precession—the propeller, turning at high speed, produces a gyroscopic

*(please turn to page 298)*

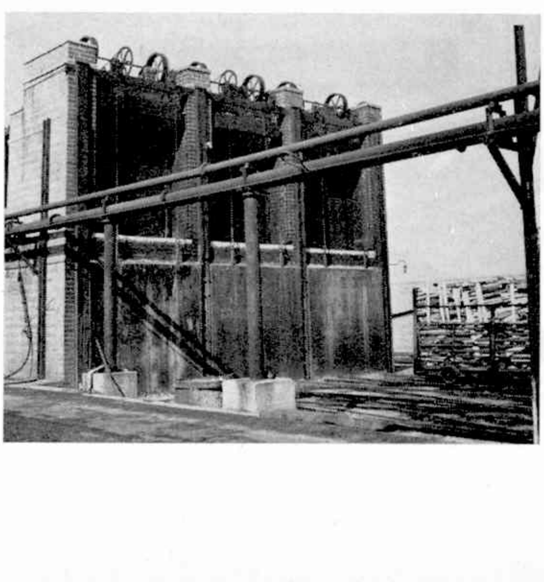
**Two pictures of our original pylon head; this particular one enables two models to be flown, hence the extension and extra wire above the Flat Commutator. Wires taped in place with plastic insulating tape are tidier and prevent an inadvertent tug from breaking a connection. Brush can be seen in photograph at left. For a single model, milled slot visible in Pivot Rod is unnecessary.**





# CHARCOAL —then and now

A. P. Major looks at old and new methods of producing an essential material



The manufacture of charcoal is one of the most ancient British rural industries, dating from the time when men first used metals, and even today it is still required for various purposes for which no other substance or material is suitable or practical. Methods of producing it have changed in recent times, but basically the principles used are the same.

Charcoal is a term applied to an impure variety of carbon produced by charring wood. It is made by the partial combustion of wood, there being insufficient air for complete combustion, and so the water and various materials such as tar and creosote are driven off, leaving the residue of solid black carbon which is the original structure of the wood. Good quality charcoal is deep black with a metallic blue tinge, brittle, porous, tasteless and inodorous. Charcoal which is brown in colour is imperfectly made.

There are three main methods of manufacture.

The most ancient, traditional and best known is the Earth Kiln, which has almost entirely been replaced today by the two other models. In this a level floor or "hearth" of ashes and earth is made about fifteen feet in diameter. Upon this area suitable wood and split logs are arranged in a stack around a central pole about six feet high. Other round logs and branch lengths are stacked in layers sloping inwards towards the pole to form an upturned pudding basin shape. Upon this stack a covering of straw, grass, bracken, leaves and turves is placed and finally earth or ashes to seal it. The central pole is then removed to form a "chimney", the Earth Kiln being lit by dropping some red hot charcoal and dry wood down the "chimney". As soon as this is alight the "chimney" is also sealed with earth so the fire spreads outwards to the edges of the stack. As the air is limited so charcoal and not wood ash is produced. To also assist controlling the air wooden screens are sometimes erected on the windward side of the stack. Observation has to be made of the stack to ensure it does not burn through and if it shows signs of doing so at the weak place more bracken, grass, leaves and turves are added. Two to ten days is usual for this method. In the past the slow-burning stacks in the woodlands were watched over day and night by the almost legendary charcoal burners who lived in huts on the site. Charcoal was then in much wider demand and the men who produced it were held in awe for their skill. Today little charcoal is produced by this method, not because it is old-fashioned, but because there is a shortage of men experienced to make and use the Earth Kiln.

The more modern variant is the Portable Iron Kiln which has a removable lid and chimney, the metal exterior replacing the previous method's earth cover to keep out the unwanted air. The method has the advantage of better control of the combustion. In this and the Earth Kiln method between six to eight tons of wood will produce a ton of charcoal. In the next method, the Retort or Wood Distillation Plant, four to five tons of wood produce a ton of charcoal. This can vary a great deal, however, according to the moisture content of the wood and whether it is air seasoned or freshly felled and green, also the species used and its percentage of bark, whether the wood used is unpeeled or the bark has been peeled from it. The amount obtained from unpeeled wood is lower than when peeled because the bark usually converts to ash.

Manufacturers who produce charcoal permanently on one site use a modified type of kiln called a Retort.

**Top, stacking a charge of wood in a traditional earth kiln, and the kiln in operation** (*photos J. Gardiner Esq.*). **Left, three retorts at a wood distillation plant** (*photo Forestry Commission*).

This is a large container that can be sealed off from the atmosphere, but which has a vent to allow the escape of gases during carbonisation. The Retort is filled with wood and a fire lit below it, the latter being controlled at the temperature, 300° Fahrenheit, to bring about carbonisation. In more complex coal or coke fired Retorts or Wood Distillation Plants, capable of holding large quantities of timber, various volatile by-products of charcoal production, such as acetic acid, napthha, wood tar and wood oils, are also obtained for use commercially.

Charcoal is prepared from a variety of species, but mainly beech, birch, oak and ash, with lesser amounts of alder, dogwood, alder-buckthorn, white willow, hornbeam and other broad-leaved species, and various conifers. The manufacture of charcoal is a useful means of using material which would otherwise be of little or no value, such as cordwood, the branch-wood and lop and top wood from felling trees. The material is usually required in lengths from 1½ feet to 7 feet and 1½ inches to 7 inches in diameter. Smaller lengths and diameter are usually uneconomic and also larger than this, requiring splitting, equally so. The demands by charcoal manufacturers can vary, depending on the type and size of kiln used. Some manufacturers can use hardwood thinnings after felling, also sawmill wastage, slabwood, sawdust and shavings. Others occasionally purchase standing timber but it is not widespread in the industry because it means expenditure on felling and transport to add to production costs. It is the usual practice to obtain wood for charcoal delivered to the site of the kiln or retort. One snag in the industry is that good sources of charcoal wood in derelict woodland being converted to forestry, hardwood scrub, or overgrown near-useless coppice, are often geographically situated away from the charcoal manufacturers.

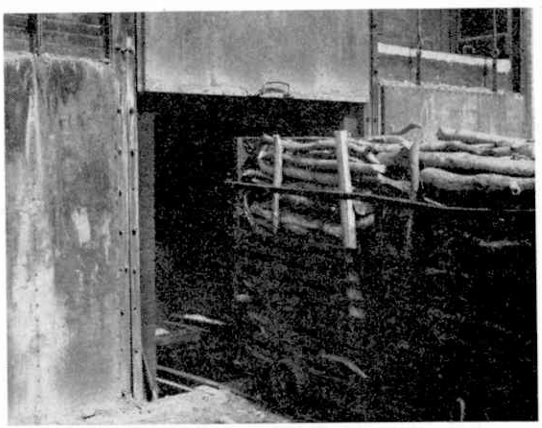
The manufacturers are distributed in Berkshire, Sussex, Kent, Hampshire, Devon, London, Radnor, Buckinghamshire, Montgomeryshire, Gloucestershire, Nottinghamshire, Perthshire.

The majority of charcoal manufactured in Britain is from broad-leaved trees and its crude form is called Lump Charcoal. When processed it is known as Granulated Charcoal in a range of sizes from ½ inch mesh to 40 mesh or as small as 150 mesh for certain products, such as medicinal charcoal.

Charcoal has a wide range of uses in various processes. In the past it was commonly used as smokeless fuel as it gave out more heat than other fuels. Occasionally it is still used for this purpose although now it is uneconomical in price compared with other fuels. It was also used for smelting in this country, the last of the charcoal iron-furnaces closing down in 1800 at Ashburnham, Sussex. Coke now replaces charcoal, but in Sweden charcoal is still widely used in iron and steel production. In Britain large amounts of charcoal are still used for case-hardening compounds for ferrous and non-ferrous metals, also in rubber goods, plastics, a pigment in black paints, for refining chemical solutions, to make glycerine, cyanides, electrical batteries, as a heat insulator for refrigerators and vacuum flasks, and to manufacture carbon disulphide used in the artificial silk industry. Powdered charcoal is used for the making of smokeless briquettes, moulders' blacking and gunpowder in fireworks, etc. Charcoal dust waste from other processes is used in horticulture as a soil improver. Charcoal absorbs odours and gases and so is used in deodorants, acetylene cylinders and other gas containers. Because of its gas absorbent qualities it is used in various medicinal preparations and refined for pharmaceutical purposes, to a powder of 150 mesh and finer than flour. It is made up as charcoal biscuits, tablets, powder, lozenges, granules, to treat indigestion, flatulence, dyspepsia, food poisoning, gastric hyper-acidity, peptic ulcers and nervous diarrhoea. It is

(*continued on page 281*)

**Portable metal kilns. The nearer one is charged and once its lid is in place is ready for firing** (*photo J. Gardiner*).



**Below, a charge of wood entering a retort, and the hot charcoal leaving it en route to a cooling chamber** (*Forestry Commission photos*).

DINKY TOYS NEWS

# SPACE RECOVERY SPECIAL

by

Frank Lomax and Chris Jelley


America's Apollo Space Programme, a highly successful though expensive probe into the unknown, has reaffirmed the U.S.A.'s leadership in moon exploration, seeming to overshadow even her closest rival, the U.S.S.R.

The technical skill required to project a rocket, manned or otherwise, into the heavens and keep it there is phenomenal and, even when it is up there, the work of the teams of experts on the ground is just as important as the tasks performed by the astronauts, each one depending on the other for the successful completion of the mission.

With world-wide television coverage of all the Apollo flights, everyone with a T.V. set has been able to share to some extent the excitement of space flight and will at the same time have seen how important the men on the ground really are to the astronauts. One operation, the importance of which is not fully realised, however, is that which comes after the flight, namely the recovery of the space capsule after it has passed through the earth's atmosphere and splashed down in the ocean. No matter how successful the flight had been, it would immediately turn into a major catastrophe if recovery failed, therefore the men and machines used in recovery must be regarded as absolutely vital. Unfortunately, we do not know the men involved, but one of the most important machines in use is the Sikorsky-built " Sea King " SH-3A Helicopter which picks up and transports the returned astronauts and their capsule to the waiting recovery ship.

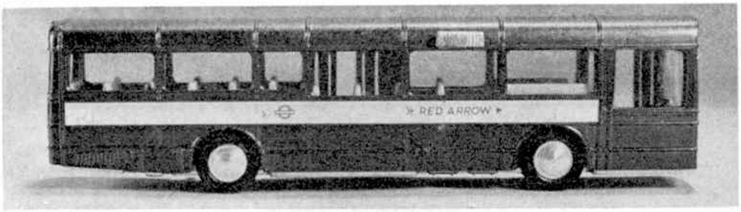
Designed and normally operated as an anti-submarine helicopter, the Sea King is large by helicopter standards, with a fuselage length of 54 ft. 9 in. and a rotor diameter of no less than 62 ft. Power is supplied by two 1,250 h.p. T58-GE-8D shaft turbine engines, manufactured by the General Electric company of America, which give the aircraft a maximum speed of 159 m.p.h. With a normal take-off weight of 1,844 lbs., it can cruise at 145 m.p.h. and has a range of 540 miles—more than enough for both its anti-submarine and space-recovery roles.

Thanks mainly to its work on Apollo recovery, the Sea King must now be one of the best known helicopters in the world and this, naturally, makes it an obvious subject for model manufacturers to reproduce in miniature form. A model of it just *had* to come—and come it has in the shape of Dinky Toy No.724 " Sea King " Helicopter from Meccano Tri-ang Limited.

The unique range of Dinky Toy aircraft already has a high reputation in the model world, but the new Sea King should really make it soar ! In our opinion, it is the best die-cast model of its type in production,

**All the excitement of space-flight splash-down and recovery can be had with the new Dinky Toy " Sea King " Helicopter, Sales No. 724. It is based on one of the actual helicopters which has played a large part in America's Apollo Space Programme.**


**Another view of the Sea King, this time on the ground. The miniature Apollo Capsule sold with the Helicopter has an opening hatch and will also float.**




**Dedicated scale enthusiasts may object to the non-scale sliding button which operates the opening doors of the new bus, but this view of the model shows that the button is not overly obtrusive.**

anywhere, and must prove one of the smash hits of 1971. Not only does it closely reproduce all the general lines of the real thing, but it actually incorporates a revolving five-bladed rotor, driven by a small electric motor mounted inside the body, and a working, finger-operated winch !

These two features, in themselves, would be enough to make the model a best-seller, but play-value is even further increased by the inclusion of a floating Apollo space capsule with each model. Designed to be hooked onto the winch cable, this capsule is something of a scale model in its own right, being correctly shaped and equipped with an opening hatch giving access to a moulded interior, complete with representations—admittedly basic—of three astronauts. The helicopter itself has a fully moulded cockpit interior and glazed windows which greatly add to realism.

The battery for the electric motor is carried inside the fuselage, behind an opening panel built into the left-hand side where it slots easily but firmly in place. The most suitable battery, incidentally, is a Mallory Duracell No.2400, obtainable from photographic shops and chemists, but an Ever Ready HP 16 or equivalent battery will also give good results. The Duracell however, has a much longer life.

A cut-out switch beneath the fuselage isolates the battery to guard against electricity discharge while the model is not in use, but the motor is actually started by simply flicking the rotor in an anti-clockwise direction. It can be stopped either by switching off, using the cut-out, or by stopping the rotor, the characteristics of the motor being such that when its armature (to which the rotor is attached) is stopped in its " natural rest " position, no current will pass and the motor is consequently " off." However, it is essential that the rotor should never be held so that the motor armature is out of its natural rest position, when the cut-out switch is " on," otherwise the electrical circuit will be completed and the battery will rapidly drain.

Winch control is achieved by means of a knurled disc also built into the fuselage and partially projecting through the lower right-hand side. Overall finish is in two-tone white and blue with red cockpit interior and black rotors. In addition, the model carries the familiar red, white and blue star emblem of the United States on each side, and it also carries the transfer markings of U.S. Navy Helicopter 66 of Helicopter Squadron 4—one of the " Choppers " which actually took part in the Apollo Programme, already having been involved in at least five recoveries. This adds the final touch to a really fabulous model !

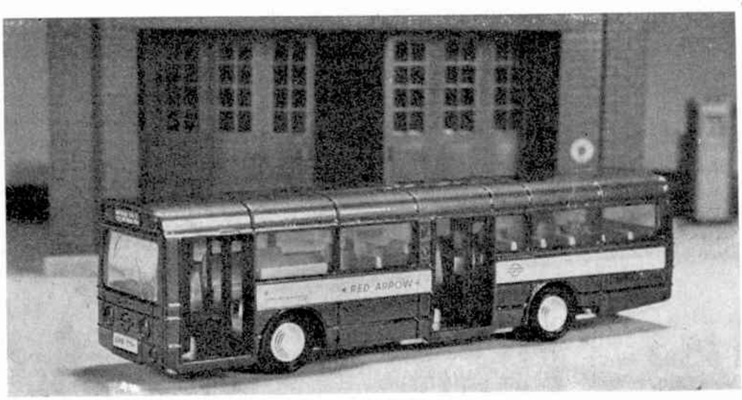
## SINGLE-DECK BUS

By allotting so much space to the Sea King, we have not left ourselves much room to cover another new release, and one which should prove a close rival to the Helicopter in popularity—Dinky Toy No. 283 A.E.C. Single-decker Bus.

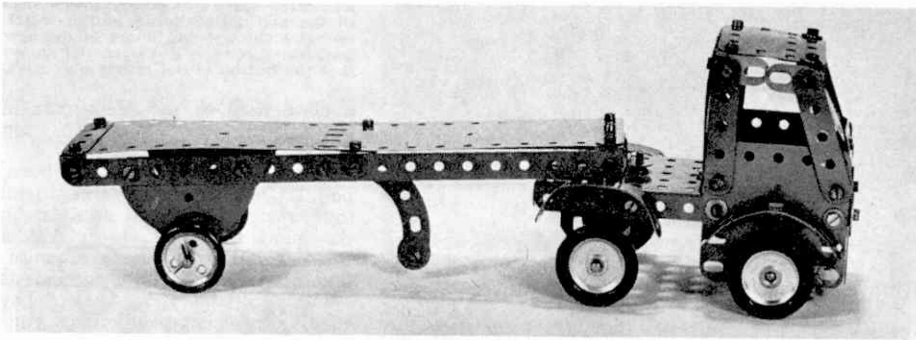
Buses are, and always have been, popular, not only among the general toy-buying public, but also among the many members of the Model Bus Federation—a national organisation of serious model bus enthusiasts —therefore the new Dinky Toy stands every chance of being a run-away best-seller. Based on a modern London Transport one-man bus, it is produced to Dinky's usual high standard and comes complete with glazed windows throughout and a moulded interior, including full seating and access and exit steps. Most important of all, however, it is fitted with opening front entrance and central exit doors which work together, remotely controlled by a small sliding button running in a slot above the third off-side window. And, for those who like sound effects, it is even equipped with a bell which is rung by flicking a lever situated just behind the nearside rear wheel arch. How's that for play-value ? !

Finish is in London Transport's Red Arrow livery of all-over red body with a white stripe across the sides. Carried on these stripes is London Transport's well-known insignia, plus " Red Arrow " lettering which stands out clean and sharp. Route number labels and number plates are mounted in the correct positions at front and rear, with an advertisement for Red Bus Rover tickets beneath the back window.

One final point which must be mentioned is the fact that this new Single-decker Bus is purposely produced quite independently of any existing model and it should not be compared with any other model. It is not intended as a partner for the Dinky Routemaster Bus and, in fact the two models are not compatible, the Routemaster being produced to 1/77th scale and the Single-decker to a scale of 1:68. The larger scale was necessary to accommodate the special action features included and, in any case, the larger the model, the more appealing it is to the average toy buyer who, after all, accounts for the vast majority of Dinky Toy sales. Larger scale, or not, however, the new bus is still a great model !




**Every model bus produced by Dinky Toys in the past has proved a success. The new A.E.C. Single-decker Bus, No. 283 is the best model of this type the Company have ever made and should turn out to be a smash hit.**

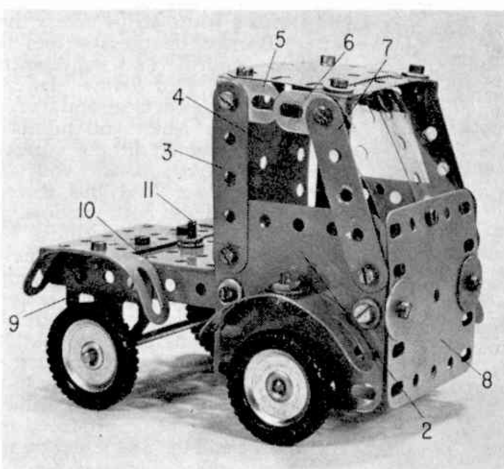


**'Spanner' describes an easy-to-build model for owners of a No. 4 Meccano Set**

# ARTICULATED FLAT TRUCK

THANKS TO THE GREAT IMPROVEMENTS being made to the highways and byways of Britain, more and more manufacturers in this country are making use of road transport to move their goods from factory to customer. As the amount of goods carried by road has increased, so too has the size of the carrying vehicles, with the result that the lorries and vans once regarded as "large" are now dwarfed by the articulated giants which can be seen thundering down our motorways at any time of the day, or night.

Inspired by thoughts of these articulated giants, we feature here a Meccano model based on an Articulated Flat Truck which should give younger modellers something to work on for a while. Built from a No. 4 Set, it is quite straightforward in design and will not present any constructional problems.




Dealing first with the tractor unit, the main chassis is simply supplied by a $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flanged Plate 1, to each side flange of which a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plate 2 is bolted, this Flexible Plate projecting two holes below the Flanged Plate. Secured to each Flexible Plate, as shown, is a $2\frac{1}{2}$ in. Strip 3, the securing Bolt also holding an Angle Bracket in place. Attached to the free lug of this Angle Bracket at each side is a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plate 4, serving as the back of the cab, the upper corners of the Plate being attached to another Angle Bracket, which is bolted, along with a third Angle Bracket and a Fishplate 5, to the top of Strip 3. Another Fishplate 6 and an Angle Bracket are bolted to the top of a second $2\frac{1}{2}$ in. Strip 7, also secured to Flexible Plate 2, then the cab roof, supplied by two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Flexible Plates overlapped two holes, is bolted to the free lugs of the Angle Brackets.

The cab front is provided by a $2\frac{1}{2} \times 2\frac{1}{2}$ in. Plastic Plate 8, bolted to the forward end flange of Plate 1, the securing Bolts also carrying $\frac{3}{4}$ in. Washers to serve as headlamps. Two $2\frac{1}{2} \times 1\frac{1}{2}$ in. Transparent Plastic Plates, overlapped one hole, provide the windscreen, these Plates being curved rearwards and trapped behind the Bolts securing Fishplates 6 to Strips 7.

Two Flat Trunnions 9 are bolted to Flanged Plate 1 to provide bearings for a $3\frac{1}{2}$ in. Rod held in place by 1 in. Pulleys with Motor Tyres, these serving as the rear wheels. The front wheels are provided by similar Pulleys and Tyres on another $3\frac{1}{2}$ in. Rod journalled in the centre holes in the lower edges of Flexible Plates 2. All four mudguards are each represented by a Formed Slotted Strip, the front mudguards being attached to Plates 2 by Angle Brackets and the rear mudguards being bolted to the ends of a $3\frac{1}{2}$ in. compound strip 10 secured to the top of Flanged Plate 1. A $\frac{3}{8}$ in. Bolt 11, shank upwards, is secured in the fourth row centre hole of the Flanged Plate to act as the connecting point for the trailer.

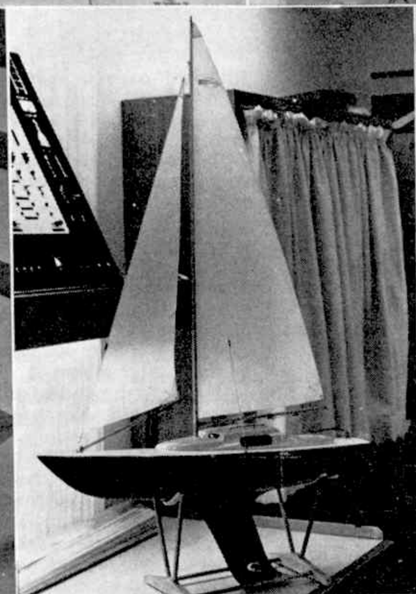
*(Continued on page 307)*

## SEEN AT THE NUREMBERG TOY FAIR

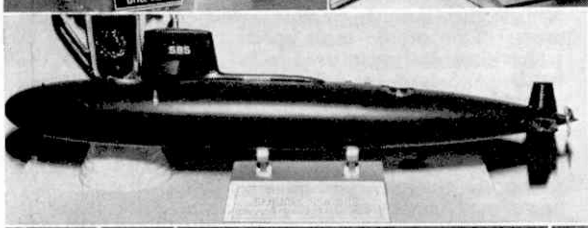
Among the many interesting model items seen at Nuremberg were the products pictured opposite; most are not at present available in Britain but possibly will be later on. The R/C glider at the top is the world speed record holder (149.7 k.p.h., or about $93\frac{1}{2}$ m.p.h.) kitted by Graupner, and the "Rivets" racer* a plastic ready-to-fly control-liner by Cox.

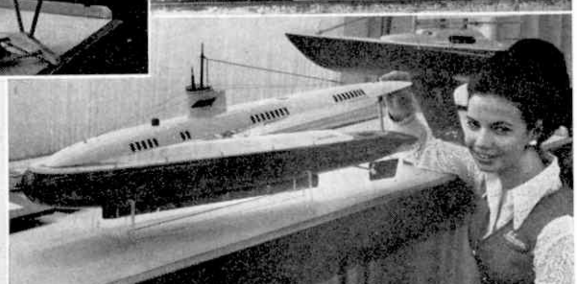
The Apollo "Little Joe" is an actual working model rocket by Centuri of U.S.A.; their Space Shuttle also rockets up, separates, and both models glide down (model rockets are not at present permitted in U.K.). Neat 31 in. yacht "Monsun" is all vacuum formed and suitable for R/C, by Schuco-Hegi (Germany). Submarine "Skipjack" is Aurora plastic*; peer through eyehole top rear and get a panoramic view of control-room! Second sub. is 41 in. working model V-FS11, also from Schuco-Hegi. Rubber-powered flying bird is a superb ornithopter which flies well; makers are French firm of Rumbeyke*. Last, cute simplified working trawler models especially designed for school work by Graupner. (* Available now or shortly in U.K.)

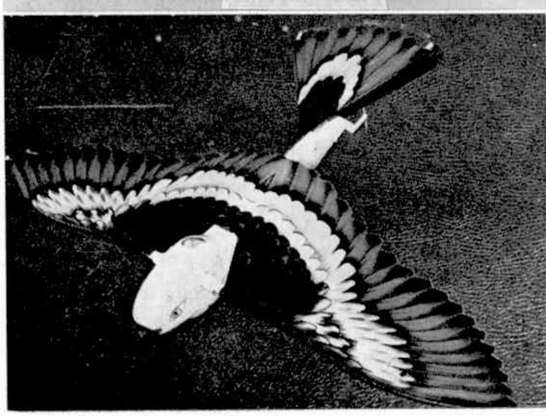

COX
ROCKET ENGINES
N60089
92
92




SPACE
5 USA
5 USA


SBS






MAA9
MAA9


# The Greek Navy of 1821

## STAMPS . . . . . . . by J. A. Mackay

This year Greece is celebrating the 150th anniversary of the outbreak of the War of Independence against the Turks. As part of the celebrations philately will be playing an important part, and already there have been two sets of stamps in honour of the occasion. The first set, consisting of four stamps, appeared on February 8th and took as its subject the role of the Greek Orthodox Church in the struggle for independence. The second series, released on March 15th, was devoted to the Greek Navy during the war.

During the war of independence the Greeks defeated an adversary which was larger and more powerful in many respects, but where the Greeks were superior was in their navy which dominated the eastern Mediterranean, the Aegean and Adriatic seas and prevented the Turks bringing up reinforcements from Asia Minor or Egypt. Then, as now, Greek ship-owners had an importance in world commerce which far surpassed the size of their country. These men, and the daring seamen of the Greek race, combined to build up a powerful navy. When the war broke out Greece was in a position to mobilise a battle fleet which, by means of its spectacular exploits, focused world attention on the Greek struggle. Initially world opinion seemed to favour Turkey, but the gallant actions of the Greek navy won it the sympathy of many European powers. Many sailors from other European nations volunteered for service with the Greeks, including the Scottish admiral Lord Cochrane, and in the closing phases of the war the Greeks had the active support of the navies of Britain, France and Russia.

At the opening of hostilities the Greek fleet consisted of sailing vessels from the islands of Hydra, Spetsai and Psara. Some of these had been constructed in the period before 1814 when Greek maritime power was at its peak. Others, however, were built later, in a period of depression when the shipping industry was undergoing a crisis. It seems strange that, at a time of depression, warships should be constructed, but in fact the men who organised the war of independence were planning ahead. The construction of this fleet was the result of careful, long-term planning carried out over a period of several years. The Philiki Hetairia (a secret society aimed at the overthrow of the Turks) contributed much to the preparation and organisation of the fleet and saw to it that all the logisitical problems were ironed out—by force if necessary—so that the navy was ready to go into action immediately the standard of revolt was raised at Missolonghi in mainland Greece.

Three of the stamps in the independence series depic ships from the three islands. The 20 lepta stamp depicts the ship *Leonidas* belonging to Apostolis of Psara. The 1 drachma stamp shows the *Pericles* of Hadji Anarghyrou from the island of Spetsai, while the 1.50d stamp features the ship *Terpsichore* owned by Tombažis of Hydra. These ships bore the flag of the Philiki Hetairia, a half-moon surmounted by a cross, an anchor, a snake and a spear. Each ship had a decorated figure-head representing the ancient Greek statesman, general or goddess after whom it was named.

Towards the end of the war the battle fleet acquired the steamship *Karteria*, commanded by an English officer, Frank Hastings. This ship had the distinction of being the first steamship employed in naval hostilities. The 2.50d stamp in the series reproduces a painting by Captain Hastings of the *Karteria*, now in the National Historial Museum in Athens.

The secret of Greek success against the Turks at sea was their judicious use of fire-ships. Taking a leaf out of Sir Francis Drake's book they launched fireships against the Turkish warships whenever the occasion arose. One of the most spectacular engagements in which fireships were used with great effect was the battle of Samos in August, 1824, when the Greek admiral Canaris (an ancestor of the Admiral Canaris who was Hitler's chief of intelligence in the Second World War) destroyed a Turkish armada off the island of Samos and thereby thwarted a Turkish attempt to capture this important strategic base. After the war, however, Samos was handed back to Turkey and it was not until 1912, during the Balkan Wars, that Samos finally drove out the Turks. The provisional government of Samos, incidentally, issued stamps in 1913 to commemorate the victories of 1824 and 1912. A contemporary artist's impression of the battle of Samos is shown on the 3d stamp.

Fire-ships destroying a Turkish frigate at the battle of Yeronda in 1824 are the subject of the 6d stamp. This is a reproduction of a painting by the artist Michaelis who was present as a sailor at that battle. During the war the Greeks launched 59 attacks using fireships; of these 39 were successful, 19 were failures and one was indecisive.

Previous stamps in this theme include the set of five issued in 1927 to mark the centenary of the Battle of Navarino and depicting battle scenes and portraits of Admirals Codrington, de Rigny and van der Heyden whose Allied fleet finally defeated the Turks and brought the war to an end.

It's almost impossible nowadays not to get caught up in the space race. Moments like those just prior to those first astronauts stepping out on to the moon caught the breath of the whole world. Each time man or machine ventures forth into space, teams of television and newspaper journalists feed us with all the space jargon and technical detail. One aspect which always fascinates me is the use of detailed Apollo Saturn rocket models to demonstrate to viewers what stage the real thing has reached up there in the blue. I thought therefore it might be interesting to take a look at some of the space hardware available in kit form—in all, nine models from two companies, Revell and Airfix.

I started with the 1/144 scale Airfix Apollo Saturn V kit which when finished stands 28 inches upon its own stand and costs £1.35. This I really enjoyed building and it seemed extremely well manufactured. My only problem was finding no way to lock the escape tower at the very top, thus securing the capsule; all other stages locked well. This kit really whets the appetite and I went on to build Airfix's Lunar Module in 1/72 scale which costs 34p, their 1/72 scale Sea King recovery helicopter at 34p and their Russian Vostok costing 65p which is the same scale as their Apollo and sits on a matching stand. The moon module made up well and included a base of moon surface showing those famous first footmarks which, carefully painted, looked very good. The instructions, however, were a little vague and when I compared my finished model to colour photographs of the real thing, the painting instructions proved very incomplete. The helicopter, on the other hand, was a great success and I thoroughly enjoyed its construction. It was well produced, included many transfers and a simple means of raising and lowering the cradle holding an astronaut by turning the 'chopper' blades. It could, incidentally, also be made as a US Navy chopper armed with torpedoes and depth charges. A kit's value is very much a matter of how much pleasure you get from it and at 34p this Airfix kit was a great success with me.

The Russian Vostok kit stands 15 inches shorter than the Apollo in the same scale but comes complete with interchangeable heads (Sputnik, Vostok, Soyuz)—the same basic rocket unit was used with all three. This kit I found very boring, probably because I was building it to complete the set rather than because of its own features. It went together well though and makes an interesting comparison in size to the Apollo.

The equivalent Apollo rocket from Revell is in massive 1/96 scale and measures almost four feet high. This again splits into all the correct stages and it is this very model that James Burke, Patrick Moore and the BBC TV space studio use to demonstrate to viewers what's happening during a moon shot. It boasts a splendid little Lunar Module and the completed kit is probably the most massively impressive plastic kit made. It costs, however, £8.75. Their Russian craft is the Vostok less the major rocket section and is the ship which took Gagarin on man's first orbit of the earth. It's in 1/24 scale, costs 99p, and includes a sliding ejection seat and spaceman, but though the finished kit is both large and detailed in its moulding, it gave me little satisfaction. The Revell Lunar Module is in 1/48 scale and boasts many features. The landing gear itself is retractable, the ascent and descent stages are detachable, as with the real thing, gold foil is used as a covering and one of the two astronauts can be seen from a module window whilst the other descends the ladder on to simulated moon which I found less real than Airfix's. It costs 99p and really provides a kit to get your teeth into, though painting instructions again


(*Sun photo.*)

# Dick Emery's Review

### TV Comic/Modeller Dick takes a look at some space models

are a bit on the vague side. Why manufacturers don't provide full details I cannot understand.

I also tried Revell's 6 inch high astronaut doing his space walking bit which costs 49p; this will please those who collect model figures but I found most uninteresting.

Without doubt my personal favourite from this manufacturer's range is the 1/24 scale Gemini capsule. The major sections tend to be rather thick plastic but the kit includes the two spacemen, detachable retro section and removable equipment module. What is so satisfying is that, for instance, the module really includes equipment such as oxygen supplies, batteries, fuel cells, electronic gear, the lot, and if you open up the twin doors to the cabin there is the most incredible instrumentation panel. The interior of this Gemini could keep a really keen modeller happy with his paint brush for very many hours. This kit costs 99p.

For my shelves then, I would pick the Airfix Apollo despite it being the smaller of the two, also their helicopter. I would forget both the Russian kits and the model spaceman but include the larger Revell Lunar Module and their Gemini.

# The Forgotten Service

**Peter Wilkes describes the work of serologists in forensic science**

The principle of the "law of contact" as applied to the work of the Serologist. A natural reaction for either man or woman with blood on his or her hands is to reach in the pocket for a handkerchief (top picture). This, if the person has a guilty conscience, is later destroyed. The obvious transfer of blood to the pocket is forgotten. For this reason all of a suspect's clothing is taken for examination.

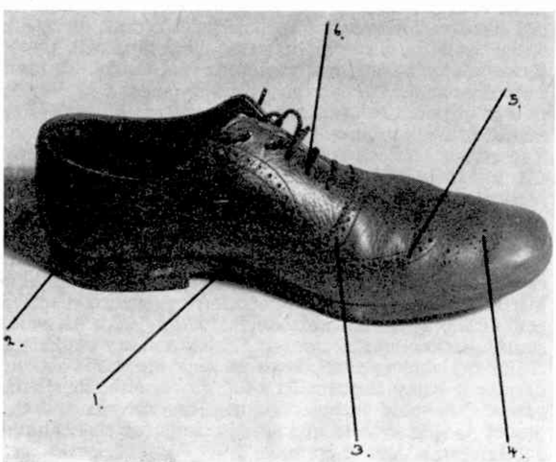
No one would disagree with the statement that, without detectives, no crime would ever be solved, but what many people fail to realise is that, without the back room scientists, the rate of detection by the police, and especially in crimes of violence, would be drastically reduced. This is particularly true of the work of the least known of all the Forensic Scientists, the Serologists.

Although science in crime detection has increased rapidly in recent years, it is in the work of the Serologist—the science of blood and blood grouping—that the greatest advances have been made. Today blood grouping and the identification of bloodstains found at the scenes of crimes are part of the everyday fight against crime and yet, not more than 30 years ago, this work was unheard of.

It does not require a vivid imagination to realise the value of this work to the detective. Often, when asked to explain away a bloodstain, a suspect will glibly tell a story of heroism towards an injured animal, even when the police know full well he is a callous, hardened criminal, completely without feeling. In such cases, if no expert were available, no matter how strong the suspicion of the police, that is all it would remain, suspicion. But, if the stain is positively shown to be not animal as stated, but human, then, in many cases, having been caught out in a basic untruth, the whole sordid story of a crime of violence will be forthcoming to the detectives, and another of those who can truly be classed as public enemies can be put away in a place from which he can cause no further harm to innocent victims.

No case illustrates more thoroughly the value of the Serologist to the police than the murder of Leopold Goodman and his wife, who were found battered to death at their home in Ashcombe Gardens, Edgware, on the 10th October, 1949.

Immediately after the bodies had been discovered, detectives made a routine call on Daniel Raven, the son-in-law of the Goodmans, to inform him of the tragedy. To their surprise they found a boiler roaring furiously in a manner that suggested Raven was anxious to destroy something completely and rapidly. With great presence of mind the detectives dampened the boiler and were in time to recover pieces of material that had obviously formed part of a suit. Their interest aroused, the police made a search of the house and found, in a bathroom, a pair of shoes that had been carefully washed.




From evidence obtained from a shoe Raven was hanged. Illustrated left are the places that the expert will examine for blood and, if the shoe has been in contact with blood, will find it. It is impossible to clean a shoe so as to remove all traces.

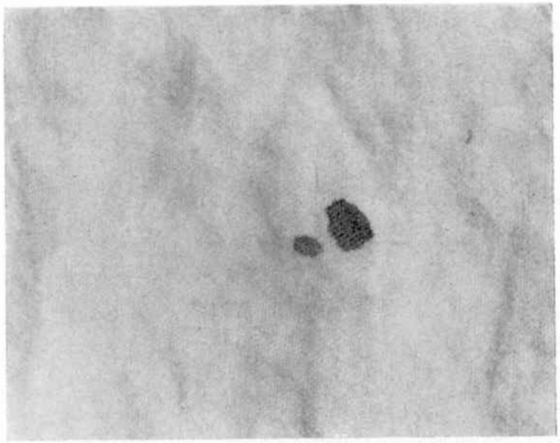
The property recovered was rushed to a Serologist, and his findings hanged Raven for murder. On the small pieces of suiting were found bloodstains of the same group as the murder victims and, despite the careful attention that had been paid to the shoes by Raven, in the welt were minute bloodstains of the same groups. Raven had no chance of escape, and after a trial at the Old Bailey, was hanged for the crime.

However, before a scientist can give a blood identification, he must have samples to work on. In most cases of violence, the criminal, in his attempts to avoid detection, goes to great trouble to remove all traces of blood, and then both police and scientist must truly show their ingenuity.

It has been recounted how minute quantities of blood were found in the welts of Raven's shoes despite his attempts to clean them by washing. In the murder of Stanley Setty, police had to lift floorboards before finding sufficient bloodstains to prove that the body had been in the flat of Donald Hume, so thorough had Hume been in his after crime clean up.

Experience has taught crime investigators that it is often in unexpected places that their samples will be found. The obvious act of a man who has blood on his hands is to reach into his trouser pocket for a handkerchief that can afterwards be destroyed. What he does not realise, and what the searchers have dis-

**Right, type of stain often found by the police when investigating a crime of violence. Sent to the laboratory they will be told if such a stain is blood and, if so, if animal or human.**



covered, is that blood will be transferred to the trouser pocket and it is this that detectives will examine.

Nor are bloodstains always the familiar red colour. The final colour often depends on the material on which they are found and can vary between red and dark brown. Indeed some are only visible under artificial light while others require ultra violet light to reveal them.

When the sample has been finally obtained, just what can the scientist actually tell from it? First, and most obvious, they must be able to tell the police if it actually is blood.

This is done by applying a chemical test. Usually a Benzidene reagent is applied to a filter paper that has been rubbed on the suspected stain. If the paper turns blue, the scientist knows, with reasonable certainty, that he is dealing with blood.

After this he can concentrate on finding out if the stain is human or animal, and for this he depends on tests based on the reaction which occurs between human blood and human serums.

C. R. M. Cuthbert, who was formerly Superintendent at the Scotland Yard Laboratory, tells an amusing story which illustrates that, although laboratory tests can identify bloodstains with absolute certainty, their speed does not always impress the police.

When a large bloodstain was found on a river bank in Kent in the middle of winter, samples were sent to the Scotland Yard Laboratory to be identified.

Unfortunately, the blood had dried and, before the tests could be applied, it had to be dissolved in a solution of salt and water.

Twelve hours later a positive identification had been made, but the police who had spent most of that time wading in the icy waters were not impressed with the wonders of Forensic Science when, as they waded to the shore dragging the carcass of a dog, they were met by a messenger who had rushed from the laboratory to tell them what they had just discovered, the bloodstains were canine in nature.

The third aspect of the work of the Serologist is in blood grouping, vital knowledge in the fight against crime, for the indentification of a group of bloodstains can give vital evidence which in many cases completely negatives an explanation given by an accused person.

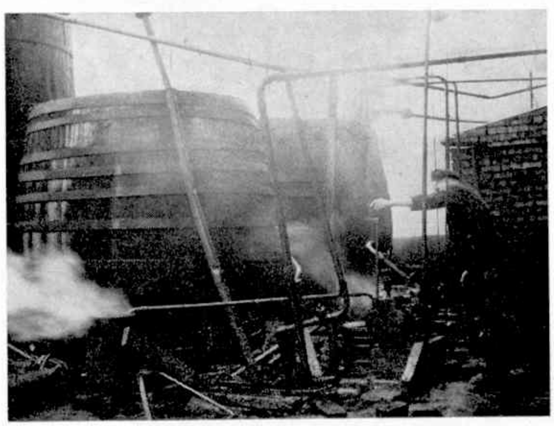
It is common knowledge that blood can be divided into four groups, "O", "A", "B" and "AB" and, when presented with a bloodstain, the Serologist can accurately give the blood group. This aspect of the scientist's work is, in fact, a negative aspect as compared with, say, the fingerprint expert. No Serologist can by blood grouping connect with absolute certainty a suspect with the scene of a crime.

Even the rarest of the blood groups, "AB", applies to 3% of the population and, when it is realised that 46% of us have blood of group "O" it will be seen that the most the expert can do is to add to what is often a chain of circumstantial evidence implicating the accused with the crime. When such other facts are presented to the court, the evidence of blood grouping provides a strong link in the full chain of circumstances which, in most cases, leads to only one inevitable conclusion, such as was proved in the case of Daniel Raven.

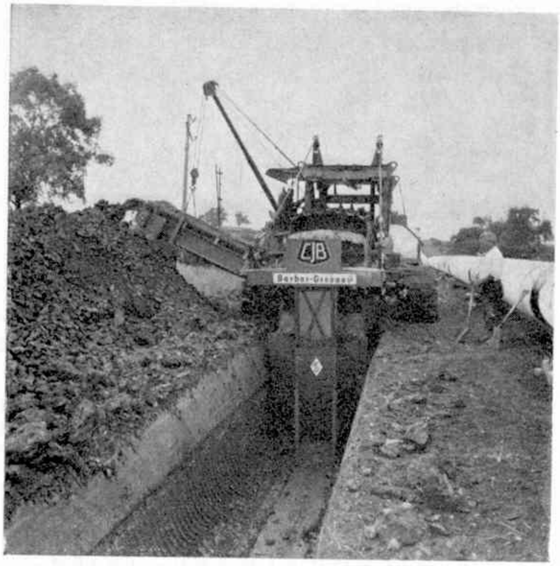
## CHARCOAL—*Continued from page 273*

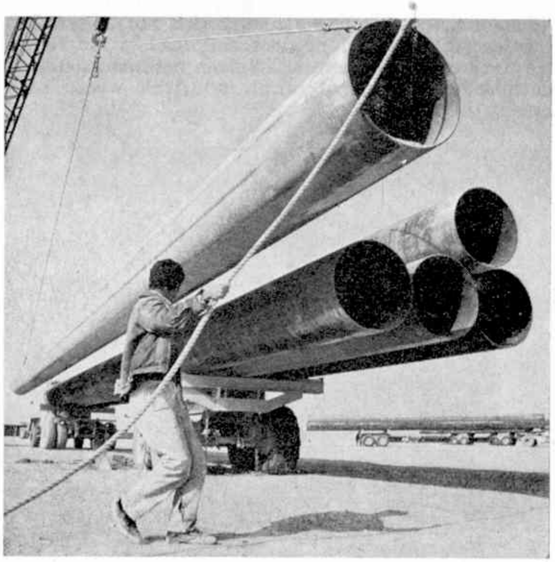
curious that home-produced pharmaceutical and other forms of charcoal are exported all over the world, yet the majority of medicinal charcoal is imported from the Continent and Scandinavia. This may be due to the fact that imported charcoal is considered better and has a more consistent quality, largely because foreign charcoal manufacturers are often able to make their product from one species of timber. British manufacturers usually have to rely on quantities of mixed hardwood species which limits the quality of their product.

But as the demand for charcoal continues to increase manufacturers in this country are undertaking research to improve their product, in particular with the carbonisation of "green sawdust". To work to full capacity efforts are also being made to obtain co-operation between timber growers, woodland owners and charcoal manufacturers to ensure a continual supply of suitable timber, particularly in one species. Some of the British charcoal manufacturers are confident their product is now as good if not better than the foreign imported product and that in the future they will be able to win orders from the manufacturing chemical and pharmaceutical industries where high quality is demanded.



**Some of the equipment required to recover by-products at a wood distillation plant.** (*Photo courtesy Forestry Commission*)



During this century pipelines have become a vital artery of industry for the transmission of gas, oils and liquid chemicals. Even coal and other solids can be conveyed over distances by this same economical method, though at the present time to a very much more limited extent.

Over the past ten or fifteen years the world's pipelines have been expanding on a vast scale. The total mileage of pipes of one sort or another in use today runs into millions, and is continually increasing. They range from local industrial systems and the water supply and sewage disposal networks serving towns and cities, to great international pipelines that carry crude oil and natural gas across continents and through mountain barriers like the European Alps and the Rockies of North America.

Looking into the future, pipelines might well become almost as important as roads and railways as a means of assisting development in backward countries. Even the laying of global pipelines under the oceans, linking the major oil and gas fields with cities and industries on other continents, is no longer regarded as just an oilman's " pipe dream ".

Pipeline engineering on the big scale grew up with the oil industry. It has reached the most advanced stage in the United States, where the entire movement

# LONG DISTANCE PIPELINES

**"Arteries of Industry"**

**BY W. H. OWENS**

of oil—from the crude well to the refined products terminal—is often made through a complex of connecting pipelines. Since the world's first long-distance pipe was laid from the new Pennsylvania oilfields to Pittsburgh, 60 miles away, in the 1870s, the American oil companies have built up a gigantic inter-State network long enough to encircle the world between seven and eight times.

In Canada, over 80 per cent of the oil and natural gas is produced in the western province of Alberta. The world's longest gas pipeline—about 2,400 miles—carries Alberta gas more than halfway across the continent, via the Prairies and the wilds of North Ontario to cities in Eastern Canada. Other long-distance pipelines go south, through the Rocky Mountains to supply gas to growing cities along the Pacific coast and also to markets in the U.S. Middle West. Pipelines radiating from Western Canada for transporting natural gas alone already total some 56,000 miles. Far to the north, an 800-mile pipeline is to be laid across the Alaska barrens to carry oil south from the recently discovered oilfields on the remote Arctic coast.

Here in Britain, where the coast tanker terminals are readily accessible to inland markets, we have no pipelines on the same scale. Nevertheless, the oil companies' network is growing steadily. Most important is the £8½ million Thames-Mersey Pipeline. This is 245 miles long, and links some of the biggest terminal oil installations on opposite sides of Britain, with intermediate regional distribution centres serving Greater London, Birmingham and Nottingham. Operated by a consortium of the leading oil companies, the pipeline carries nearly four million tons of oil a year.

Other oil pipelines include those linking deep-water ocean tanker terminals on the west coast—for example, Milford Haven and Finnart (Scotland)—with distant refineries. There are also long-distance pipelines running from Fawley Refinery, on Southampton Water, direct to London Airport and to Severnside near Bristol. The Fawley-Airport pipeline, completed in 1969, carries fuel oil which is too sticky for pumping just as it is. So the oil is pre-heated before it goes into the pipeline. To ensure that it reaches its destination as a free-flowing product, thermal insulation is provided throughout the entire route of 64 miles.

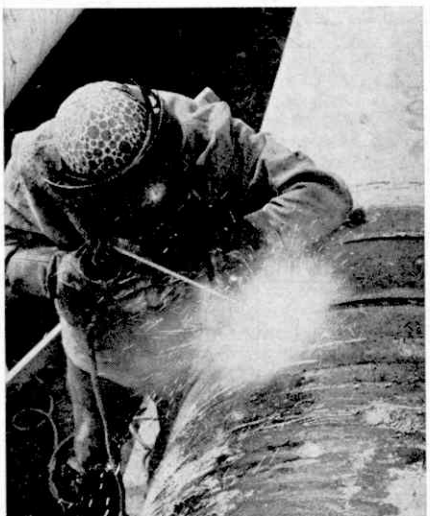
Britain's biggest pipe-laying programme has resulted from the discovery of North Sea gas. The Gas Council already has more than 1500 miles of large-diameter, high-pressure steel pipelines in operation or under construction, and plans to complete 2500 miles by 1975. A number of productive North Sea gas fields are supplying towns and industries via shore terminals at Bacton, in Norfolk, and in the Humber estuary at Easington, Yorkshire.

Four submarine pipelines have been laid and are in operation under the North Sea, and a fifth is under construction to harness supplies from a gas field some 60 miles off the Norfolk coast. Each of the four feeder lines from Bacton has an ultimate capacity of 1,000 million cubic feet of gas a day—or as much gas used by all Britain's 12½ million gas consumers on an average day before the North Sea discoveries. One of them is the 36-inch diameter high-pressure line running 106 miles from Bacton to Whitwell, near Stevenage, to supply North Sea gas to London and the South-East.

Pipelines do have a very great advantage over other forms of industrial development, especially in a small and densely populated country like Britain. They provide a highly efficient, silent service hidden under the ground. An extensive cross-country network can be laid without any loss or damage to farmland, or permanent disfigurement of the countryside.

Negotiations with landowners and farmers, across whose land a line will pass, begin months ahead of the pipeline construction. These cover the amounts of compensation payable, obligations of the pipe-laying contractors, and so on. Agreements always stipulate that the land will be restored to its original condition as quickly as possible. Within months of the laying of Britain's first natural gas pipeline, for example, crops were growing immediately above it.

Giant trenching machines used for laying North Sea gas feeder lines can dig at the rate of up to one mile of 7 ft. deep ditch every day. Welded pipelengths, each 40 ft. long and weighing nearly five tons, are handled from pipe distribution points by powerful side boom tractors of the largest type made. As each pipelength is welded, the weld is inspected by ultrasonic methods and shot radiograph tests to ensure that it conforms to the very demanding specifications for these lines which operate at pressures of 1,000 lbs. per square inch. Then the pipe is lowered into the trench which is filled in, the surface made good, and any repairs done to fences, gates and so on as may be necessary. (*please turn to page* 298)



**Opposite page, top to bottom, a trenching machine excavating for a North Sea gas pipeline, (CJB Pipelines Ltd.), finishing off insulation over a weld on the million gallon-a-day pipeline from Fawley Refinery to London Airport (Esso), and pipe lengths being loaded on a giant truck at Tobruk (BP).**

**Top, the glow in this pipe is from the welder nside joining two lengths of a Libyan pipeline.**

**Left, welding a section of the 36 in. line which carries North Sea gas from the Bacton (Norfolk) terminal 106 miles to Whitwell, near Stevenage. Right, a gas feeder main being measured up. (CJB Pipelines Ltd.).**

# SAND YACHTS

Sand yachting is an exciting sport which always attracts interest. Most clubs are on the coast, where large stretches of firm sand occur, and where the likelihood of a good breeze exists. Speeds of 50-60 m.p.h. can be achieved, so the sport can be certain to provide many thrills and some spills. Our larger model hails from Dunbar, just east of Edinburgh, where the Scottish Championships will be held this year, over last weekend in June. For those who would like to build something immediately, we also include plans for a smaller and simpler model, full size on the next two pages.

## Vonna by Richard Smeed

*(Full-size plans available price 15p inc. post from Meccano Plans Service, 13-35 Bridge Street, Hemel Hempstead.)*

This model is based on the D.N. class sand yacht mainly sailed at the local sand yacht club at Dunbar. As can be seen from the plan, its construction is fairly simple. The length of the model is 18 in. and it has a 16 in. mast with a 10 in. boom.

Construction begins with the main body, $\frac{1}{8}$ in. sq. balsa lattice work with a covering of 1/32 in. sheet top and bottom. The seat back is made out of $\frac{1}{16}$ in. sheet and is inclined backwards. Behind the seat the body is made up from two $\frac{1}{16}$ in. sheet formers glued in a 'T' shape and covered with 1/32 in. sheet. When this stage of the model is completed an 8 in. hardwood front axle can be cut and glued firmly to the underside of the body.

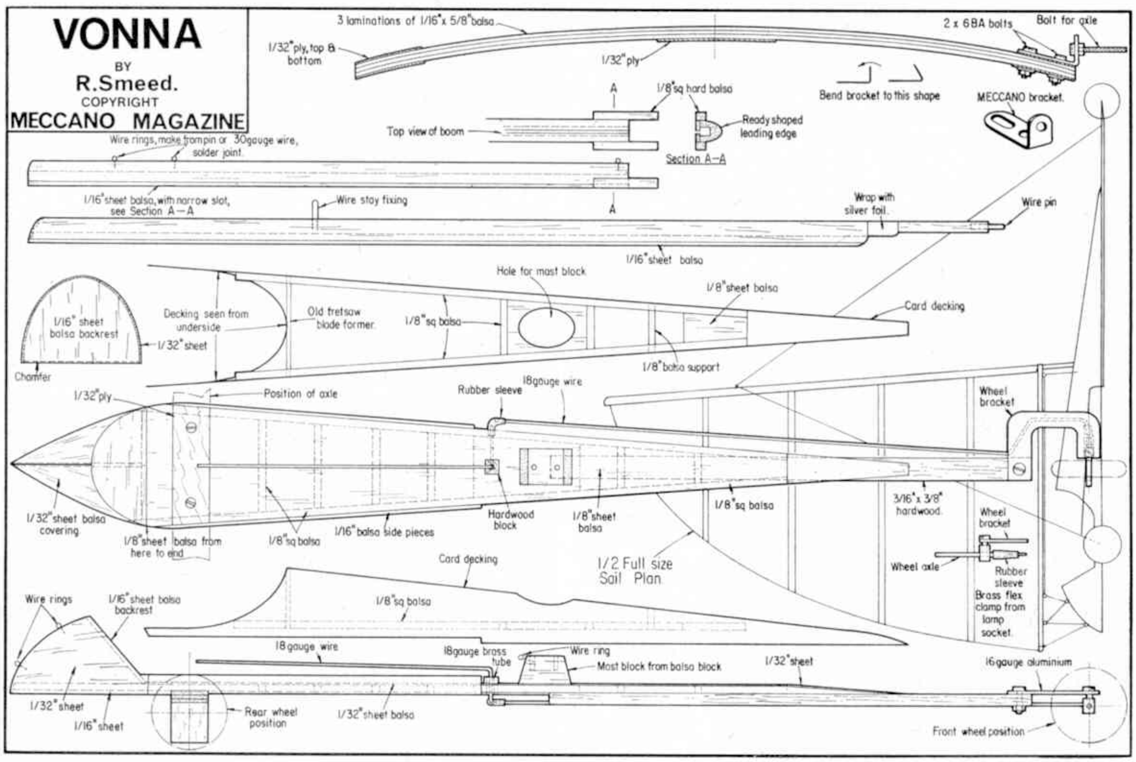
The back axle is formed from 3 strips of $\frac{1}{16}$ in. balsa $\frac{5}{8}$ in. wide and 12 in. long. They are glued together and while the glue is setting a slight curve is obtained by suspending the axle between two thick books and placing a suitable weight in the middle of the lamination. When dry the axle should clear $\frac{1}{2}$ in. above the ground. The axle is then fixed to the underside of the body by 2 10 B.A. nuts and bolts.

The wheelbrackets are made from small pieces of aluminium secured to the axle by 10 B.A. nuts and bolts. The actual stub axles themselves can be the same size bolts. The wheels are all approximately $1\frac{1}{4}$ in. diameter and can be salvaged from an old toy or bought as model car accessories (Meccano parts).

### Steering Assembly

The front wheel bracket is also made out of sheet aluminium cut into a 'U' shape large enough for wheel clearance. The stub axle is again a 10 B.A. bolt. This is passed through the centre of the wheel and is soldered in the hole of an old screw-clamp taken out of an old plug or other unused electrical appliance. The bolt should protrude about $\frac{1}{4}$ in. through the other side of the hole. The screw from the clamp is passed through a hole drilled in the aluminium bracket and is screwed into the top of the clamp.

The connecting rod is bent out of thin gauge wire. Copy the plan accurately here as wheel clearance is essential. The actual steering arm is made out of the same thin gauge wire bent to the shape on the plan. The steering arm, connecting rod, and axle need to be pivoted and this is simply done by cutting small pieces of rubber sheathing used on electrical wire and slipping these over the ends of the wire.



**Mast and Boom**

These are both made from wing leading edge, utilising its shape and slot. A thin strip of $\frac{1}{16}$ in. balsa is cemented over the slot and when dry a narrow slot is cut with a hacksaw blade throughout the length of the mast. The lower portion of the mast is cut to the shape shown and a small piece of wire is cemented into the bottom of the mast. A small piece of silver paper is cemented just under the step in the mast. This for protection from the boom on fullsize yachts but it is just decoration on the model.

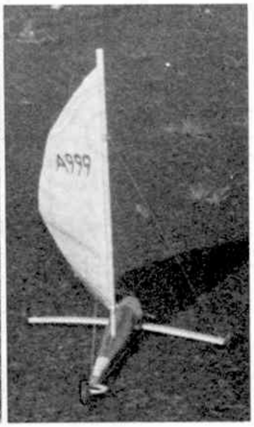
The boom is fashioned in a similar manner with two strips of $\frac{1}{8}$ in. square balsa cemented at one end to form a 'U' bracket, to locate the boom on to the mast.

The "decking" or "fairing" is an entirely optional extra. The usual D.A. class yacht does not have this, but designing the model, with a fullsize version in mind and having studied the yacht that won a recent National Championships held at Dunbar, I decided to make one that would be removable.

A frame is fashioned from $\frac{1}{8}$ in. sq. balsa and is pinned to the body of the yacht. A paper pattern can be made at first but the actual covering is thin cardboard. This is gently curved and is glued to the frame. An old fretsaw blade can be fashioned to suit as a former and is glued at the cockpit end of the decking. This can now be either glued to the body or a pin can be fixed to the frame and thus be pushed into the body of the yacht to enable the fairing be removed at any time. A hole is cut in the top of the covering to clear the mast.

**Sail and Rigging**

The rigging consists of three stays, 1 front and 2 side. Thin string or thick thread is utilised here; one end of each stay is fixed to the bolts on the wheel brackets and the other ends should have small wire hooks attached to them and these hook on to a wire loop glued into the mast about 1/3 of the length from the top of the mast. The stays should be adjusted so that the mast when erect should lean slightly backwards and the top of the mast should swing from side to side about the width of the yacht.


The method of sheeting in the sail on fullsize yachts is through six separate pulley-blocks, but pulleys in this case are just small "eyes" fashioned from thin wire and glued to the boom, mast and body.

The mast is supported by a small block of balsa cemented on to the body as shown on the plan.

Finally, the sail is made from a piece of nylon, terylene or cotton (there may be a suitable piece around the house) and is cut so that the boom when fixed to the sail clears the cockpit. The leach can be cut to a suitable curve joining the top of the sail and the bottom corner.

The sail is attached to the mast and boom by gluing a piece of string to the luff and the bottom of the sail. This enables the edges to be slid up the slot formed in the mast and boom. If the sail does not stay by friction it can be glued or pinned. Battens, fashioned from strips of 1/32 in. × $\frac{1}{8}$ in. cut to the correct length and stuck at 4 places on the sail, stiffen it and give better performance.

# SANDFLY

This is a simple, quickly made and inexpensive little model which will give quite a snappy performance on a smooth surface in moderate breezes. A school playground is the best place to run it, but ask permission first!

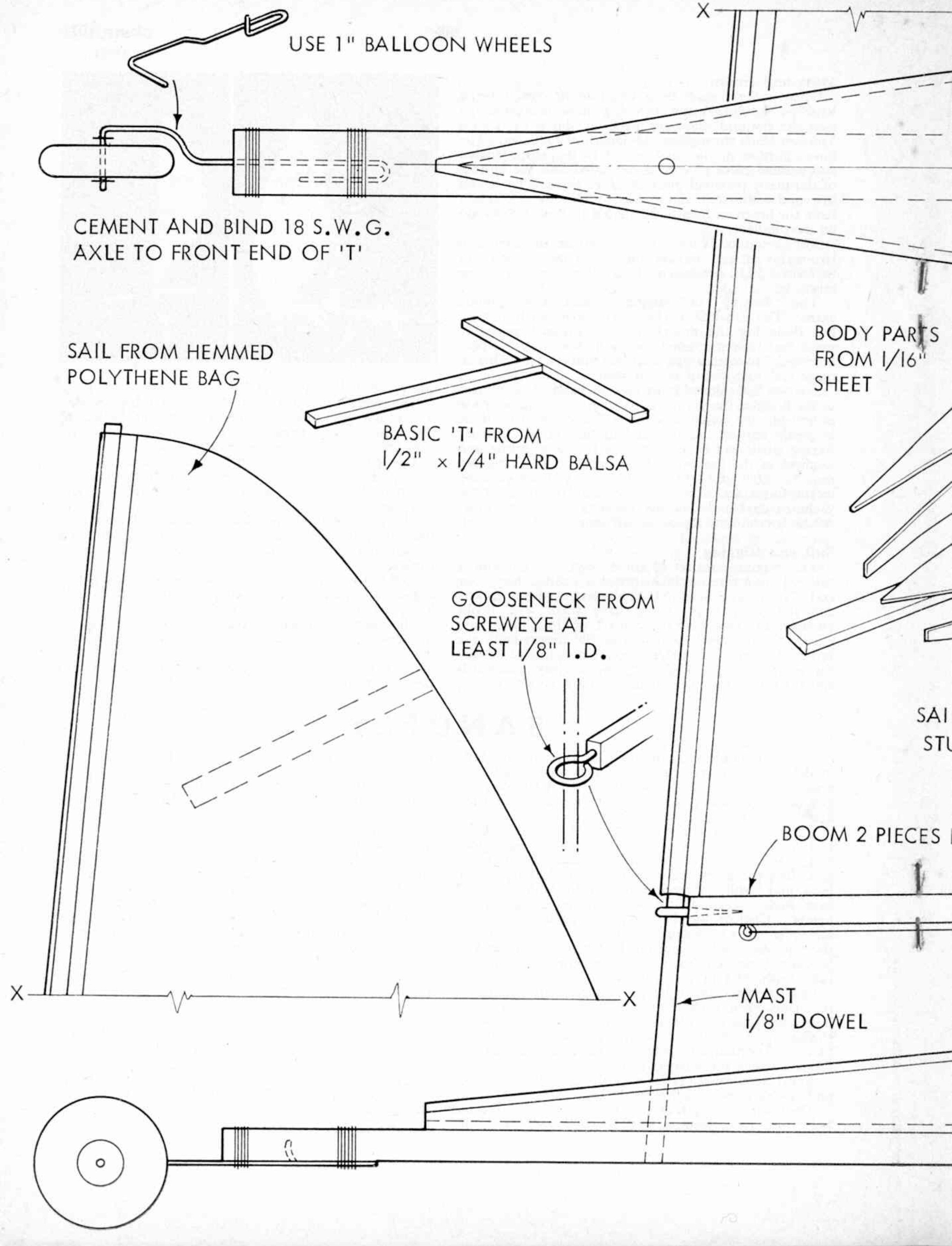
The base is a T shape cut from $\frac{1}{4}$ × $\frac{1}{2}$ in. hard balsa and cemented as shown. Trace and cut the body floor and cement to the T, fit the bulkheads B1 and B2, and then the sides. Leave these a little long at the back, and "roll" a curve into them by rolling a pencil over them, pressing it down with the palms of the hands. Cement in place, pinning while the cement sets, then cut a rectangle to fit the rear end. Sand over the top edges and cement on the top piece; the cockpit opening is best cut out after. Trim the top edges and sand flush, and fit the seat back.

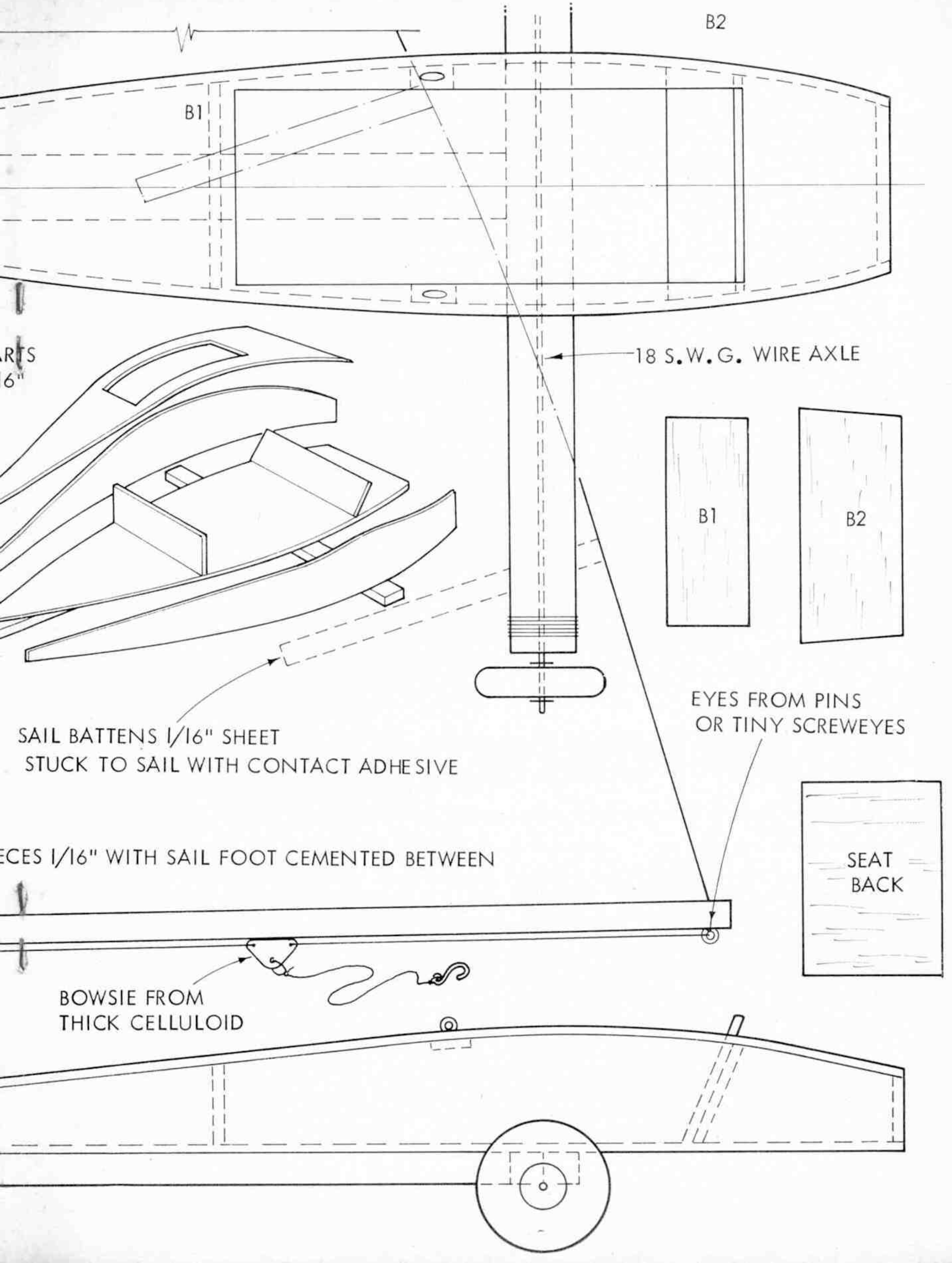
Cut the rear axle to length and bend the front axle to shape, then cement and bind the wires in place. The wheels are best fitted by soldering on a cup washer, sliding on the wheel, and soldering a second washer in place. Alternatively, roughen the wire with an old file and epoxy the washers in place.

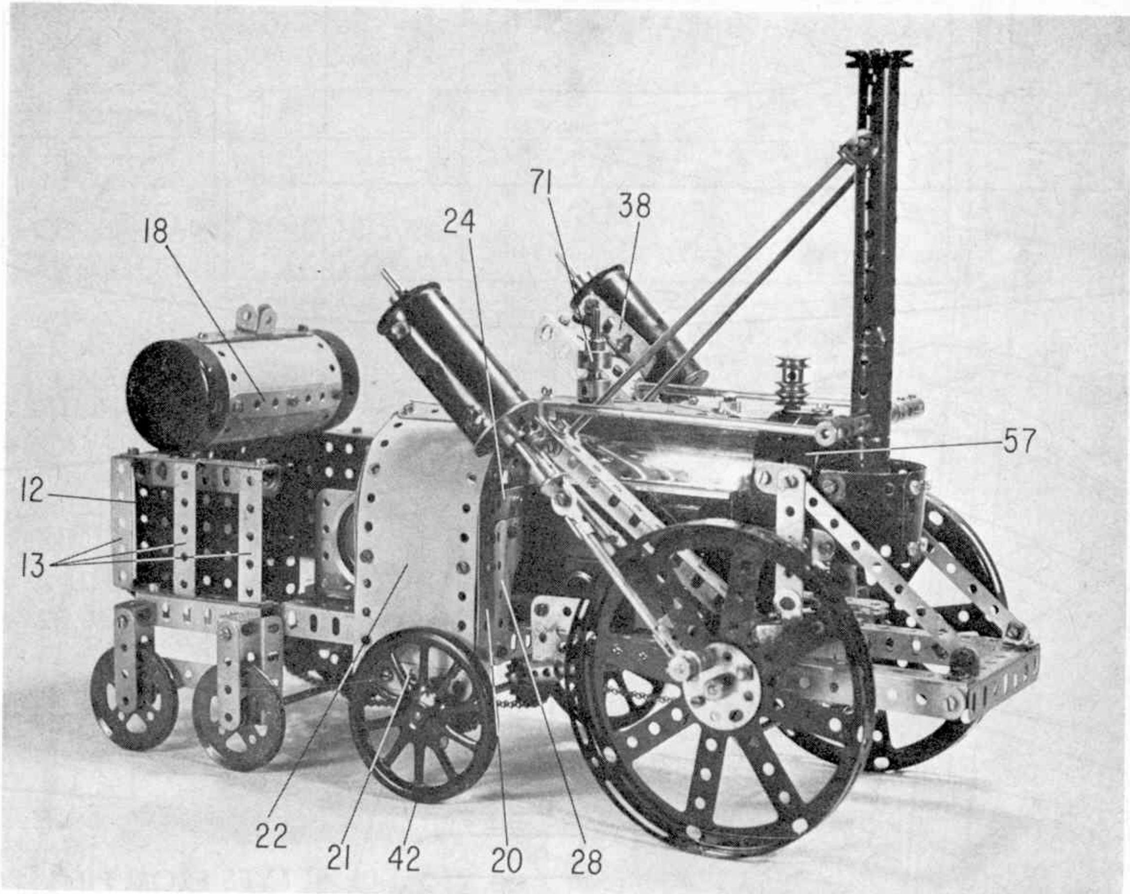
Apply sanding sealer (two or three coats) rub down and colour dope or paint to choice.

The mast is a length of $\frac{1}{8}$ in. dowel cemented into the body and base, leaning slightly backward. Cut the sail from a hemmed plastic bag so that the hem can be slid over the mast. Use two pieces of $\frac{1}{16}$ in. balsa for the boom, cemented together with the sail foot between them; pierce a few holes in the plastic to allow the cement to key the two balsa strips together. Carefully drill a hole in the mast end of the boom and screw in a screw-eye large enough to slip over the mast (it could be bent from wire), take it out again, squeeze cement in the hole, and replace the eye. Make two little loops from soft pins and cement in the same way, positions as shown. Cut a three-hole bowsie from celluloid, thread on a piece of button thread, and string between the two small eyes. Tie another piece of thread to the third hole and tie a little hook to the free end.

Slide the boom "gooseneck" and sail hem over the mast and put a couple of stitches through the top to prevent it sliding right down. If you fit battens to the sail, use contact cement. Fit an eye each side of the cockpit to hook the sheet on; if preferred, solder a wire across these eyes and hook the sheet to that. Adjust the sail position by sliding the bowsie along—you'll soon find where it needs to be for which course. For very breezy weather a small weight can be tied to the cross-bar next to each rear wheel—then watch it scoot!


USE 1" BALLOON WHEELS
CEMENT AND BIND 18 S.W.G.
AXLE TO FRONT END OF 'T'
SAIL FROM HEMMED
POLYTHENE BAG
BASIC 'T' FROM
1/2" × 1/4" HARD BALSA
BODY PARTS
FROM 1/16"
SHEET
GOOSENECK FROM
SCREWEYE AT
LEAST 1/8" I.D.
BOOM 2 PIECES
MAST
1/8" DOWEL
X
X
X


B2
B1
ARTS
16"
18 S.W.G. WIRE AXLE
B1
B2
SAIL BATTENS 1/16" SHEET
STUCK TO SAIL WITH CONTACT ADHESIVE
EYES FROM PINS
OR TINY SCREWEYES
ECES 1/16" WITH SAIL FOOT CEMENTED BETWEEN
SEAT
BACK
BOWSIE FROM
THICK CELLULOID




# STEAM-POWERED "ROCKET"

## 'Spanner' describes an historic model built by M.M. reader Roger Le Rolland

George Stephenson's steam locomotive, the "Rocket", along with the Battle of Hastings, the Magna Carta and the exploits of Napoleon Bonaparte, is a morsel of history which has been fully digested by every scholar. For the railway minded more particularly, it is not difficult to visualise a frenzied crowd throwing their prim hats and bonnets into the Autumn sky at the famous Rainhill Trials of October 1830, when the puffing "Rocket" streaked along a section of the Liverpool and Manchester Railway, at the terrifying speed of 15 mph!

Stephenson won £500 on that occasion, the prize offered by the directors of the Railway for the engine which would give the best performance on a level length of their track, a length situated at Rainhill Bridge, Lancashire—hence the title of the trials.

Sadly, the era of workaday steam locomotion has disappeared from this land forever, leaving a romantic vision which cannot be equalled by sophisticated, modern engines. Such machines as Stephenson's "Rocket" and its contemporaries marked the beginning of the railway age, an industrious, furious time which resulted in the establishment of a comprehensive railway system covering the entire country.

Mr. Roger Le Rolland of Stoke-on-Trent, Staffs, has captured something of the spirit of this pioneering age with a working model of the "Rocket" which, I feel, would make the Tyneside engineering wizard proud to behold. Not only does it look like his uniquely-shaped original, it also works just like it, in that it is actually powered by live steam as supplied by the Meccano Steam Engine.

The accompanying photographs show Mr. Le Rolland's original construction, as opposed to an M.M. re-built version, and for this reason we would like to pass on Mr. Le Rolland's apologies for the fact that some of the parts are not in mint condition. They have, he explains, seen years of service. Also, although the accompanying photographs are in black-and-white, it will be noticed from the shading of some of the parts that their colour is not compatible with

Meccano colours for those particular parts. The simple reason for this is that Mr. Le Rolland has re-painted some of his parts and, in a few isolated cases, has departed from "official" colours. Whatever the colours, however, the model itself is captivating.

As I have stressed on several occasions, one of the attributes of the Meccano Steam Engine is that its design enables it to be used not only as a power unit, but also as a strong, integral part of the parent model's structural framework, thanks to its large, rigid baseplate. In this case, the Engine provides a substantial section of the Rocket's chassis, but before completing the remainder of the chassis, the initial drive system should be assembled while there is still plenty of room to work.

The flywheel is first removed from the Steam Engine, then a 3 × 1½ in. Flat Plate 1 is secured to the side of the Engine baseplate, as shown, the rear end holes of the Plate coinciding with the third holes from the rear in the baseplate side. Bolted to the upper edge of the Flat Plate, one on top of the other, are a 1½ in. Strip, a Double Arm Crank 2 and a Double Bent Strip 3, all these providing bearings for a 2½ in. Rod held in place by a 2 in. Sprocket Wheel 4 and a Collar. A ¾ in. Sprocket Wheel 5 is fixed on the outer end of the Rod, then the flywheel is remounted on the Engine crankshaft. Sprocket Wheel 4 is connected to the Sprocket on the crankshaft by Chain.

Now bolted to the underside of the Engine baseplate, in the positions shown, are two 5½ in. Angle Girders 6 and a 4½ × 2½ in. Flat Plate, the forward securing Bolts in the latter case also fixing a 4½ in. Angle Girder 7 to the underside of the Plate. The vertical flange of this Girder is bolted to the vertical flange of rear Girder 6, while the sides of the Flat Plate are extended rearwards by two 5½ in. Angle Girders 8. Bolted between Girders 8 at each side are a 4½ × 2½ in. Flexible Plate 9 and a 4½ in. Angle Girder 10, the vertical flange of the latter extended upwards by a 3½ × 2½ in. Flexible Plate 11. A 3½ × 2½ in. Flanged Plate 12 is attached by Angle Brackets to each Girder 8, the end flange of this Plate also being bolted to Girder 10. The upper rear corners of the Plates at each side are connected by a 4½ in. Strip, which is also bolted to Flexible Plate 11.

Secured to the upper edge of each Flanged Plate 12 is a 3½ in. Angle Girder which is connected by three 2½ × ½ in. Double Angle Strips 13 to another 3½ in. Angle Girder bolted to the vertical flange of Girder 8. The Bolts fixing two of the Double Angle Strips to this lower Girder also fix a 3 in. Angle Girder 14 in place, a 2 in. Angle Girder 15 and a Double Bracket in turn being bolted to each end of the vertical flange of this Girder. Girders 15 are connected by a 3 in. Strip, while a 2 in. Strip 16 is bolted to the spare lug of each Double Bracket. The lower holes in Girders 15 at each side will later serve as bearings for the rear axles.

Bolted between the upper edges of Flanged Plates 12, in the position shown, is a 4½ × ½ in. Double Angle Strip, to which a 3½ in. Angle Girder 17 is fixed. Bolted to the free flange of this Girder is the water tank, supplied by a complete boiler, to which three Strip arrangements 18 are secured, one at the top, one at the front and one at the rear. Each arrangement consists of a 1½ in. Strip, a 2½ in. Strip and a 3½ in. Strip mounted one on top of each other, but note that two Double Brackets 19 are also bolted to the top of the upper arrangement to represent the filler-point.

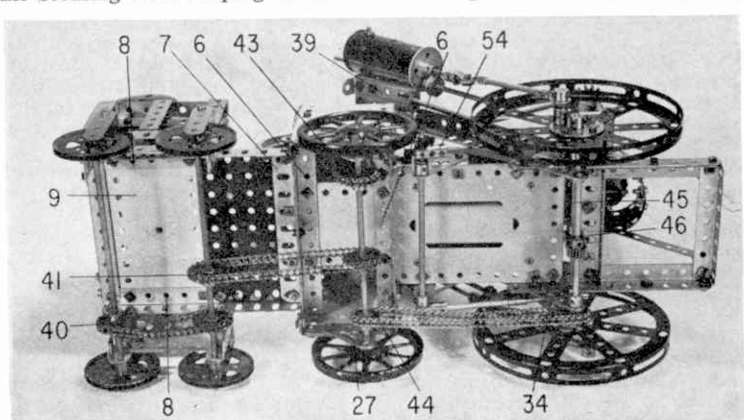
At this stage the Engine drive mechanism can be enclosed. Bolted to the ends of Angle Girders 6 at each side are two 3½ in. Strips 20, the Strips projecting one hole below the Girders. The lower ends of the Strips are connected by a 2½ in. Strip 21, attached by Angle Brackets, the securing Bolts helping to fix a 5½ × 2½ in. Flexible Plate 22 to the Strip, while the upper ends of the Strips are each extended by a 2½ in. Stepped Curved Strip 23. Note that the connecting Bolts, in the case of the forward extensions only, also fix a 5½ in. Strip 24 between the Strips at each side. In the case of the rear extensions, the ends of Stepped Curved Strips 23 at each side are connected by two 2 in. Slotted Strips 25, each Slotted Strip being spaced from the appropriate Curved Strip by two Washers on the shank of the securing ⅜ in. Bolt. The central Bolt fixing the two Slotted Strips together also holds a Hinge in position, a 2½ × 2½ in. Flat Plate 26 being bolted to this Hinge to provide an inspection cover for the drive mechanism. A handle for the cover is supplied by an electrical Contact Stud held by Nuts in the opposite edge of the Plate.

Flexible Plates 22 are curved round to follow the contours of Strips 20 and Curved Strips 23 and are secured to the Strips by Angle Brackets, suitably placed. The upper edge of each Plate is overlaid by a 2½ in. Strip.

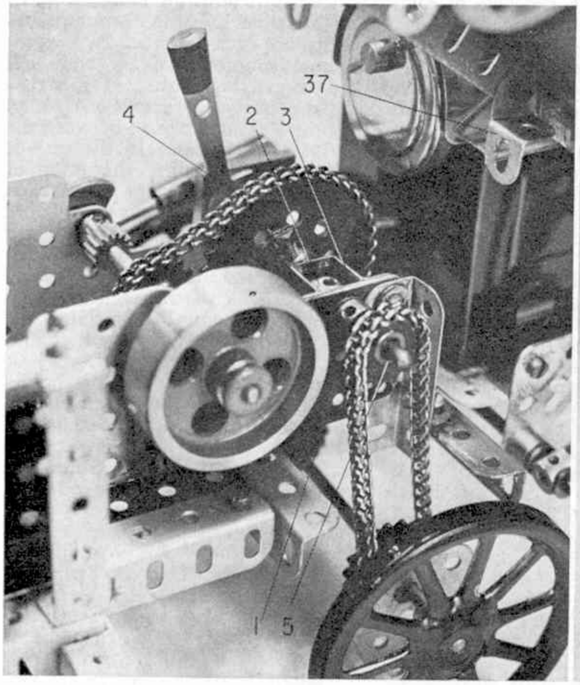
Bolted to each Strip 21 are two 1½ in. Corner Brackets 27, mounted one on top of the other, holes in these Brackets later providing bearings for another of the model's axles. Two Flexible Gusset Plates 28 are then bolted to forward Angle Girder 6 and attached to Strip 24 by Fishplates to complete the gearing enclosure.

The Engine baseplate is now extended eight holes forward at each side by two 5½ in. Angle Girders 29, the vertical flange of each of these Girders being overlaid by a 5½ in. Strip. The Girders are connected, through their end holes, by a 3½ in. Angle Girder 30, the securing Bolts also holding two Angle Brackets 31 in place,

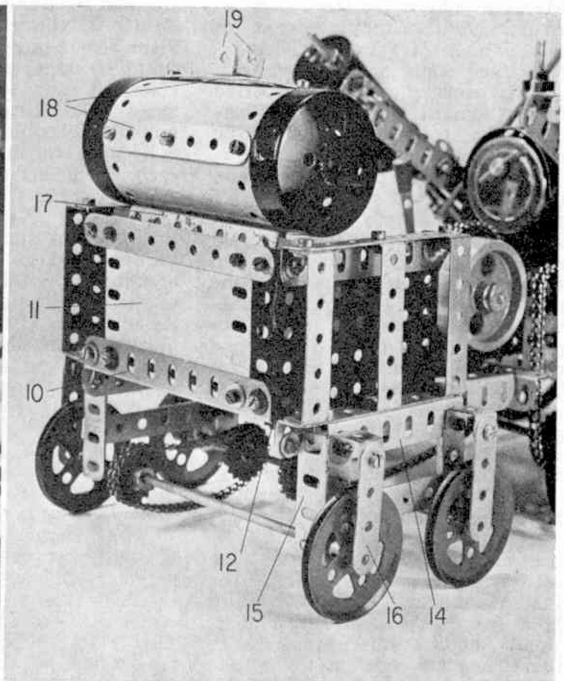
**Opposite: George Stephenson, the father of the locomotive, would be proud of this live-steam reproduction of his famous "Rocket", designed and built by Mr. Roger Le Rolland of Stoke-on-Trent, Staffs.**




**The value of the Steam Engine's strong baseplate which enables the Engine to be used as an integral part of the main structure is evident from this underside view of the "Rocket".**




A close-up view of the initial chain-drive system added to the Meccano Steam Engine, as it appears with the covering removed.




The tender of the locomotive, viewed from the rear. Note that the two rear axles are journalled in Angle Girders 15, only, and do not pass through Strips 16.

and through their seventh holes, by another 3½ in. Angle Girder 32. Bolted to this latter Girder is a 2½ × 1 in. Double Angle Strip 33.

Two 1½ in. Corner Brackets 34, one on top of the other, are secured to the side flange of each Angle Girder 29, the corner holes in the Bracket coinciding with the fourth hole of the Girder. These holes are left free to receive the front axle later. Bolted to the side flange of each Girder through the next hole forward is a 1 × ½ in. Angle Bracket 35, to the spare lug of which a 7½ in. Angle Girder 36 is attached by an Obtuse Angle Bracket. Towards its upper end, this Girder is connected to nearby Stepped Curved Strip 23 by a Corner Angle Bracket 37. Bolted to the upper end of the Girder is a Girder Bracket 38 to which a 2½ × ½ in. Double Angle Strip 39 is secured.

It is advisable at this stage to fit the axles and wheels. Four similar axles are each provided by a 6½ in. Rod, the two rear axles being journalled in the lower end holes of Angle Girders 15, where they are held in place by 2 in. Pulleys. The rear of these two axles is fitted with a 1 in. Sprocket Wheel 40 which is connected by Chain to a similar Sprocket Wheel on the foremost of the two axles. This latter axle carries a second 1 in. Sprocket Wheel 41 which is, in turn, connected by Chain to another 1 in. Sprocket Wheel fixed on a 6½ in. Rod journalled in the centre forward holes of Corner Brackets 27 and held in place by Spoked Wheels 42. Also fixed on this Rod is yet another 1 in. Sprocket Wheel 43 and a ¾ in. Sprocket Wheel 44. Sprocket Wheel 43 is connected by Chain to Sprocket Wheel 5 on the Engine drive extension, while Sprocket Wheel 44 is connected to a ¾ in. Sprocket Wheel fixed on the end of a 4½ in. Rod 45 held by a Collar in the lower corner holes of Corner Brackets 34. A ½ in. Pinion on this Rod meshes with another ½ in. Pinion on a 4 in. Rod journalled in the Corner Brackets, immediately above Rod 45. This second Pinion meshes in turn with a third ½ in. Pinion 46 fixed on the front axle which is supplied by a 6½ in. Rod journalled in the upper corner holes of the Corner Brackets and held in place by Collars.

Each of the main driving wheels is provided by a Hub Disc 47, to the centre of which an 8-hole Bush Wheel is bolted. Secured to the face of this Bush Wheel is an Adaptor for Screwed Rod, on the shank of which five Washers and a Rod and Strip Connector are loosely mounted, being held in place by a Collar. Fixed in the Rod and Strip Connector is a 2½ in. Rod 48, on the other end of which another Rod and Strip Connector is carried, the latter Connector being pivotally connected to an End Bearing 49 fixed on the end of a Keyway Rod. This Rod slides free in the boss of a 1⅛ in. Flanged Wheel wedged in the lower end of a Cylinder 50 bolted to Girder Bracket 38. Another Flanged Wheel is wedged in the upper end of the Cylinder, the whole unit, of course, representing one of the two driving cylinders present on the original Rocket.

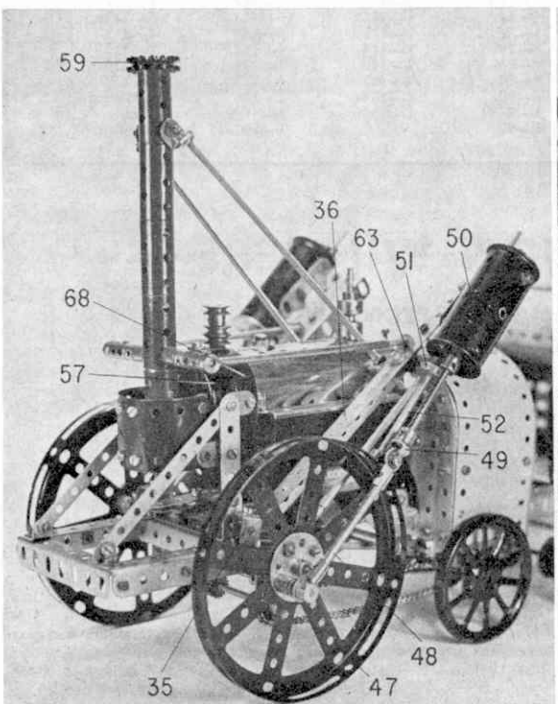
Held by a Collar and a ½ in. Pulley with boss 51 in one of the holes in the face of the Flanged Wheels is a 6½ in. Rod 52, on the lower end of which a Collar is fixed. This arrangement does not serve any practical purpose on the model, but is representative of one of the features of the full-sized original.

Now bolted to each side of the Engine baseplate, in the position shown, is a 1½ in. Angle Girder, to the vertical flange of which another 1½ in. Corner Bracket 53 is bolted. Held by Collars in the lower corner holes of this Corner Bracket at each side is a 5½ in. Rod, on each end of which a Coupling 54 is held by a Spring Clip, the Coupling being spaced from the Spring Clip and from the nearby Collar by a Washer in each case. Fixed in the longitudinal bore of the Coupling is a 4½ in. Rod, some 1½ in. from the other end of which a Right-angled Rod and Strip Connector is fixed. Lock-nutted to the lug of this Connector is a second Right-angled Rod and Strip Connector 55 fixed on the end of a 5 in. Rod, free to slide in the forward lug of Double Angle Strip 39. A sliding movement is imparted to this Rod by the action of a Collar (mounted, along with four Washers, on a ¾ in. Bolt 56 fixed to the inside face of the main driving wheel) knocking against the 4½ in. Rod held in Coupling 54.

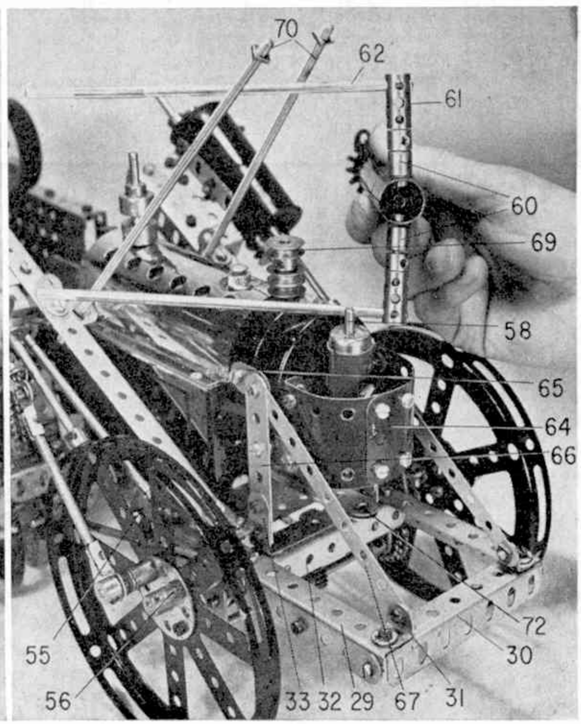
The chimney can next be built up from five Sleeve Pieces, connected together by Chimney Adaptors. The lowest Sleeve Piece is mounted on two 1½ in. Screwed Rods held by Nuts in a Boiler End 57. The upper of the two Rods passes through the centre hole in the Boiler End and also secures a Chimney Adaptor to the inside centre of the Sleeve Piece. An Adaptor for Screwed Rod 58 is bolted to the top of this Chimney Adaptor, the shank of the Adaptor then being extended upwards by a 4½ in. Screwed Rod attached by a Rod Connector. This Screwed Rod projects through the Chimney Adaptors connecting the remaining Sleeve Pieces together, Nuts being tightened against the Chimney Adaptors to hold them rigidly in place. It will be found that the Screwed Rod projects a distance of approximately ¼ in. above the upper Chimney Adaptor which connects the first and second Sleeve Pieces. A Collar is screwed by one of its threaded bores on to this protruding end, then a Multi-purpose Gear 59 is tightly secured to the top of the Chimney by a 1⅛ in. Bolt screwed into the other tapped bore of this Collar.

Bolted to the second Sleeve Piece from the lower end of the chimney are two Adaptors for Screwed Rod 60, each spaced from the Sleeve Piece by a Washer. A Collar and a Coupling 61 are added to the shank of each Adaptor, a 4½ in. Rod 62 being carried in the end transverse bore of the Coupling. This Rod is extended, via a Rod Connector, by a 1 in. Rod which will later be inserted into the spare hole of an Obtuse Angle Bracket 63 bolted to Angle Girder 36 through its sixth hole down.

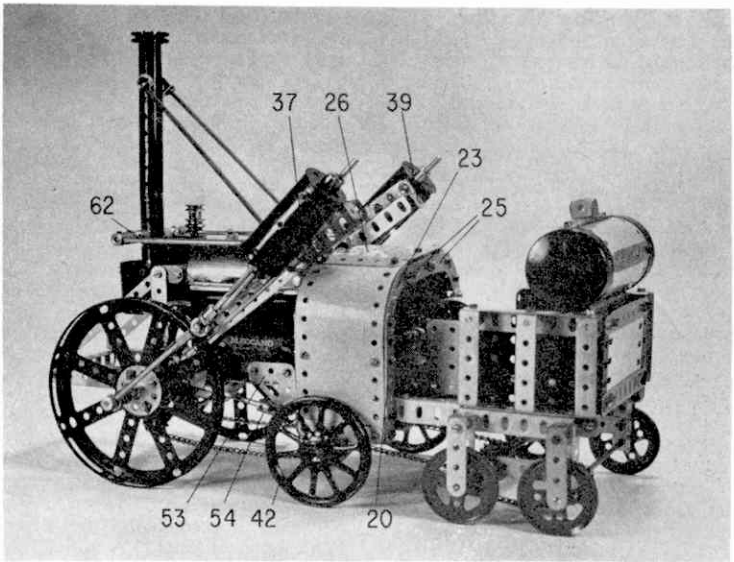
The base of the chimney is enclosed behind a 4 × 1½ in. compound flexible plate, 64, built up from two 2½ × 1½ in. Flexible Plates curved to shape and attached to Boiler End 57 by Angle Brackets. Bolted to each side of the Boiler End are a Fishplate 65, a 4½ in. Narrow Strip 66 and a 3 in. Strip 67, the Fishplate being spaced from the Narrow Strip by a Washer. Another Fishplate is bolted to the top of the Boiler End, then a second Boiler End 68 is fixed to the Fishplates to fit snugly against the first Boiler End. Note that a ¾ in. Bolt, shank upwards, is used to connect the second Boiler End to the upper Fishplate, two ½ in. loose Pulleys and a ½ in. Pulley with boss 69 being added to the shank of the Bolt, as shown. The lower corners of compound plate 64 are connected to Strips 67 by Fishplates, the latter being spaced from the Strips by three Washers on the shank of each securing ⅜ in. Bolt, then the whole assembly is mounted in position in front of the Steam Engine Boiler by bolting Strips 67 to the lugs of Double Angle Strip 33 and by bolting Narrow Strips 66 to Angle Brackets 31. Boiler Ends 57 and 68, of course, serve as




A close-up view of the front end of the model showing the assembly of the imitation drive cylinders and connecting rods.




In this close-up view of the front of the model, the chimney has been removed to show the fixture to which the upper Sleeve Pieces are attached.




Another general view of the "Rocket" showing the high standard of realism which Mr. Le Rolland has managed to achieve without becoming involved in unnecessary complication.

a false extension to the boiler of the Steam Engine.

With everything in position, the earlier-mentioned Rods carried in Coupling 61 are inserted into Obtuse Angle Brackets 63, further chimney-stays being provided by two 8 in. Screwed Rods 70, held by Nuts in Angle Brackets bolted to Angle Girders 36 and in further Angle Brackets bolted to the upper Sleeve Piece in the chimney. The final touch is supplied by a Socket Coupling 71, carrying an Adaptor for Screwed Rod, which is fixed on the brass cap protruding from the top of the Steam Engine boiler, towards its rear end.

Having built Mr. Le Rolland's Rocket, it will be found that the extended forward end of the Steam Engine makes it difficult to fit the methylated spirits burner into the firebox of the Engine. This problem can be easily overcome by simply extending the handle of the burner with 2½ in. Strips 72. It is important to stress, incidentally, that all moving parts of the model—particularly the imitation cylinder connecting rods—be carefully adjusted to ensure perfectly free-running. With everything in order, the model will operate extremely well and give a magnificent impersonation of the real thing. The only thing to remember is that the Steam Engine, being a genuine working unit, gets very hot and must be treated with due respect.

**PARTS REQUIRED**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3—2 | 2—9c | 2—15 | 2—24 | 2—55a | 5—96 | 2—161 | 2—192 |
| 1—2a | 5—9e | 3—15a | 3—26 | 19—59 | 3—96a | 1—162 | 2—201 |
| 7—3 | 2—9f | 1—15b | 1—27f | 1—62b | 3—111 | 2—162a | 4—212 |
| 4—4 | 7—10 | 2—16a | 2—35 | 4—63 | 1—111a | 5—163 | 4—212a |
| 10—5 | 6—11 | 1—16b | 1—45 | 1—72 | 1—111d | 5—164 | 3—213 |
| 4—6 | 28—12 | 2—18b | 1—46 | 2—79 | 1—114 | 2—166 | 2—216 |
| 4—6a | 2—12b | 2—19a | 8—48a | 1—80b | 2—118 | 1—171 | 2—230 |
| 2—8b | 4—12c | 4—20 | 1—48c | 2—81 | 10—133 | 6—173a | 2—235 |
| 6—9 | 6—14 | 4—20a | 2—53 | 4—90a | 1—154a | 2—188 | 1 Meccano |
| 2—9a | 1—14a | 3—23a | 1—53a | 1—94 | 1—154b | 1—190a | Steam |
| 7—9b | | 2—23b | | 1—95 | | 1—191 | Engine |

# CAR COMPETITION WINNERS

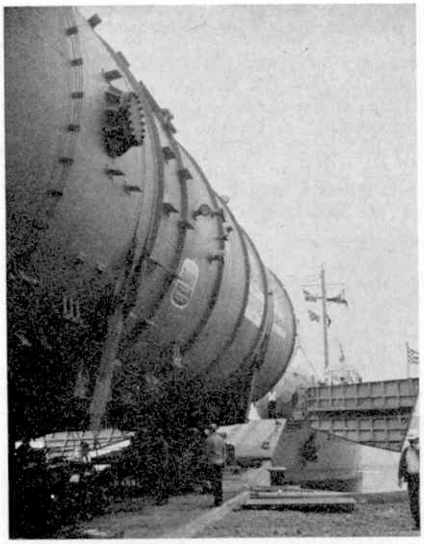
The postal strike rather upset our monthly Dinky silhouette competition; only 25 correct identifications were made of the March silhouette (Mercedes Benz 250 SE, Dinky No. 160) and we didn't have one in April due to the post difficulties. May, however, saw the entry back to normal; the car was the Alfa Romeo 33 Tipo Le-Mans (Dinky No. 210).

## MARCH PRIZEWINNERS

P. Sims, Southampton; C. Donne, Chigwell, Essex; Roger Whiteman, Nottingham; Allan M. Cookson, Blackpool; M. Aggleton, Richmond, Surrey; Geoffrey Hughes, Northumberland; Raymond Levy, Manchester 22; Chris Stokes, Sanderstead, Surrey; Andrew Lewis, Co. Dublin; M. Robsin, Highcliffe, Hants; Nicholas Mitchell, Derby; Philip Northway, Dunfermline; David Edwards, Crawley, Sussex; David Martin, Hatch End, Middx.; John Runberley, Huddersfield; Stephen Sinclair, Liverpool 8; A. Peacock, Hertford; George Avery, East Putney; Peter Kent, London; Richard Newsome, Market Drayton, Salop; Brian Martin, Glasgow; A. Yarwood, Macclesfield; J. Campbell, Battersea; Paul Goddard, Barnstaple; K. A. G. Mackenzie, Truro.

## MAY PRIZEWINNERS

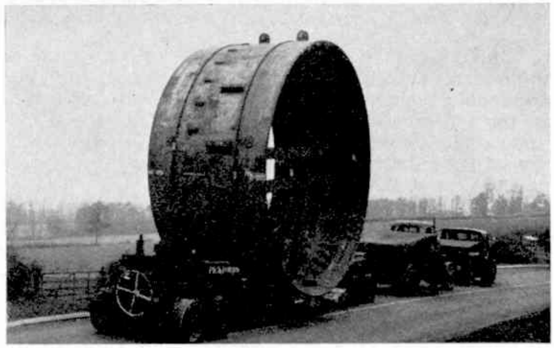
T. J. Moore, Crowborough, Sussex; M. Reed, Hemel Hempstead; Paul Richardson, Cleckheaton; J. M. C. Mouat, Shenfield, Essex; James Morton, Sheffield; J. Flynn, Newbury; David Kirk, Leicester; David Peat, Aldershot; Mark Gilbert, Newark; W. R. Kerswell, Dorchester; J. Whittaker, Lichfield, Staffs; John Apps, Gerrards Cross, Bucks; William J. Vevers, Musselburgh, Midlothian; D. Lee Williams, Loughborough; David Sorrell, Chelmsford; K. Cowley, Sheffield; T. Bolt, Herefordshire; A. Sartain, Wiltshire; Neill Cudlip, Redruth, Cornwall; C. R. Weston, Nottingham; Richard Parkin, Hertford; C. S. Thompson, Kent; Kim Fullbrook, Braintree, Essex; Martin Pink, Surbiton; Peter Glynn, Birmingham; A. Boston, Bingley, Yorks; Ian Watts, Aylesbury; L. Glover, Yorks; Adrian Williams, Stratford-upon-Avon; Simon Cross, Ipswich; Nicholas Hudis, Ipswich; M. Denning, Epsom; Peter Fisher, Cannock, Staffs; David Abbott, Epsom; Simon Chandler, Royston, Herts; Nigel Dixon, Folkestone; Melvin Stamp, Reading; Ian Shergold, Reading; Nigel Harding, Cheshire; Robin Ashworth, Hull; Norman Tamblin, East Lothian; R. G. Thomas, Bristol; Matthew Claridge, Melrose; James W. Rowe, Camberley; William Yates, Oxfordshire; J. S. Napper, Alton, Hants; Andrew Farren, Coventry.



# OUTSIZE TRANSPORT

**The movement by road of abnormal indivisible loads**

By Trevor Holloway



IT is expected that by the time this article is printed the heaviest-ever one-piece load to be transported by road in Britain will have made its journey. The load weighs about 307 tons. Preparations are also in hand to move five other loads of similar weight. Even heavier loads are expected by the heavy haulage specialists in the near future.

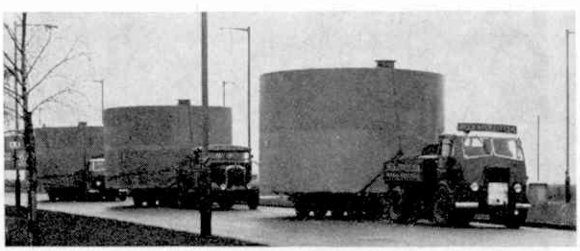
The motorist who finds himself boxed in behind an abnormal load probably mutters rude things about heavy haulage, but the truth is that without this highly specialised service many a vital industry would be hopelessly bogged down and our export trade would be seriously handicapped.

The question is often asked: "Why not transport these abnormal indivisible loads by rail?" The answer is that although excessive weight does not greatly worry the railways, excessive *bulk* does. Load gauge limits on our railways are much as they were a century ago. Tunnels, bridges and trackside apparatus provide obstacles which only the entire rebuilding of our rail systems can eliminate. Actually, there is even less clearance on some lines today than there was a generation ago, owing to the installation of ground-level signalling apparatus, additional island platforms, and so on.

Conveyance by road is the only alternative—but the majority of roads in Britain came into existence when this country was largely an agricultural one and many are narrow and winding and carried across streams and rivers by bridges of which a large number have remained unaltered for centuries. Many of our more modern roads (motorways excepted) were primarily designed to carry a large volume of normal traffic safely and speedily—certainly not the 100-ton-plus loads of the present day.

The crux of the problem is this: our scientists and engineers can produce the heavyweight plant which industry urgently needs, but our roads have not kept abreast of engineering development. How to deliver the goods can be a bigger problem than making them!

Maybe you have heard the story of the home handyman who made his wife a fine wardrobe and then found it was too large to go through the bedroom door; our engineering firms have to be careful not to fall into a similar trap. Before they accept an order for an outsize or heavyweight indivisible piece of equipment they must first be certain they could deliver it when made.



**Top left, unloading a 101 × 23 ft. 238 ton carbon steel chemical reactor, shipped from Italy on the 1100 ton freighter *Brunneck*.**

**Top right, a load like this is too bulky to go by rail! Above, these giant tanks, 20 ft. diameter and 14 ft. high, travelled through the heart of London en route to Portsmouth. Right, 270 ton generator transformer travelling from Edinburgh to Longannet Power Station, Fife.**

**Left, a Scammell Contractor tractor with a 300-ton nett load capacity trailer carrying a 185-ton transformer.**

Would it not be more sensible to despatch some of these giant loads in smaller pieces ? One of the chief arguments against this is that after being reassembled at the customer's site, it would be difficult, if not impossible, to test the equipment adequately. This can only be done efficiently by means of the complex testing gear at the place of manufacture.

Planning the movement of an abnormal load is often a long and complicated process, covering a period of perhaps 18 months. Sometimes as many as 60 authorities, each with rights to safeguard and services or property to protect, have to be consulted.

Certain legal obligations have also to be observed. The haulier must indemnify highway and bridge authorities against damage if the total load weighs more than that permitted under normal traffic regulations. These authorities must also be given advance warning of the date and time the load will be passing through their particular sectors.

The maximum weight (trailer and load) which may legally be moved on roads in Britain is 150 tons. For loads in excess of this weight it is necessary to obtain

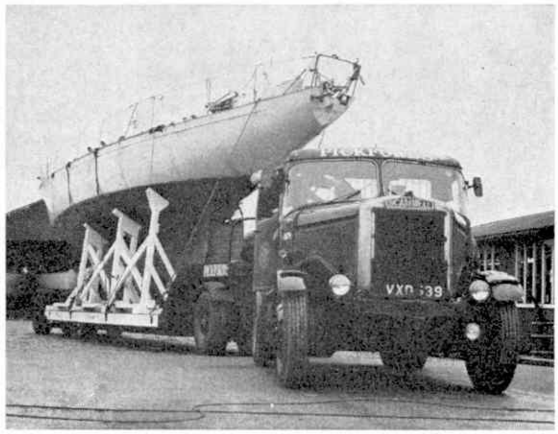
**Motor vessel *Countess of Breadalbane*, 90 tons, en route through Inverary from Loch Awe.**

the special authorisation of the Minister of Transport. Incidentally, the overall width of the load may not exceed 20 ft. and overall length may not exceed 90 ft. without special permission.

Every inch of the route must be surveyed and note taken of the width and strength of bridges, height of overhead cables, the angle of sharp bends, and so on. This first survey may be made weeks or months before the load sets off, so a second and last-minute survey has to be made in case any obstructions such as new lamp standards, traffic islands, etc., have appeared along the route.

Weak bridges have to be shored up, verges may have to be strengthened, tree branches lopped, and sometimes it is necessary to lower the road surface under a bridge in order to give the necessary headroom.

Unsuitable roads often make it necessary for a load to make a long detour. A typical example was when a 125-ton stator had to be delivered to a site less than 20 miles from its place of manufacture. The only practical route entailed a detour of 100 miles ! A low railway bridge at Nethercleuch and a weak one at



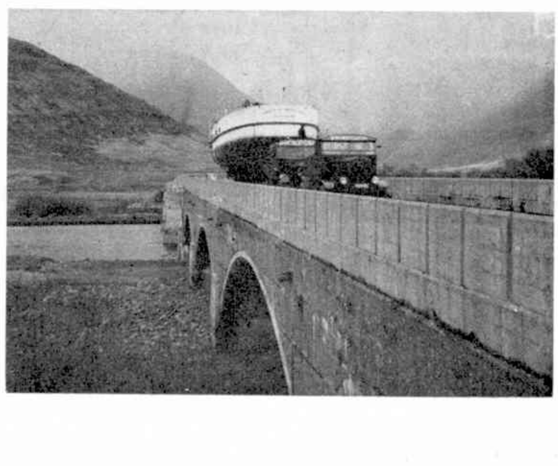
**A much-travelled vessel, *Gipsy Moth IV*, was taken by road for exhibition at many places.**

Beattock have often added 87 miles to the 198-mile journey from Manchester to Glasgow.

When the route has been finally agreed, it is written out in great detail—in places almost yard by yard. Among those who receive copies is the man in charge of the vehicle crew. He may know every inch of the road from previous journeys, but the smallest diversion from the chosen route, or the neglect of a single precaution, might be calamitous.

The heavy haulage men had one of the trickiest jobs on record when transporting an 80-ton, 102 ft. long steel fractionating tower across London to the North Circular Road. At one point, clearance between the load and houses on either side of the road was only a quarter of an inch !

Another exacting operation was when British Railways decided to transfer their 90-ton motor vessel, *Countess of Breadalbane* from Loch Awe, Scotland, to a new sphere of duty on the Clyde.



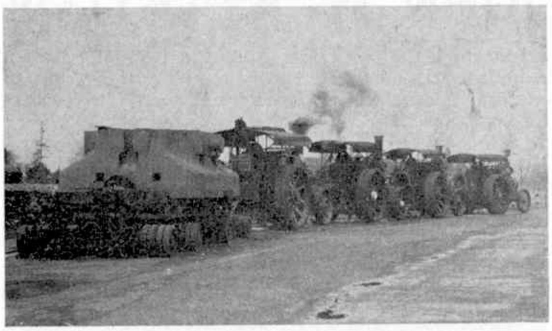
***Countess of Breadalbane* on her journey. Not many ships this size cross this bridge !**


**A boiler drum 120 ft. long and 240 tons nett from John Thompson Ltd. being taken to a Wolverhampton railway station.**

First, the vessel was brought close inshore, then manoeuvred onto two 16-wheel bogie trailers submerged in the shallow water. The vessel was then winched ashore and up a steep gradient to the road. Then, hauled by two heavy-duty tractors, the *Countess* moved off at a steady 5 m.p.h. toward Loch Fyne, some twenty miles distant, which was the nearest point of access to the sea.

On arrival, the loading procedure was reversed—the vessel was gently coaxed back into the water and floated off her bogies. Many Scottish folk will never forget the Sunday morning a ship " sailed " past their front doors !

Great advances have been made in recent years in the design of carrying trailers. One of the largest has 64 tyres, the wheels being of the oscillating type,



**Old way—four steam traction engines hauling a giant casting.** (*Photo, Pickfords Ltd.*)

which means that every individual wheel can accommodate itself to irregularities in the road surface. Pickfords are currently using trailers with a net load capacity of 300 tons.

It is interesting to note that two of Pickford's largest trailers are fitted with air-cushion equipment, utilising the hovercraft principle. This air-cushion spreads the weight of the load over a larger area of the road surface. Many loads could not be moved if this system were not available, unless considerable sums of money were expended in strengthening bridges.

Despite the slow speed, the frequent stops to let traffic pass, and meal breaks for the crew, a load will often cover 45 miles or more in a working day. In most instances the crew consists of between five and nine men, all highly skilled. Team spirit among the crew is vital, for the work is extremely exacting and demands intense concentration and infinite patience.

The heavy-duty tractive units in use today are often rated at 240 h.p. It is not uncommon for two such units to head a load with a third pushing at the rear. A communications system links the drivers in order that gear-changing and braking, etc., may be synchronised.

Despite its greater efficiency, heavy haulage has lost some of its glamour. In the early days it was a fine sight to see three or more giant steam traction engines heading an outsize load.


**Largest load at time of writing on British roads was this 270 ton transformer on its 85 ton transporter.**

The industry still recalls with pride that transport history was made shortly before the war when the (then) world's largest bulk load was brought to London from Annan, Scotland. It was a giant steam accumulator weighing 90 tons and measuring 70 ft. in length and 12 ft. in diameter. Hauled by three Fowler 10 m.p.h. steam traction engines, the mammoth load crept southwards on its 325-mile journey at an average speed of 2 m.p.h., taking eighteen days to complete the trip. The load was carried on two 16-wheeled 32 solid-tyred bogies. What a thrill such a sight would be to present-day traction engine fans !

**Sharp bends and icy roads are only two of the problems faced by the heavy haulage experts.**

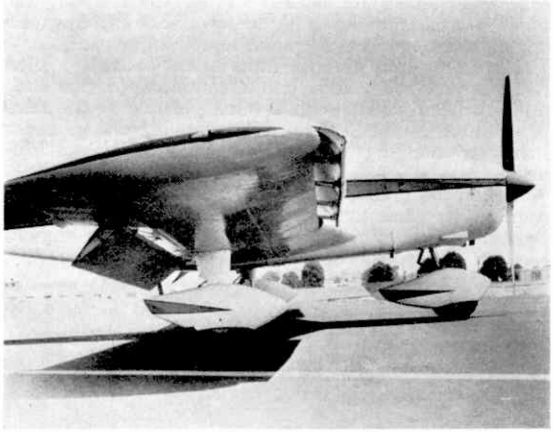
### Challenge for America's Big Three

Since the war the lightplane market has been dominated by America's " big three " manufacturers, Beech, Cessna and Piper. Latest newcomer to try competing with them is Cook Aircraft Corporation of Torrance, California, with a neat little four-seater named, appropriately, the Challenger.

At first glance it looks rather like a Piper Cherokee, but there are important differences. For less than $10,000 (£4,100) the owner of a Challenger gets a roomy all-metal aeroplane that cruises at up to 145 m.p.h., will slow-fly at a mere 50 m.p.h., covers 16 miles on a gallon of motor-grade petrol, and is strong enough for aerobatics when carrying only two persons.

Key to its low cost is that the aircraft was designed from the start for mass production, using automatic

# AIR NEWS by JOHN W. R. TAYLOR



riveting machines. The number of parts needed to build it has been kept to a minimum, and the use of complicated metal-to-metal bonding and costly, special materials has been avoided completely. Safe slow-flying ability is ensured by wing leading-edge slats, of the kind fitted to the Sabreliner business jet, which extend automatically when speed drops sufficiently for the Challenger to exceed an angle of attack (nose-up attitude) of 8 degrees.

Another big advantage for the private owner is that this lightplane can be operated from quite small airfields. The combination of leading-edge slats and slotted trailing-edge flaps help it to take off in only 207 yards with a full load and it will land in 135 yards. Powered by a 150 h.p. Lycoming O-320-E2A engine, the Challenger will fly nearly 700 miles at a cruising speed of 125 m.p.h. Maximum permitted speed in a dive is 185 m.p.h.

The prototype flew for the first time in May 1969 and, with a second machine, was expected to gain its certificate of airworthiness from the Federal Aviation Administration by the time you read this copy of *Meccano Magazine*. Cook Aircraft already have orders for 20 production Challengers.


### World Record for Cessna

While Cook Aircraft plan enthusiastically to build their first 20 aeroplanes, the biggest of their competitors —Cessna Aircraft Company—is well on the way to delivering its 100,000th aeroplane. No other company in the world can match such a total. In fact, Cessna has headed the production league for single-engined aircraft every year since 1956.

The latest milestone was passed in December, when the company delivered its 95,000th aeroplane—a twin-engined Model 421 Golden Eagle business transport which went to Energoinvest of Yugoslavia. The total was made up of 80,863 single-engined machines and 14,137 multi-engined types. Well over half of the total were sold in the 'sixties, and Cessna is now

Top, the new Cook "Challenger" four-seat lightplane, offering competition to America's " big three " lightplane makers. Its short-field performance is greatly assisted by the wing slats and flaps seen in the second picture.

Above, a Los Angeles County Fire Dept. 204B helicopter dropping fire-fighters in mountains.

Left, Cessna's 95,000th aircraft, a 421 Golden Eagle business transport sold to a Yugoslavian company.

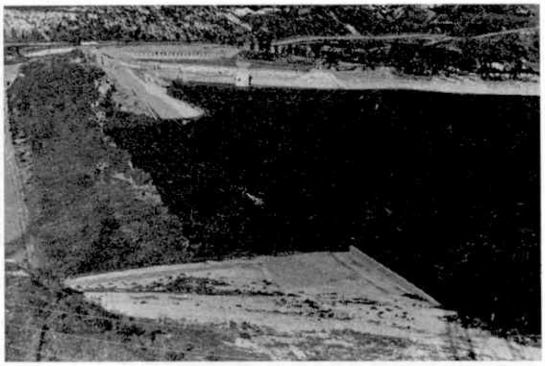
marketing a total of 39 different commercial models, ranging from the little two-seat Model 150 to the eight-seat Golden Eagle, and with the new twin-turbofan Citation business aircraft soon to bring the number to 40. Three types have each had production runs of more than 10,000 and continue to sell as well as ever; they are the Model 172/Skyhawk family, with a total of 16,665 deliveries between 1955 and the end of 1970; the Model 150 which, including versions built by Reims Aviation in France, accounted for 15,189 deliveries since 1958; and the 182/Skyline series, totalling 11,485 since 1956.

The grand total of 95,000 included 11,763 military aircraft, of which more than 1,400 have been twin-jet T-37 trainers and A-37 light attack aircraft produced since 1954.

Above, this 204B of Los Angeles C.F.D. is a veteran fire-fighter; it is capable of water drops of more than 300 gallons.

Left, a Jet Ranger of the Fire Department making a water drop on a blaze in Griffith Park, six miles from the downtown section of L.A.

Below, a barely visible L.A. City Police Dept. Bell 47 'copter inspecting the section ot the Van Norman Dam which collapsed in the recent earthquake (*pic. by Los Angeles Times*) and, bottom, $20,000,000 damage to the freeway interchange complex just outside Los Angeles. Note collapsed overpass sections.



### Crocodile Airlift

A helicopter of the South African Air Force took part recently in an unusual errand of mercy. The 200 crocodiles inhabiting Lake St. Lucia, on the Northern Natal coast, were starving because their normal diet of freshwater fish was being killed off by increasing saltiness of the water. So the ' chopper ' airlifted them to a new home. It was no easy task because, apart from the sharpness of their teeth, the crocodiles weigh anything up to 1,000 lb. each.

### ' Choppers ' Fight Fires and Earthquake

A few months ago, in California, helicopters performed mercy missions of a different kind. More than 50 of them went into action when a disastrous series of brush fires blackened almost 500,000 acres, whipped up by winds gusting to more than 100 knots. In Los Angeles County alone, damaged was estimated at $8.8 million, with almost 300 homes destroyed.

Spearheading the airborne assault were some 20 ' choppers ' belonging to the City of Los Angeles Fire and Police Departments and the Los Angeles County Fire and Sheriff's Departments. While the firemen's Bell Jet Rangers, Model 204Bs and 205A-1s, worked virtually round the clock, dropping up to 320 gallons of water at a time to dampen the fires, the smaller Bell 47s laid hose for firefighters on the ground, patrolled the fire areas and served as aerial command posts for the operation.

Police and sheriff helicopters, in addition to patrol and reconnaissance, helped to evacuate people from buildings in the path of the fires and kept a wary eye open for anyone starting a fire deliberately. SX-16 Nightsun searchlights on police helicopters guided other ' choppers ' and fixed-wing aircraft into drop areas after dark; and more than 30 commercial helicopters were hired by the U.S. Forest Service and California Forestry Division to back up the " official " fleet.

Once the fires had been brought under control, the helicopters began the task of re-seeding about 100,000 of the burned acres, in a desperate battle against time. Unless the grass had been replenished speedily in steep and unstable areas, mudslides brought on by winter rainstorms might have taken a tremendous toll in property and lives. The job of re-seeding another 200,000 acres in less confined areas was tackled by fixed-wing aeroplanes.

No sooner had the helicopter pilots got their breath back after these hectic operations than another disaster struck. At 6.01 a.m. on February 9, Southern California's worst earthquake in 38 years aimed its full fury at the San Fernando Valley, leaving in its wake 64 persons dead, more than 1,000 injured, almost 200 homes and business places destroyed and at least 3,000 damaged. During a minute that seemed like a lifetime, the quake toppled a dozen overpass bridges on to motorways. Lights and telephones failed. Broken gas mains touched off hundreds of fires. Two-thirds of the concrete facing of the Van Norman Dam collapsed, threatening to inundate an area housing 80,000 people with 3,600 million gallons of water.

Once again the aftermath of a natural disaster was made less terrible by the fact that Los Angeles is the centre of America's biggest concentration of government and commercial helicopter operators. First into action were more than 20 ' choppers ' belonging to Los Angeles City and County authorities, always ready at a minute's notice and geared for emergencies. The whole area had to be surveyed, and victims found and evacuated from the hard-hit Sylmar district where 48 persons died in the wreckage of the Veterans Administration and Olive View Hospitals. Doctors, norses, medical supplies and rescue equipment had to be flown in.

Bells of the City Police Department provided aerial films of the disaster area by closed-circuit TV to the mobile field command post on the ground, controlled traffic to prevent jams, and watched for looters who are always ready to prey on victims of disasters. The injured where whisked by helicopter to hospitals 50 or 60 miles away. A JetRanger used for news reporting by KTLA-TV fed live pictures and sound free of charge to its own and rival networks, and relayed up-to-the-minute news and evacuation orders as engineers fought, successfully, to save the dam. Pipelines and roads had to be surveyed for damage; insurance salvage estimators were flown over the area for preliminary checks on the likely cost of restoring it to life. Even Vice-President Agnew and Governor Ronald Reagan used helicopters for close personal inspections of damage that would cost $500 million to repair.

In four days alone, helicopters logged an estimated total of 670 flying hours. " I don't think I've ever seen so many helicopters at one time " commented an F.A.A. official. It was a great effort, but " Had the dam collapsed, you would have seen them in some *real* action."

## PIPELINES (continued from page 283)

Although pipelines will function for years with very little attention, they are regularly inspected. On all long-distance gas and oil lines this is done by helicopter or light aircraft. On the 2,400 mile Trans-Canada gas pipeline, for example, skilled pilots maintain patrols over the line from end to end. Flying at almost tree-top level, they watch out for " pin-hole " leaks. These may be traced by patches of dead or dying vegetation along the route. Pilots not only report by radio on actual damage, but also on heavy trucks, vehicle concentrations or roadworks in the vicinity which might cause damage.

In a specialist engineering field once monopolised by the Americans, British pipeline engineers have carried out many large-scale projects around the world in recent years. One example was the building of the 500-mile Algerian Pipeline, at a cost of £24 millions, to carry oil from remote Sahara wells to the Mediterranean shore. This involved the shipping from Britain of 100,000 tons of line pipe, tankage for 3 million barrels of crude oil, 30,000 horse-power of main turbines, in addition to £3 million worth of construction plant and the recruitment of 400 skilled men to carry through the job.

Another British pipeline contract abroad was the laying of the 300-mile Transalpine Pipeline to carry oil from Trieste on the Adriatic to the Ingolstadt refinery in Germany. The most difficult section was that through the Austrain mountains. To lay the pipeline from Ploken Pass, on the Austrian-Italian border, over the Alps to Kufstein, on the Austrian-German border, entailed the construction of three major rock tunnels.

## ELECTRIC R.T.P. (continued from page 271)

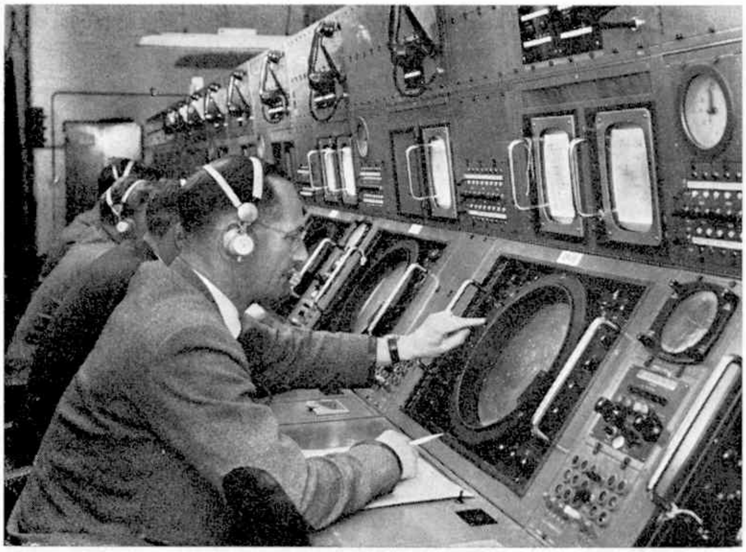
effect. Now if you apply a force to a gyroscope, its reaction is at 90 deg. to the force. In our case, we are turning the model to the right (as it travels in a circle) and the reaction is for it to put its nose down. With the model drawn last month, this factor is not considerable, and can be ignored, but if you progress to other models or converted kits, you might run into it.

If this particular model is reluctant to take off and yet appears to be travelling fast enough to do so, check its balance, which should be along the line of the tether attachment point. Nose-heaviness will prevent take-off, but the cure is either to attach a little Plasticine at the tail end or to cut through the tailplane trailing edge, score underneath along the elevator line (shown on the plan) and gently crack upward to form an elevator. Do only one side, and crack the t.e. up only about $\frac{1}{16}$ in. Try flying again, adjusting the elevator slightly or if necessary making one on the other tailplane half. Quite a small movement has quite a large effect. When satisfied, cement the elevators in position.

If the model still does not unstick, it must then either be an insufficiently powerful motor, or insufficient current reaching the motor. Try the sound of the motor direct off the transformer or if possible try another transformer or battery.

If, when flying, the model takes off quickly and stalls, or is very hard to control, it may indicate tail-heaviness and slight down elevator will help. Moving the tether point also has a marked effect on flight—back to hold the nose down and vice versa—but this is really a last resort. If you have followed the plan reasonably, and made a fair job of construction, no difficulty should be experienced.

For full-power flying, get the model circling at a steady four or five feet, then gradually apply full power. We think you'll be amazed !



# RADAR

## and other wonders

By
Charles A. Rigby

RADAR stands for Radio Direction and Range, and is a process of determining the position of distan objects by radio waves. In this way, the bat's natural means of detecting objects by the 'echo' they throw back is employed. It was gradually developed as the result of research work on 'Radio-location' carried out in 1935 by Sir Robert Watson Watt and a team of scientists, and proved most useful for detecting enemy aircraft during World War II.

Several years before this, much was discovered about the 'echoes' caused through radio signals being bounced off reflecting surfaces, such as the Moon, as well as 'Direction-Finding' with the use of radio transmitters. In the USA, radar history goes back to 1922, when it was first observed that radio signals were interfered with by objects moving between the transmitter and the receiver. In 1925, it was discovered that high frequency waves would bounce back from the moving object to their source. The transmitter and receiver could, therefore, be set up in the same place as is done with acoustic sounding and echo ranging.

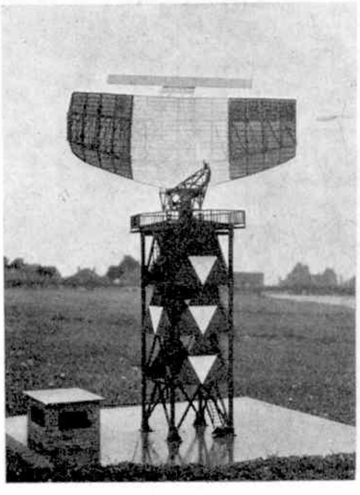
The waves could be accurately focused, and by 1930, it was possible to 'pick up' aeroplanes. By 1934, means was found to measure the distance of the reflecting object by the time required for the echo to return. In 1928, tests were carried out in New York with radio echo between an aeroplane and the ground to measure its distance from the ground, or from a mountain-side ahead of it. An understanding of basic principles is important. In operation, radar sends out radio waves which are reflected back to sensitive receivers when a moving object such as a ship or plane enters the area which the radio waves cover.

A radar transmitter sends out a short pulse of waves in a certain direction. If the impulse impinges on and is reflected from an object and the reflected pulse is received say 'u' microseconds after emission, the distance of the object and speed of the waves in metres

Below, long-range 23cm. air surveillance radar (AR5) by Plessey.

Top, Marconi 8½ in. TV monitors with flight information above radar displays at Southern Air Traffic Control Centre.

Below, Marconi Doppler navigation aerial in a Super VC10. All BOAC aircraft now have this system.



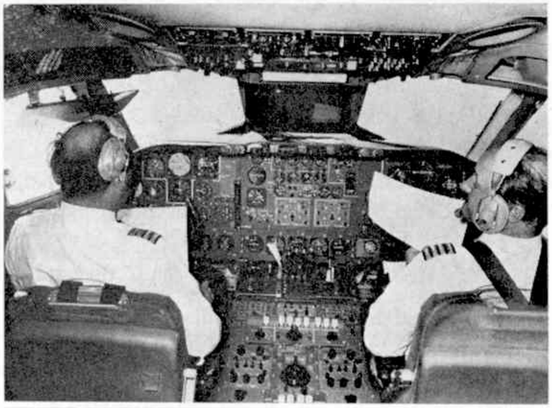
WF-3 X-band automatic tracking wind-finding radar by Plessey is a great aid for meteorologists.

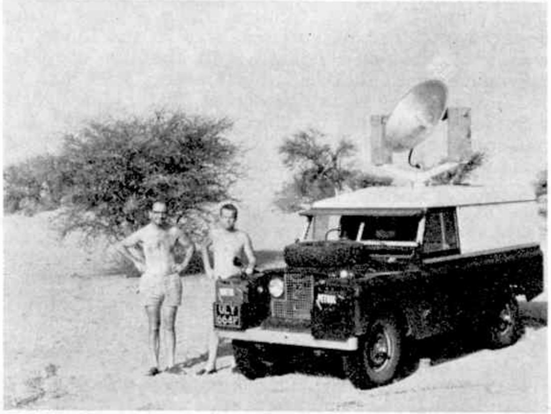

Left, Marconi microwave aerials at Southern Air Traffic Control Centre (near London Airport). The three dishes receive signals from the radar sites at Ash, Ventnor, and Clee Hill.

Below, cockpit of a VC10 fitted with the Marconi Doppler Navigator ('Aeroplane' photo)

Below, centre, GEC-AEI (Electronics) Escort is a marine radar which has proved excellent for detecting locusts, either individual or in a swarm.

Bottom, an early TV demonstration of the Marconi PETA, the device used by many police forces to check on vehicle speeds.





can be calculated. To locate an object that is travelling in a given direction, a continued series of pulses are emitted at definite intervals. If as usual, the same aerial is used for transmitting and receiving, the intervals must be so timed that a reflected pulse can be recorded before the next pulse is sent out.

To get sharp definition of an object, a narrow beam of high power is required. With an aerial of moderate size, this can be attained only on high frequencies. Again, a short duration of pulse with well-defined waves is desirable. If a pulse of 0.2 microsecond duration is to contain 100 waves, the frequency must be 500 megacycles. The interval between pulses is determined by the maximum range to be explored. The aerial must be directive. If a portion of the surrounding space is to be explored, it must be capable of transmission in various directions. The paraboloid aerial or the parabolical-cylindrical type is often used, 'scanning' of the objects being achieved by mechanical motion. Spiral 'scanning' covers a solid angle of space round a fixed direction. Rotation round a vertical axis combined with a vertical rocking motion, explores a 'cylinder' round the aerial. Simple rotation round a vertical axis is used on board ships as an aid in navigation.

For frequencies up to 600 Mc./s the transmitter is a valve oscillator with resonant transmission line as oscillatory circuit. For higher frequencies, a Magnetron tube is used, the receiver being a superheterodyne. The signal is usually presented on the 'screen' of a cathode-ray-tube which is embodied in a special display showing the PPI. or Plan Position Indicator. A trigger switch automatically separates the transmitter from the aerial at the termination of a pulse, and isolates the receiver during pulse times.

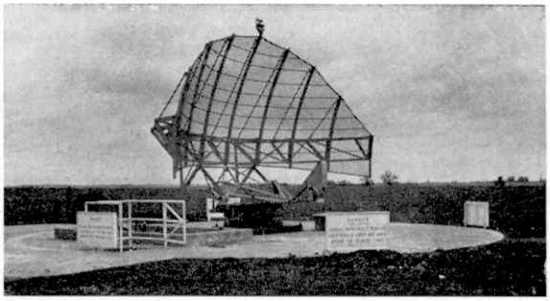
As mentioned, the aerial is used for 'Scanning' the distant objects. For example, an aerial mounted in a perspex ' blister ' on the underside of an aeroplane produces a beam of waves like a fan. This is very narrow in the horizontal plane and very broad in the vertical plane. The aerial rotates once in every second, so that the narrow band sweeps over the ground like the hands over the face of a clock. The reflections from the features of the ground and moving objects are recorded on a cathode-ray-tube, on a radius that revolves over the tube's face in unison with the revolution of the beam over the ground. So the picture of these is left glowing in the tube as the beam goes round, over and over again.

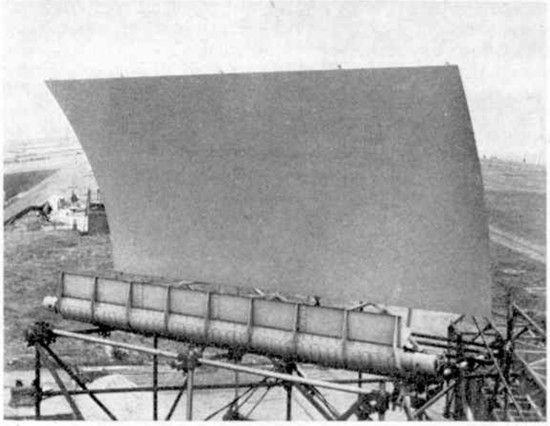
There are, of course, various types of radar instruments, these being chosen according to the purpose for which they must serve. In this respect, the range covered is important. Used for surveillance of aircraft, including height finding, at airports, and on ocean-going vessels, chiefly, these matters have to be considered. Some have a number of ranges, such as those used on large ships, while others have only one range. Pulse durations of transmitters also differ according to the different makes and purposes, as well as the sizes of displays. Aerials, again, take different forms such as the paraboloid (dipole), the Adcock with sense element, Scanner with Slotted Waveguide (used on ships), the S Band Frequency Scanner, and the ordinary mesh-type head. The chief parts of radars are: (1) The Scanner Unit, (2) Transmitter, (3) Receiver, (4) Display with Plan Position Indicator (PPI), (5) Inverter, and (6) the Power source.

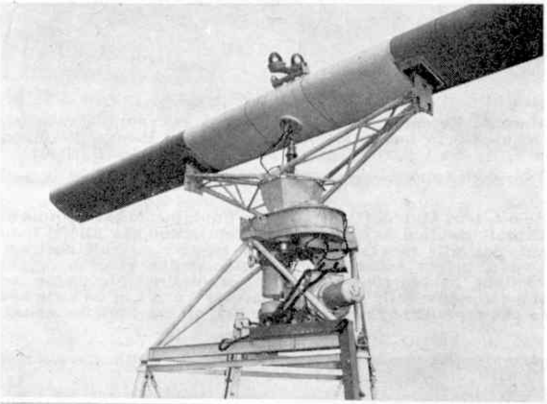
During 1962, a new approach to radar at sea added considerably to its development. Up to then, navigational radar had not fully satisfied the needs of the navigator. It had long been appreciated by navigators that if they were to save precious minutes, even seconds, in evaluating a situation involving an apparently unchanging compass bearing, then compass stabilisation must be applied to the radar display. Also after an avoiding alteration of course, accurate observation of the further development of the situation, either on the P.P.I. or on a reflection plotter, again demanded a fixed ' North-up ' stabilisation. North-up stabilisation is, of course, an integral function of a true-motion radar display.

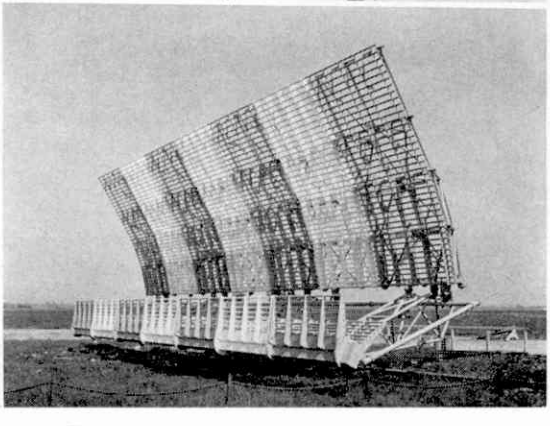
In direct conflict with this is the very understandable and human desire of the navigator to see, on the radar screen, a ' bird's eye view ' of the situation as he sees it from the bridge of his ship. He does not want—and should not have—to turn himself round, physically or mentally, through a certain number of degrees in order to equate in his mind what he sees on radar with what he might see with his own eyes from the bridge of his ship. This is the time when most of all he needs a radar picture in precisely the same orientation, i.e. ' Ship's-head-up ', as the real-life observations he makes through the wheelhouse window or from the wing of the bridge. Today, several other improvements have been added, including brighter displays and clearer ' pictures ' or ' blips ', and fully automatic plotting of all targets visible on the radar screen.

In another sphere, namely the desert, it has also been employed in long-range-survey for forecasting and preventing locust plagues in Africa. The radio echoing









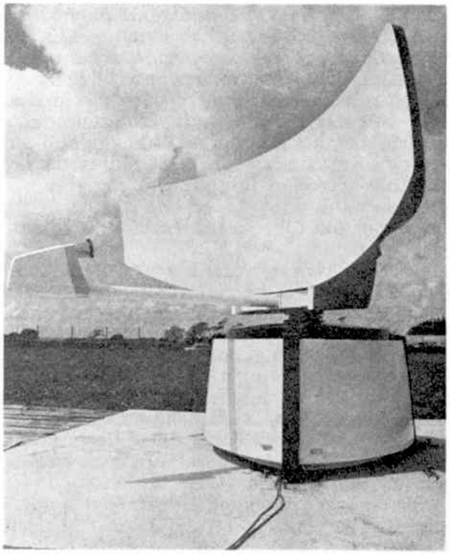
**Top to bottom, Marconi 50 cm. surveillance aerial at R.A.E., Bedford; S-band frequency scanner by Marconi which electronically tilts the beam to obviate the mechanical nodding of the aerial; SECAR aerial and turning gear, also from Marconi; another type of 50 cm. aerial, for long range and high cover, from the Marconi firm.**

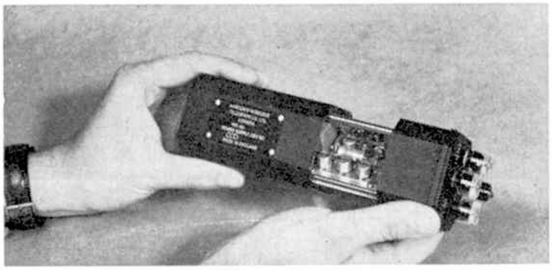
area of a locust is much smaller than that of a bird, hence an instrument operating at a frequency in the 3-cm. band was chosen, the arrangement including a standard transmitter-receiver and gear box with a 9-inch display unit and range marker.

Besides its uses at airports, there are also radar beacons. For checking the speeds of automobiles, there is the radar speed trap, such as 'PETA' (Portable Electronic Traffic Analyser) which utilises the well-known Doppler Effect of frequency change in the electro-magnetic waves due to the signals being reflected from moving objects.

The study of meteorology also saw the introduction of Storm-warning Radar. Radar has also provided the modern scientist with a powerful research tool enabling him to measure distance between atoms to an accuracy of 1/100th of a millionth of an inch. By shooting radar waves through the material to be studied and measuring the remaining power, scientists can achieve results 1,000 times more accurate than possible with the best optical instruments. It is also used by trawlers to detect shoals of fish.

In the field of electronics, more wonders have followed.





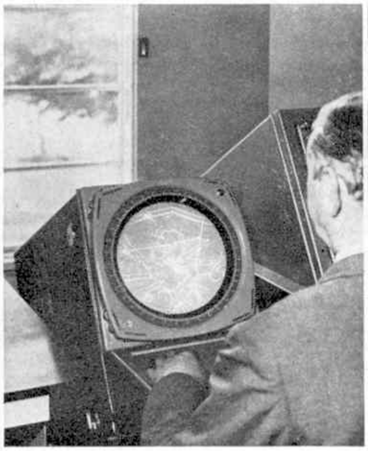
Marconi Research Laboratories used microminiaturisation techniques to build this 75 Mc/s Marker Beacon Receiver.

Top right, Plessey ACR430 X-band Airfield Control Radar.

Below, left, Marconi Moving Map Equipment; the computed aircraft position is in the screen centre and the filmed map automatically moves to show the relative aircraft position. Centre, bright radar display easily visible even in bright sunlight, by Marconi. Right, Marconi Predictor radar for ships automatically plots all "targets" and can be switched to show predicted positions say six or ten minutes ahead.

The same principle of 'Doppler Drift' or 'Shifts' is also used in modern aeronautical navigation equipment, known as Doppler Navigators, which enable the ground speed and drift angle of aircraft to be measured and displayed visually, thus helping to make air navigation more accurate. Another wonder recently perfected for use in aeroplanes is based in a 6-inch diameter moving map display, using back projection-film technique to present a detailed map of the area in which an aeroplane is flying. The map moves under the control of a navigation computer to show the 'present position' of the 'plane at centre-point of the display and the pilot can see at a glance his position in relation to any required track, waypoint or destination.

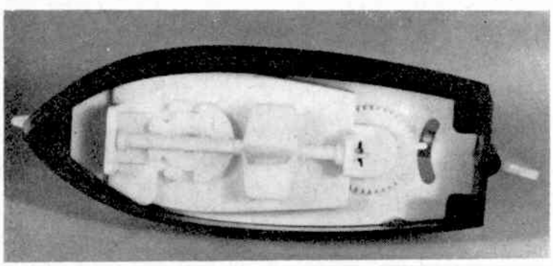
More wonderful still, SAMI a new Speed of Approach Measuring Indicator also employs the Doppler Effect to measure the approach velocity of tankers coming alongside a jetty. As tankers of over 200,000 dwt. are now commonplace, close and continuous control of the speed of approach to the berth is of vital importance. These are some of the wonders of today.

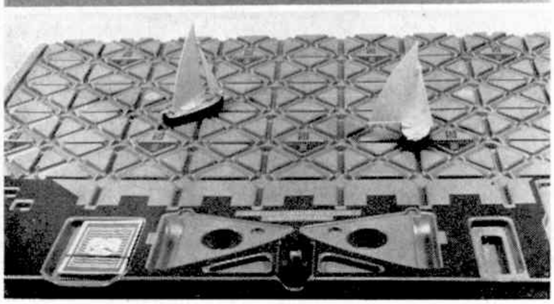


# Have You Seen ?

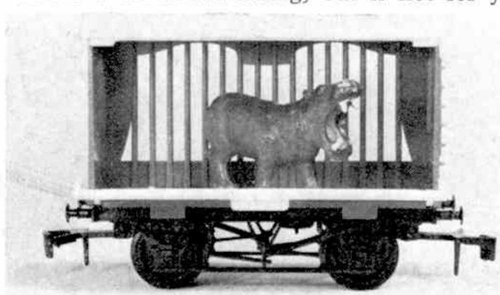

**Right, stamps from Ascension Island. Below, Lee-Oh game—only half the board is shown—and a shot of the mechanism in the dinghy which must be set right to allow the model to be moved. Bottom right, Big-Big Train Zoo Wagon, with hippo.**

A new definitive set of stamps covering Man into Space was released by Ascension Island on February 15th. They are most attractive and as a set cover major milestones in space technology, as is clear from the list of subjects: ½p, Early Chinese Rocket A.D. 1232, 1p, Medieval Arab Astronomers, 1½p, Tycho Brahe's Observatory Quadrant & Supernova of 1572, 2p, Galileo's Telescopes and drawing of Moon 1609, 2½p, Isaac Newton, Mathematician & Astronomer, 3½p, Harrison's Chronometer 1735, 4½p, First American Manned Orbital Flight 20.6.67, 5p, 200 inch Hale Reflector, Palomar, World's largest telescope, and King Nebula in Lyra Messier 57, 7½p, Jodrell Bank, World's largest Radio telescope, 10p, Mariner V11 and Mars seen through a telescope, 12½p, Soviet Sputnik 11 with "Laika," 25p, 2.6.65 Gemini IV walk in space, 50p, 21.7.69, Apollo XI first men on the Moon, £1, Future Space Research Station. Available from stamp dealers.





Something new in boxed games is "Lee-Oh," a fine, exciting game for anyone remotely interested in sailing. Like most good games, it takes a couple of runs to get the hang of it; basically you race sailing dinghies for several laps over your choice of course laid out on an enormous (3 × 4 ft.) plastic board, but the dinghies can only move if you have the sails set right for the direction you intend to take. This is achieved by means of an ingenious mechanism in each model. An "officer of the day" controls the racing and hazard cards can change wind strength, rule a capsize, and add other complications which add to the fun. It teaches a lot about sailing, but is not for young



children, unless they are keen sailors. Price is around £5, from Major Games Ltd., New Hall Works, Lower Edge Road, Elland, Yorks.

Latest Big-Big Train release is a Zoo Wagon, an animal cage on a four-wheel chassis with bars one side and a drop-down door/ramp the other. The cage lifts off, and the roof lifts, so that to use a crane in the eye provided on the roof, a rubber band etc. must be slipped round. A hippopotamus or a zebra is provided.

An immense range of plastic kits is newly available through importers Richard Kohnstam & Co. These are the French Heller kits, ranging from the Cadet series at 20p each to large and sophisticated models at nearly £4. Scales are the standard Continental 1/100, 1/200 and 1/400, and there is a rich range of subjects, from Viking ships to between-wars unusual French aircraft, to modern merchant and warships, space items, and cars. Illustrated are two of the ships in the range, the *Avenir* passenger ferry at 25½ ins. and the attractive Spanish *Le Galion*.

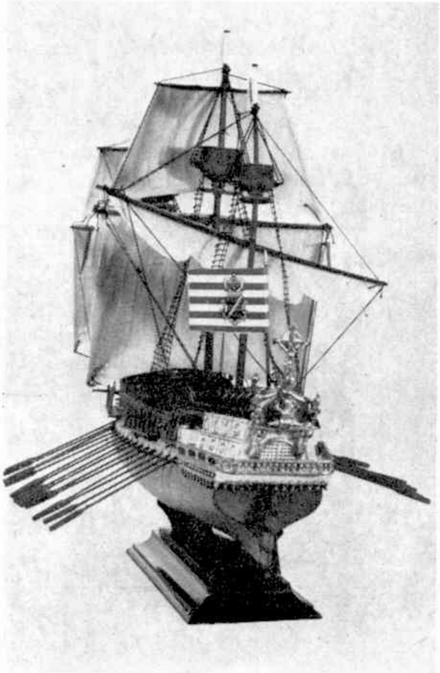
Half a dozen recent Matchbox cars are shown, left to right, top row, Wildcat dragster in bright orange, hot rod Draguar, Ford Capri (orange with matt black bonnet) and, second row, Beach Buggy in purple with sandspot finish, Formula 1 racing car (freelance) with aerofoils, and Rat Rod dragster. All these cars have Superfast wheels and are 2⅞ in.

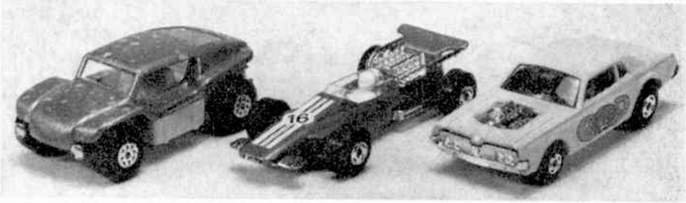
long (Buggy 2 $\frac{9}{16}$ in.) and each represents excellent value at 15p.

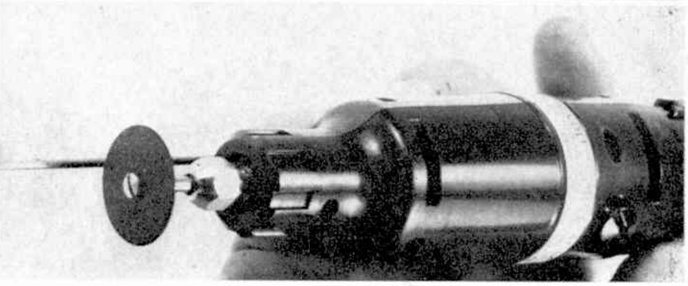
Among new publications we have seen recently was 'French Warships of World War II', by J. L. Couhat, published at £2.25 by Ian Allan Ltd. Size 6½ × 5 in., 176 pages, many fascinating photos and, of course, a potted history of the period as well as ship details.

Finally this time, if you are a super de luxe builder of models, or a sculptor, or other craftsman of similar type, you will be interested in the Dremel "Moto-tool" which is a grinder, polisher, cutter, drill, and so on, for direct hand use or via a flex drive. It costs £18, or with all accessories £25, but on many jobs it is worth its weight in gold. A good, solid, long-life job. Importers are Tottenham Model Raceways, 367-9 High Road, Tottenham, London N.17.

**Above, Heller *Avenir* beautifully built by a 17-year-old. Below, equally nicely made by one of our lady staff, *Le Galion* by Heller. Six new Matchbox issues and a view of the Dremel Moto-tool set up with a cutter-grinder provide the remaining pictures.**

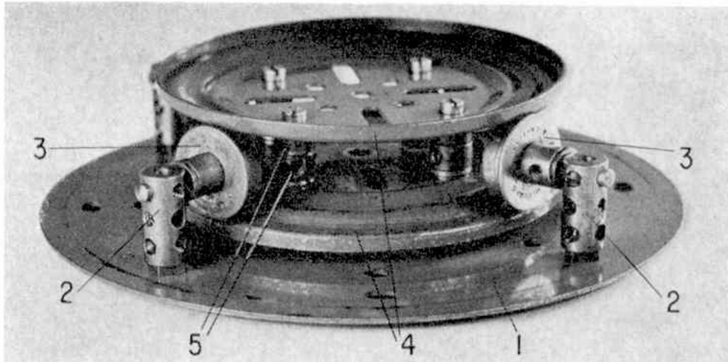






# Among the Model-Builders

## with 'Spanner'




The problems of instability and "rocking" in the swivelling upper sections of Meccano-built cranes and excavators can be kept to a minimum with this Hook Roller Turntable designed and built by Mr. Pat Lewis of Formby, Lancs.

### Hook Roller Turntable

Of all the many subjects open to the Meccano modeller, perhaps the most popular among enthusiasts of all ages fall under the "Cranes and Excavators" heading. Meccano, in fact, is an ideal medium for the reproduction of cranes and excavators—which is hardly surprising considering it was the sight of the cranes of Liverpool's dockland that played a large part in inspiring Frank Hornby to invent Meccano 70 years ago !

Most cranes and excavators, of course, incorporate a turntable to allow rotary movement of the main body and, in Meccano reproductions, these turntables can cause a bit of a problem. Unless strongly built and correctly adjusted, they can allow excessive play which results in loose and unstable structures. This problem can be minimised, however, by using a Hook Roller Turntable instead of the more usual turntables which generally include a common "flat" roller race.

Our first mechanism this month is just such a Turntable designed and built by Mr. Pat Lewis of Formby, Lancs. Uncomplicated in design, it is nonetheless perfectly adequate for most intermediate-size models and will be found to keep "rocking" well within acceptable bounds. Shown inverted for ease of description in the accompanying illustration, the mechanism consists of a 6 in. Circular Plate 1, on to which the swivelling superstructure of the model would be built. Secured in diametrically opposite positions to this Plate are four Threaded Pins, on each of which a Coupling 2 is tightly fixed. Fixed in turn in the end transverse bore of this Coupling is a 1 in. Rod, on which a ¾ in. Flanged Wheel 3 is loosely mounted, the Flanged Wheel being spaced from the Coupling by a Washer. There is no need to hold the Flanged Wheel on the Rod with another part, such as a Collar or Spring Clip, as the flanged guide section of the Roller Unit will serve this purpose when the Unit is completed.

The guide section itself consists of two Ball Thrust Race Flanged Discs 4, connected together by four ¾ in. Bolts, but spaced apart from each other by two Collars 5 and a Washer on the shank of each Bolt. Flanged Wheels 3, of course, locate between Flanged Discs 4 and, as the Discs would be secured to the fixed section of the parent model, Circular Disc 1 is therefore prevented from moving excessively up and down. If the space between the Flanged Discs should be a little too great, thus allowing unnecessary play, it can be reduced by replacing the standard Washers on the connecting ½ in. Bolts with the thin Brass Washers included in the range of electrical parts.

| PARTS REQUIRED | | | |
|---|---|---|---|
| 4—18b | 8—38 | 4—63 | 4—115 |
| 4—20b | 8—59 | 4—111 | 1—146 |
| 4—37a | | | 2—168a |

### Racing Car Suspension

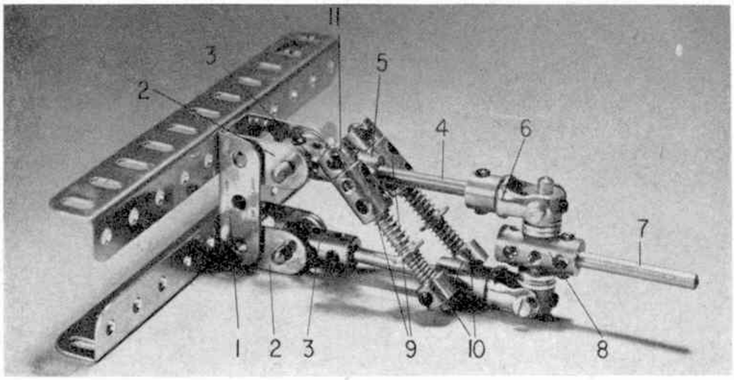
If cranes and excavators are popular subjects among Meccano model-builders, so also are road vehicles. As a result, mechanisms suitable for inclusion in road vehicles always prove interesting, therefore I am especially pleased to feature next a highly successful Suspension Unit for racing cars of the Formula 1 type. Full credit for its design goes to Mr. Brian Taylor of Harrow, Middlesex who produced it for use in an advanced racer he had built and I must say that he has made an excellent job of it.

In the accompanying illustration, the chassis members of the parent model are represented by two 5½ in. Angle Girders, between which a 1½ in. Angle Girder 1 is bolted, the securing Bolts also holding two 1 × ½ in. Double Brackets 2 in place. Mounted on a 1 in. Rod in the end holes in the lugs of each of these Double Brackets is a Coupling 3, a Washer spacing it from the lugs at each side. Fixed in the longitudinal bore of each Coupling is a 2 in. Rod 4, on which are mounted a Collar 5 and a Swivel Bearing 6, the latter positioned on the outside of the end Rod. Note, however, that on the upper Rod, Collar 5 is positioned against Coupling 3, while on the lower Rod, it is positioned against the Swivel Bearing. In both cases, the Collar is secured on the Rod by two long 5mm Grub Screws, Part No. 69b.

The stub axle is provided by a suitable short Rod 7 fixed in the longitudinal bore of another Coupling 8, which is mounted loose on a 1½ in. Rod fixed in the "spider" of Swivel Bearing 6. The Coupling is spaced from the Swivel Bearings by three Washers at each side, the Rod passing through the centre transverse smooth bore of the Coupling. Another short Rod 9, forming part of the steering linkage, is secured in the inside end bore of the Coupling.

Now screwed on to the protruding ends of the long Grub Screws in upper Collar 5 are two Short Couplings 10 which act as guides for two sliding 3 in. Rods, the lower ends of which are secured in two Collars 11, screwed on to the Grub Screws in lower Collars 5. Two Compression Springs, separated by a Washer, are mounted on each Rod between the Short Coupling and Collar, a final Collar 12 being mounted on the upper end of the Rod to serve as an end stop.

When built as described, the Suspension Unit works remarkably well, but, as Mr. Taylor points out, even better results can be obtained by replacing the Meccano Compres-




Full credit for this racing car Suspension Unit goes to Mr. Brian Taylor of Harrow, Middlesex who recommends it for use in models based on Formula 1 originals.

sion Springs with springs from retractable ball-point pens such as those manufactured by Bic. It's a point worth remembering.

**PARTS REQUIRED**

| | | | |
|---|---|---|---|
| 2—9 | 2—18a | 12—38 | 4—120b |
| 1—9f | 2—18b | 6—59 | 2—165 |
| 2—11a | 2—37a | 3—63 | |
| 4—17 | 2—37b | 2—63d | |

**Rotary Transmission**

I close this month with details of an interesting "experiment" in the transmission of rotary motion conducted by Mr. A. E. Bennett of Norwich. "The idea came," he says, "When I was pondering over the problem of how to transmit circular motion on one plane by the use of connection rods, as opposed to gears or pullies."

The result is a simple, effective mechanism which is quite fascinating in operation and, although Mr. Bennett himself doubts the utility of the unit as it appears here, I believe that an enthusiastic modeller, with initiative and imagination, will be able to put the principles involved in the Unit to good use.

As far as construction is concerned, two identical Girder frameworks are each built up from two upright 9½ in. Angle Girders 1, connected together at top and bottom by a 12½ in. Angle Girder 2, through their sixth holes down by a 12½ in. Strip 3 and through their seventh holes by another 12½ in. Angle Girder 4. The centre holes of Girders 2 and 4 and Strip 3 are connected by a 9½ in. Strip 5, while the lower corners of the framework are braced by a 5½ in. Angle Girder 6 as shown. When completed, the girder frameworks are connected together at each side by a 5½ × 2½ in. Flat Plate 7, the whole arrangement being mounted on two 5½ × 2½ in. Flanged Plates.

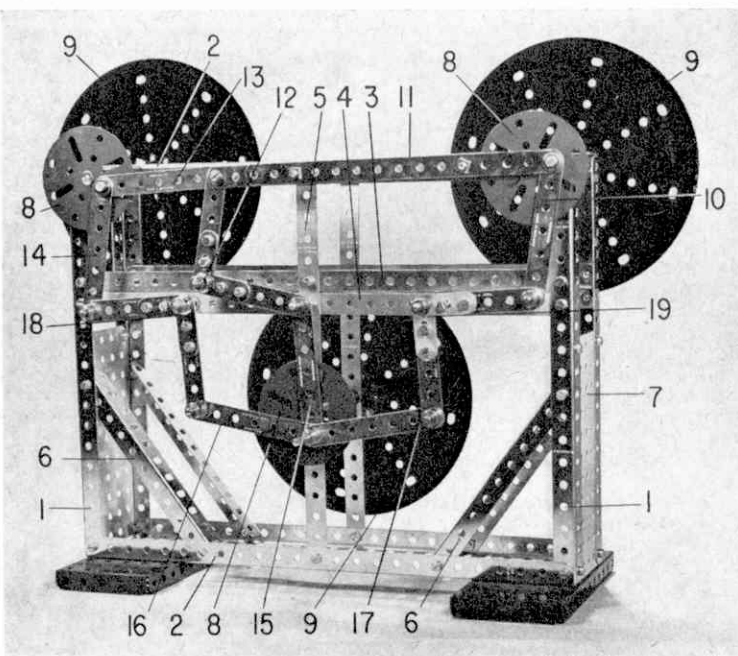
Now journalled in the framework, in the positions shown, are three 4 in. Rods, each held in place by a Face Plate 8 and an 8-hole Bush Wheel to which a 6 in. Circular Plate 9 is bolted. The Bush Wheel is spaced from the frame by two Washers. Pivotally attached to the upper right Face Plate are a 3½ in. Strip 10 and an 8½ in. compound strip 11, built up from two 7½ in. Strips. Lock-nutted to the end of the compound Strip are a 3 in. Strip, attached to the arm of a Bell Crank 12, and a 3½ in. Strip 13, the end of this latter Strip in turn being pivotally connected, along with another 3½ in. Strip 14, to the upper left Face Plate.

The other arm of Bell Crank 12 is extended by a 3 in. Strip which is pivotally connected, by means of a Threader Pin and Collar, to 3½ in. Strip 15, mounted on a Long Threaded Pin secured in the lower Face Plate. Also mounted on this Pin are two further 3½ in. Strips 16 and 17 which are pivotally connected as above to 3 in. Strips, secured to the arms of two more Bell Cranks 18 and 19 fixed on Rods journalled in Angle Girders 4. The other arms of the Bell Cranks are extended by further 3 in. Strips, the ends of which are pivotally connected to Strips 10 and 14.

In operation, when the lower Face Plate is revolved by means of the Threaded Pin, the upper right Face Plate will also revolve in the same direction, while the upper left Face Plate will revolve in the opposite direction. The large Circular Plates, of course, serve as flywheels.

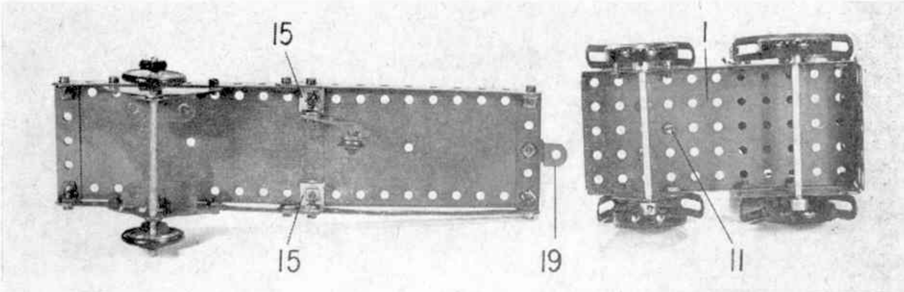
**PARTS REQUIRED**

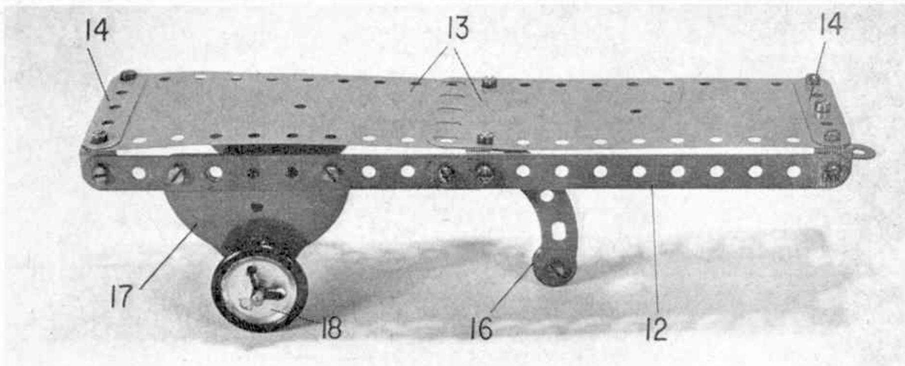
| | | | |
|---|---|---|---|
| 2—1 | 4—8a | 64—37b | 2—111c |
| 2—1a | 4—9 | 10—38 | 5—115 |
| 2—1b | 3—15a | 2—52 | 1—115a |
| 6—3 | 3—15b | 6—59 | 3—128 |
| 6—4 | 3—24 | 2—70 | 3—146 |
| 6—8 | 68—37a | 3—109 | |




The trial mechanism designed by Mr. A. E. Bennett of Norwich, Norfolk which he produced purely as an "exercise" in the transmission of circular motion on one plane without the use of gears or pullies.

**This example of a simple Meccano model built from a standard Set No. 4 will appeal to, particularly, the many thousands of younger Meccano users. Something straightforward like this could well qualify for a prize in the Building Competition which closed a week before publication of this issue.**




## Trailer

The trailer itself should present no difficulties Two 10 in. compound strips 12, each built up from two $5\frac{1}{2}$ in. Strips, are connected together at the ends by two $2\frac{1}{2} \times \frac{1}{2}$ in. Double Angle Strips. Fixed to the Double Angle Strips are two $5\frac{1}{2} \times 2\frac{1}{2}$ in. Flexible Plates 13, each overlaid by a $2\frac{1}{2}$ in. Strip 14, the Plates being joined in the centre, with the securing Bolt also fixing two Double Brackets 15 to the underside of the Plates. The outside lugs of these Double Brackets are bolted to compound strips 12. A $2\frac{1}{2}$ in. Stepped Curved Strip is bolted to the inside lug of one of the Double Brackets, a $\frac{1}{2}$ in. Pulley 16 being attached to the lower end of the Curved Strip to serve as a jockey wheel.

Also bolted to each compound strip 12 is a Semi-circular Plate 17, to which a Trunnion is bolted, the apex holes of the Trunnions at each side providing the bearings for a 4 in. Rod held in place by Spring Clips. Each Spring Clip is spaced from its respective Trunnions by a Washer. Mounted loose on each end of the Rod is a 1 in. loose Pulley with Rubber Ring 18, this Pulley also being held in place by a Spring Clip. The trailer is then completed by bolting a Reversed Angle Bracket 19 to the centre underside of the furthest Double Angle Strip. This Reversed Angle Bracket serves as the trailer towbar, the hole in its free lug locating on Bolt 11.

**PARTS REQUIRED**

| | | | |
|---|---|---|---|
| 4—2 | 1—23 | 1—90a | 2—190 |
| 8—5 | 4—35 | 4—111c | 2—192 |
| 2—11 | 60—37a | 1—125 | 2—193 |
| 10—12 | 56—37b | 2—126 | 2—194a |
| 1—15b | 10—38 | 2—126a | 2—214 |
| 2—16 | 2—38d | 4—142c | 4—215 |
| 4—22 | 2—48a | 2—155 | |
| 2—22a | 1—52 | 2—188 | |

Start collecting

# REPLICA GUNS

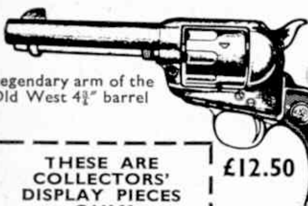
Superb machined metal working models constructed to close tolerance specifications to reproduce original size, weight and balance of these famous guns. Each gun field strips, ***yet cannot be fired. No licence or certificate required.*** Each gun makes a prized possession and fine display.

**1851 CIVIL WAR NAVY COLT**

Cap and ball revolver. The favoured side-arm in the American Civil War.

**£15**

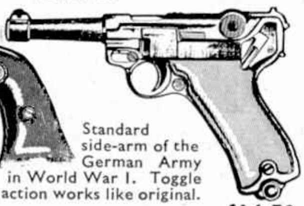
**COLT PEACEMAKER**



Legendary arm of the Old West 4¾" barrel

**£12.50**

**LUGER**



Standard side-arm of the German Army in World War I. Toggle action works like original.

**£14.50**

**THESE ARE COLLECTORS' DISPLAY PIECES ONLY AND DO NOT REQUIRE A LICENCE OF ANY KIND**

*All prices post paid*

**Send a large s.a.e. and 10p P.O. for illustrated Gun Catalogue.** *Orders should be sent to:* **Dept. MM**

## Replica Models (UK) Ltd

**5 North Street · Hailsham · Sussex Tel. 4170**

**THE ACTION-PACKED TABLE CRICKET GAME**

A NEW TABLE GAME where the Cricket enthusiast can reproduce, at will, all the finesse of the great Summer game. Play your own: TEST MATCHES! COUNTY CHAMPIONSHIPS! GILLETTE and CHARRINGTON CUP MATCHES! SUNDAY LEAGUE CRICKET! With all the skill of real cricket: bowling, double wickets and all the OUTS, such as clean bowled, stumped, caught, L.B.W., run out, etc. Spin, leg and off breaks, Hits for six, four and odd runs.

SUBBUTEO Regd TABLE CRICKET

**DISPLAY EDITION**
COMPLETE with 00 Scale Miniature Painted Cricketers, stumps, ball, etc. **£1.37½**

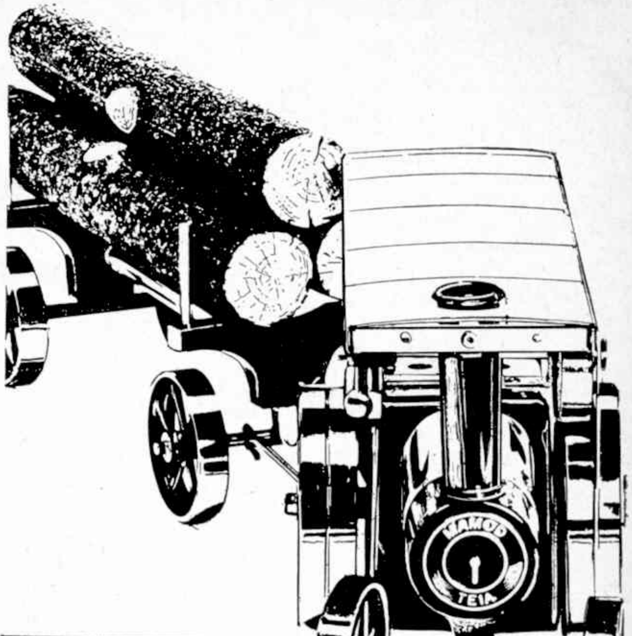
**CLUB EDITION**
COMPLETE with 00 Scale Miniature Painted Cricketers, stumps, ball, etc. together with Green Baize Cricket Pitch. **£2.62½**

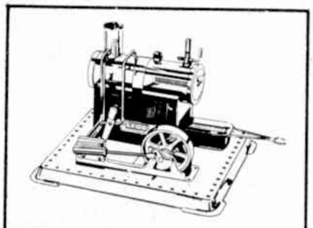
**TEST MATCH EDITION**
COMPLETE with 00 Scale Miniature Painted Cricketers, stumps, ball, etc. with Green Baize Cricket Pitch, Sight-screens, Groundsmen & Roller, Spectators, Deck Chairs & Scoreboard. **£3.70**

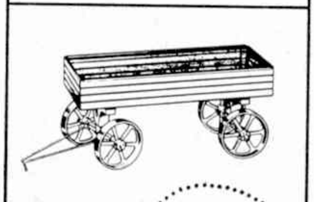
Please ask at your local Sports or Toyshop or Department Store. In case of difficulty write for literature and lists of stockists to

## SUBBUTEO

**Dept. C37 Langton Green, Tunbridge Wells, Kent.**







Precision built Mamod Steam Models are fun, fascinating—and *safe*. Traction Engine, Steam Roller, Stationary Engines. At leading toy and sports shops from £2.45 to £7.55. Now range includes Lumber Wagon and Open Wagon for even more excitement.

**GREAT FOR BOYS**

## Mamod steam models

*Manufactured and fully Guaranteed by*
**Malins (Engineers) Ltd., 206 Thorns Road, Quarry Bank, Brierley Hill, Staffs.**

PLANES BOATS CARS TRAINS MECCANO

# MODEL SHOP DIRECTORY

**M denotes Meccano accessory and spare parts specialists**

**AYLESBURY**
Tel: 85752
**TAYLOR & McKENNA**
46 FRIARS SQUARE

**BATH** Tel: 60444
CYRIL HOWE'S
CHEAP STREET,
BATH, SOMERSET
The Model Shop of the West for all your modelling requirements. Aircraft, Boats, Engines, Radio Control. Expert advice available. M.A.P., Meccano Sets, spares, etc.

**BIRMINGHAM** Highbury 3237
KINGS HEATH MODELS
5 York Road, Birmingham 14.
Everything for the modeller: Boats, Cars, Planes, Railways, Kits, etc. Meccano sets and reasonable stocks of spares.

**BRADFORD** Tel. 44556
TRAIN SHOP SUPERMARKET
179-181, LUMB LANE, BRADFORD 8.
All makes of Model Trains and Motorways Shop Surplus, Bankrupt and Slightly used. Catalogue 1/- Post Free.
COLLECTOR'S MODELS Matchbox, Dinky, etc.
WAR GAME FIGURES & ACCESSORIES.
Minitanks, Hinchcliffe, etc. List S.A.E.

**CARLISLE** Tel: Carlisle 23142
PALACE CYCLE STORES,
122 BOTCHERGATE,
CARLISLE.
Meccano Stockists for Airfix, Dinky, Matchbox, etc.

**HEMEL HEMPSTEAD**
Tel: 53691
**TAYLOR & McKENNA**
203, MARLOWES
**M**

**KENT** Tel: Erith 32339
DERRETT (TOYS) LTD.,
52/54 ERITH HIGH STREET,
ERITH, KENT.
Aircraft, Boats, Fibreglass Hulls, Tri-ang-Hornby, Lima, H.O., H. & M. Units, Scalextric, Airfix, Riko, Pactra, Plastic kits, Minitanks, Marquetry. Prompt Mail Order Service.

**KENT** Tel: Dartford 24155
MODERN MODELS LTD.,
49/51 LOWFIELD STREET,
DARTFORD, KENT.
For all your modelling requirements. Radio/Control, Aircraft, Boats, Cars, Railways. All leading makes from The Shop with the Stock. Prompt mail order service.

**LEEDS, 1** Tel: 25739
BRADFORD MODEL RAILWAY CENTRE,
23 ALBION PLACE
(Off Briggate).
The North's Leading Model Railway stockists in OO and N gauges. Branches at Cloth Hall Street, Huddersfield and Frizinghall, Bradford.

**LEICESTER** Tel: Leicester 21935
RADIO CONTROL SUPPLIES
52 LONDON ROAD,
Mail Order Specialists.
Closed Monday.
Open until 8.30 p.m. Friday.
The Showroom of the Midlands with full R/C service facilities.

**LONDON** Tel: Regent 1846
JEREMY,
16 PRINCES ARCADE,
PICCADILLY, LONDON, S.W.1.
MECCANO ACCESSORY AND SPARE PART SPECIALIST.
**M**

**LONDON** Tel: 01-560 0473
RADIO CONTROL SUPPLIES
581 LONDON RD., ISLEWORTH, MIDDX. Mail Order Specialists
Open each weekday and until 8.30 p.m. Fridays.
Largest R/C stockists in the country.
Own R/C service centre.

**LONDON** Tel: Mill Hill 2877
H. A. BLUNT & SONS LTD.,
133 THE BROADWAY
MILL HILL, LONDON N.W.7.
**M**

**MANCHESTER**
Tel: Blackfriars 3972
THE MODEL SHOP
7-13 BOOTLE STREET,
OFF DEANSGATE,
MANCHESTER 2.
THE NORTH'S LEADING MODEL, HOBBY AND TOY SHOP. MECCANO SETS AND SPARE PARTS A SPECIALITY.
**M**

**NEW ZEALAND**
BUNKERS LTD.,
P.O. BOX 58
HASTINGS.
(Mail orders from all countries welcomed.)
**M**

**READING** Tel: Reading 51558
READING MODEL SUPPLIES
5 Chatham St. Car Park, Oxford Road,
READING, BERKSHIRE.
BERKSHIRE'S MODEL CENTRE
*You can drive right to us.*

**ST. ALBANS** Tel: 59234
BOLD & BURROWS LTD.,
19-23 CHEQUERS STREET,
ST. ALBANS, HERTS.
Meccano Sets and Spares.

**SCARBOROUGH**
Tel: 65005
" PAT NURSE "
87 COLUMBUS RAVINE
SCARBOROUGH, YORKS.
Toys and models store. Meccano spares dealer.
Mail and telephone orders welcomed.

**SCARBOROUGH**
Tel: 3223
" WALKERS "
15 ST. THOMAS STREET,
SCARBOROUGH, YORKS.
Meccano and Dinky Toy Specialist.
Mail orders welcomed.

# CLASSIFIED ADVERTISEMENTS

**PRIVATE: Minimum 18 words 36p and 2p per word for each subsequent word.**
**TRADE: Minimum 18 words 54p and 3p per word for each subsequent word.**
**Box numbers count as six words when costing the advertisement. When addresses are included these are chargeable at the same rate (2p or 3p) per word as the remainder of the advertisement. Copy and box number replies should be sent to the Classified Advertisement Department, MECCANO Magazine, 13-35 Bridge Street, Hemel Hempstead, Herts. Latest copy date for insertion in the July issue, May 4th.**

## WANTED

**M.M's 1934-1942,** single copies or complete years. State prices to: G. Thompson, 6 Leopardstown Gardens, Stillorgan, Co. Dublin, Ireland. P

**Wanted,** obsolete military Dinky Toys. Please send details to Major A. R. Skipper, 20 Foxhill Crescent, Camberley, Surrey. P

**Meccano magazines** 1916-1923. Professionally bound preferred. Up to £4 paid for really good and complete individual nos. 1 to 8, 10 to 12, 14, 17, 20, 35. Obsolete parts: 2 nickel plated non rusted nor stained Nos. 95B, 5 Nos. 57A, up to twelve each. Nos. 66 and 67, 2 each Nos. 141 and 156—Thank you in advance for writing stating condition and price required (sorry no offers) to: C. R. Michaux, 30 Avenue Kreig, CH-1208 Geneve, Switzerland. PQ

**Meccano magazines** prior 1946 and any obsolete Meccano literature. Also French M.M. Leonard, 10 Bd Mettewie, Brussels, Belgium. PQR

**Pre-War** 0 or 1 gauge locomotive and coaches wanted, made by Marklin, Bing, Lowke, or Hornby, please state condition and price required. Procter, 10 Church Hill, Patcham, Brighton. Phone 553940. T/C

**Wanted.** Dinky aircraft pre 1950, particularly Spitfires, Hurricanes, Blenheims and other military and pre-war models. Collections or single items. Details to R. J. Donally, Wood Broughton, Cartmel, Grange-over-Sands, Lancs. P

**M.M's Wanted** 1930 (Feb., July, Aug., Sept., Dec.) 1931 (Sept., Nov., Dec.) 1936 (March, Dec.) Also any odd pre-1924 copies. Dawes, 17B, Wigmore Street, London W1. P

**Collector Urgently Requires** for surprisingly high prices, any unusual cast iron and tin toy children's money-boxes made before 1950. I particularly want a "Footballer" moneybox, a "Tommy," "Queen Victoria," "Wimbledon," "Grenadier," "Volunteer," "John Bull," Sentry (tin) Giant, Clown, "Hoop-la," "Robot" (aluminium), Musical Bank, etc., but will consider any kind of money-boxes, especially those with working parts and moving figures. Exchange also considered against old toys, pre-war Meccano, etc. All letters answered so please write if you can help.—Haley, 5 Flushouse, Holmbridge, Nr. Holmfirth, Huddersfield HD7 1QD. H/S

**Wanted.** Toy soldiers by Britains Ltd. also their horse-drawn vehicles, trucks, tents, buildings and airplanes. Write E. P. D'Andria—3410 Geary Blvd. Suite 343, San Francisco, California 94118. NOPQ

**Pre-War** model trains sought by Lowke, Marklin, Bing, etc. O or larger also tinplate toys—10 Church Hill, Patcham Village, Brighton 553940. T/C

## FOR SALE—PRIVATE

**Over 200 Meccano Magazines,** 40 pre-war. Offers preferred for lot or exchanges. Williams, 175 Maesglas, Cardigan, Cards. P

**For Sale,** Diecast models, Rio, Dugu, Rami, Tekno, Mercury, Gama, Wiking, Belle Epoque, French Dinky etc.: Also obsolete Dinky Corgi, Spot on and others. S.A.E. (Large) T. I. Jeffrey, Pitmullen House, Nr. St. Andrews, Fife, Scotland.

**For Sale.** Brand new unopened Meccano Magazine Binder 16/- post paid. Apply, R. Scott, Desscot, Kingwood, Henley, Oxon. P

**Dinky Toys**—Approximately 20 years old, all in fair condition. Also Meccano Magazines 1948-1955, some years incomplete—for further details s.a.e. to F. Kirby, 15 Marton Moor Road, Nunthorpe, Middlesbrough. P

**Meccano Magazines** 1921 to 1969 all bound same. Red covers, gold letters. Perfect condition. No torn pages or crosswords filled in etc. Best offer over £100 required plus carriage O.N.O. D. H. Stephenson, 2 De Montfort Road, Hinckley, Leics. Tel: Hinckley 5966 evenings. Daytime Hinckley 3234. P

**1930-40 M.M's.** 1930 Meccano steam engine, minus gears. 1928 "Meccano Parts and How to Use Them." These are offered for sale or exchange for any interesting mechanical toy or engine. M. F. Macdonald, 17 Glazbury Road, London W14. P

**Large Meccano,** boxed, sufficient to build many of No. 10 Models. Transformer, six motors, clockwork, electric, steam. Fair condition—Offers. Potts, 10 Chaucer Avenue, Hartlepool, Durham. P

**Large Red/Green** accumulation of Meccano, Motors, E2OR and clockwork, Electrokit all in 5 drawer cabinet. Scores of magazines, leaflets, instruction books. "Book of prize models," "Meccano Parts and how to use them" etc. £50. N. James, 2 Paget Road, Cowley, Oxford. P

**Large Meccano** outfit in four £5 parcels or £15 complete. Details: A. M. Lewis, 119 Shawhurst Lane, Hollywood, Birmingham B47 5SP. P

**Meccano**—available for exchange, original pieces Nos. 66-67-119-132-150-159-169 and 167 complete. French language M. Magazines Nos. 1-2-5-6-8-10-11 and 1924 to 1937. New Models books 1928 and 29, certain Super-Model publications. Looking for steam engines, 1912 electric motors and some others, accumulators, old sets, manuals for 1901/1910 and 1932/35. Mr. Marcel Terlon, 69-Charly, France. P

**Large Meccano Outfit** in four drawer cabinet. Set includes: one Emebo motor, one reversing clockwork motor. All parts in very good condition. Apply: J. Potter, 60 Westgate, Sleaford, Lincs. P

**TURN YOUR UNWANTED BOOKS, SPARES, ETC. INTO CASH THROUGH AN INEXPENSIVE ENTRY IN THESE COLUMNS!**

## TRADE

**G.B., F.D.C.'s,** Airletters: British and Foreign Cacheted Ship Mail covers (Merchant and Naval). Enquiries S.A.E.—Shade, 82 Waveney Drive, Lowestoft, Suffolk. P

**Canoes.** Glassfibre: Folding-Rigids: D.I.Y. Kits: Free catalogue.—Granta Boats (MM), Ramsey, Huntingdon. NOPQ

**"M.M.s"** 1916-1942. Available/Wanted. £40 (minimum) offered for complete set. Lambert, 60 Salhouse Road, Rackheath, Norwich. P/Q/R/S/T

## GENERAL

**Free Gift** to new applicants when requesting my discount approvals—A. Renner, A.D.P.S., 57 Warwick Road, Beaconsfield, Bucks. L/W

# MAP The Finest Range of Model Technical Books in the World!

## 128 MECCANO MAGAZINE HANDBOOK


Essential to every Meccano user is this comprehensive booklet. Deals with manufacture, general hints, mechanisms, motors and special outfits, spares, clubs and history. Dealers' directory.

*7¼ x 4¾ in. 66 pages. Profusely illustrated*

**12½p**

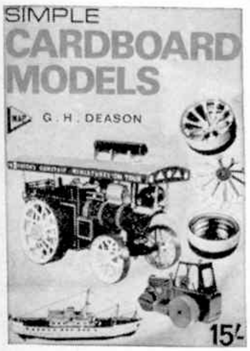
## 115 MODEL BOATS RADIO CONTROL HANDBOOK


Introductory booklet for boat r/c enthusiasts. Equipment maintenance, fault-finding, r/c in yachts, etc.

*7¼ x 4⅞ in. 36 pages. Two-colour cover. Useful pictures and diagrams.*

**12½p**

## 132 SIMPLE CARDBOARD MODELS




This magnificently-illustrated book deals with working models of Rollers, Road Engines, Ships, Cars, Tracklaying Vehicles, Rail and Tramway models and other working models, including models of *RMS Scillonian* and the *Ruston Bucyrus Excavator*

*9¾ x 7¼ in., 120 pages, square backed, drawn on two-colour picture cover. 75 photo illustrations. 77 drawings, including working plans.*

**75p**

## 34 1001 MECHANICAL FACTS


Claimed 1001 facts, this is a handbook of simple mechanical knowledge for everyone interested in model or general engineering.

*7¼ x 4¾ in. 103 pages. 90 line drawings and photo-pictures.*

**30p**

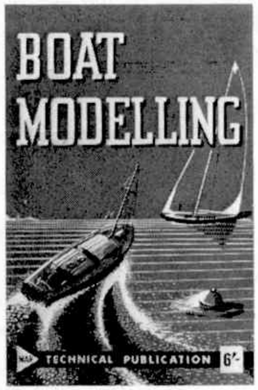
## 20 HISTORY OF BRITISH DINKY TOYS 1934-64


*8½ x 5½ in. 152 pages. Cloth bound, gold blocked spine. Two-colour dust cover. 76 photo-illustrations, numerous tables.*

**75p**

A book devoted to the products of one toy factory. It contains not only a short history of the original company which produced Dinky Toys, but also a year-to-year description of the cars issued. with a fine selection of photographs devoted mainly to earlier and less commonly seen examples, and a very valuable series of tables listing all Dinky Toys, 1934-64 in numerical order with a special numbering system which is designed to smooth the way for collectors. This 'Collectors' Piece' of a book should be in the hands of every single Dinky Toy fan.

## 14 BOAT MODELLING

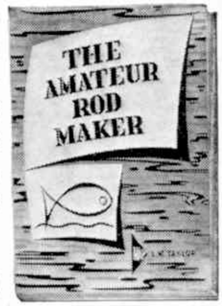



A comprehensive book for the not-so-expert modeller covering every aspect of model boat work from construction through to sailing. Author Vic Smeed provides a wealth of practical assistance. Chapters include: Tools and materials, hard chine hulls, round bilge hulls; superstructure fittings, finishing; I.C. engines, electric motors, hydroplanes and special models; operations, radio control.

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

**40p**

## 118 THE AMATEUR ROD MAKER

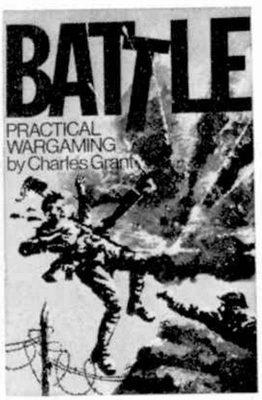



How many model makers go fishing? Then handyman can develop the popular 'do-it-yourself' cult and make his own rods and other fishing accessories to the highest professional standards, without the use of any elaborate workshop or special tools.

*7¼ x 4¾ in. 64 pages. Bound in stiff card with bright two-colour cover. 28 large line drawings.*

**22½p**

## 150 BATTLE! PRACTICAL WARGAMING




This book by Charles Grant is based on a series of articles that have been appearing in *Meccano Magazine* and offer the enthusiast wargamer in neat book form a fine selection of suggested wargaming rules for campaigns involving World War I and II armies. Infantryman's weapons, defensive power of armour, strike value of anti-tank guns, communications, artillery organisation, mines and morale are some of the aspects considered. In addition a number of value tables, recording devices for measuring items such as sub-machine gun 'cone of fire' are included.

*7¼ x 4⅝ in. 160 pages, hard bound in linson boards, with full colour dust cover specially painted. Well illustrated throughout.*

**£1.05**

MAP

HOW TO ORDER. Ring round the reference number of the titles you have chosen. Carry out totals to cash column and then total up at the bottom. POSTAGE free on orders over £1 UP to 60p 5p, 60p to £1, 7½p.

14 · 20 · 34

115 · 118 · 128

132 · 150

Name ........................................................ ____________

Address ........................................................ £

........................................................ ____________

**MODEL & ALLIED PUBLICATIONS LTD. 13-35 BRIDGE ST., HEMEL HEMPSTEAD**

Printed in Great Britain by ELECTRICAL PRESS LTD., Maidenhead, Berks., for the Proprietors, MODEL & ALLIED PUBLICATIONS LTD., 13/35 Bridge Street, Hemel Hempstead, Herts. Published by the ARGUS PRESS LTD., 12/18 Paul Street, London, E.C.2, to whom all trade enquiries should be addressed. Registered for transmission by Magazine Post to Canada.

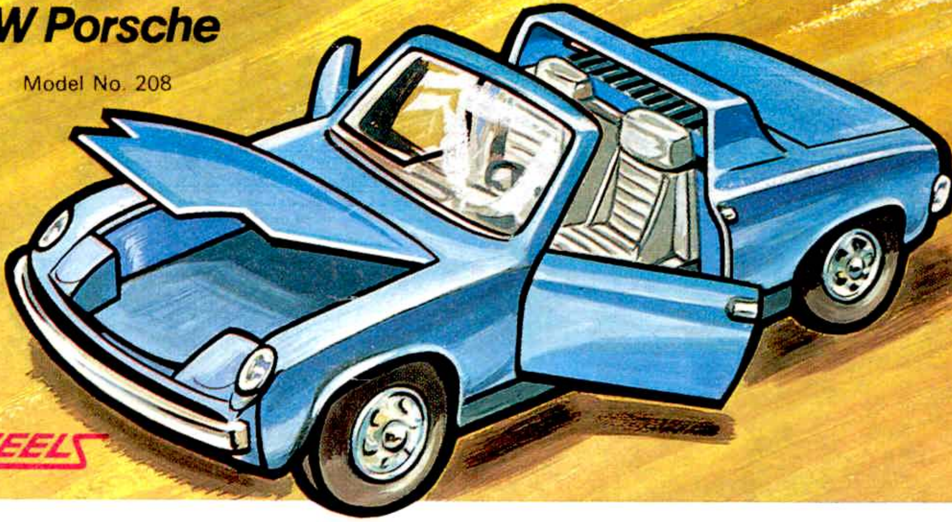
# 2 SUPER NEW DINKY TOYS!

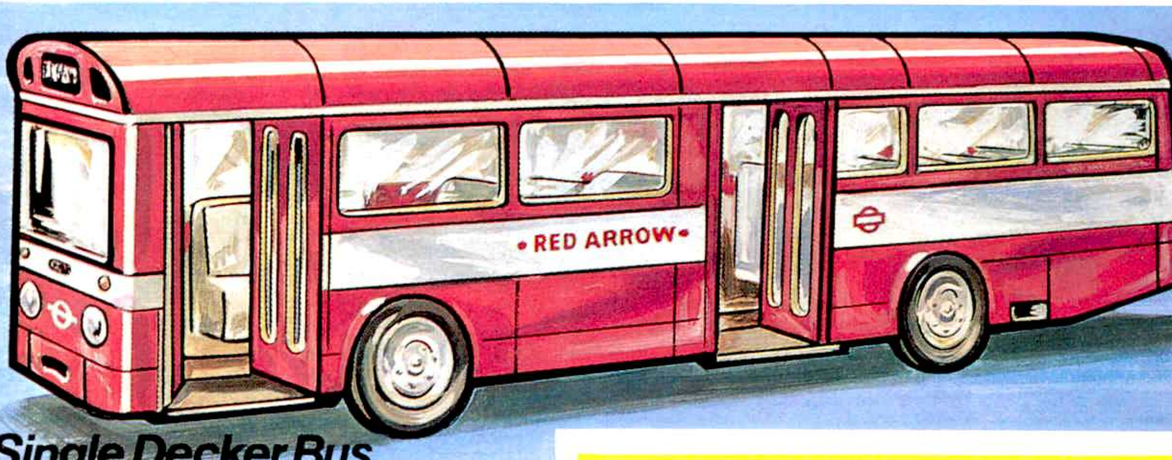
## Powerful VW Porsche Sports Car

Model No. 208

- ★ 2-seater
- ★ Opening doors
- ★ Opening bonnet revealing luggage compartment
- ★ Moulded seats, steering wheel and window

WITH SPEEDWHEELS






## Single Decker Bus with button-operated bell

Model No. 283

- ★ Automatic opening doors
- ★ Moulded seats, steering wheel and windows
- ★ Set of road sign transfers inside

Colour of models may differ from illustrations

leaders go for

**DINKY TOYS**®

the tough, action-packed models

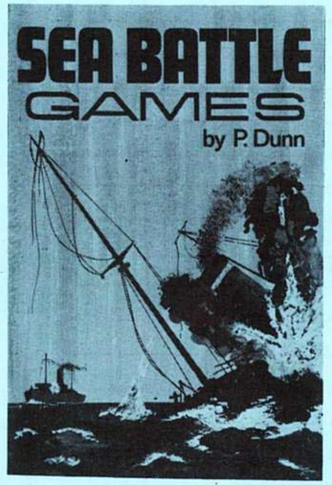
# WARGAMING on land & sea!

## 120 Introduction to BATTLEGAMING


Twelve chapters and numerous appendices. Subjects include Origins of battle gaming; choosing an era; basic field layout; adding realism; organising an army; rules for ancient warfare; rules for horse and musket era; rules for modern warfare; variations of the game; ideas for advanced players; making model soldiers.

7¼ x 4⅝ in. 160 pages, hard bound in linson boards, full-colour dust cover. Profusely illustrated throughout.

**£1.25**




## 151 SEA BATTLE GAMES

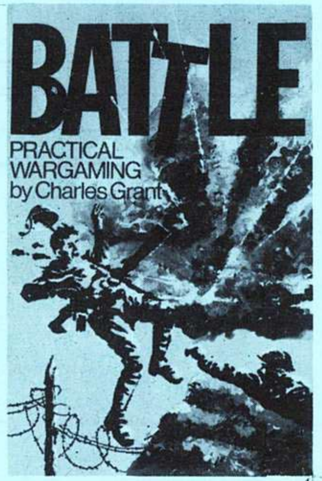
Naval wargaming is here treated in fine detail. Author P. Dunn has been playing seabattle games for a number of years and has wide experience of the various methods of playing advocated. The author deals in great detail with Napoleonic period ironclads, and pre-Dreadnought gunnery systems, with a chapter on early periods — Armada and similar. Of special interest are his rules for map campaigns and a hypothetical world war game.

7¼ x 4⅝ in. 176 pages, hard bound in linson boards, full colour dust cover specially painted. Profuse line drawings, tables. Now ready.

**£1.25**

## 150 BATTLE! PRACTICAL WARGAMING

This book by Charles Grant is based on a series of articles that have been appearing in Meccano Magazine and offer the enthusiast wargamer in neat book form a fine selection of suggested wargaming rules for campaigns involving World War I and II armies. Infantryman's weapons, defensive power of armour, strike value of anti-tank guns, communications, artillery organisation, mines and morale are some of the aspects considered. In addition a number of value tables, recording devices for measuring items such as sub-machine gun 'cone of fire' are included.




7¼ x 4⅝ in. 160 pages, hard bound in linson boards, with full colour dust cover specially painted. Well illustrated throughout.

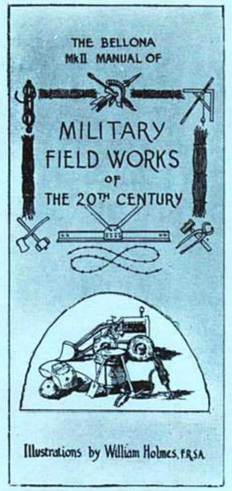
**£1.05**

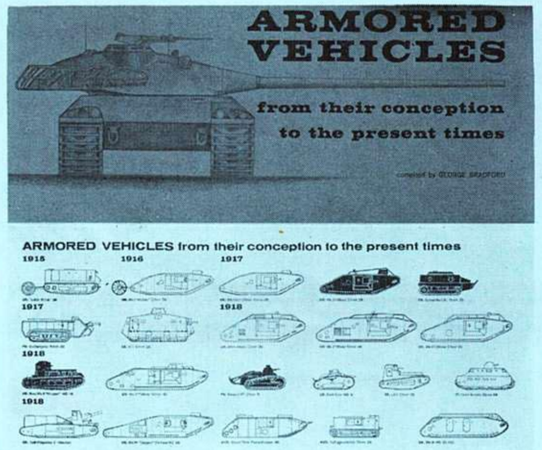
## MILITARY FIELD WORKS of the 20th Century

MILITARY FIELD WORKS of the TWENTIETH CENTURY

This second volume contains well over 100 fully detailed illustrations, including a VI launching site and, details of defence works in Korea and Vietnam. This is a much larger and more comprehensive volume than the first book.
Size 11 x 5 in. 40 pages

**50p**




## ARMORED VEHICLES

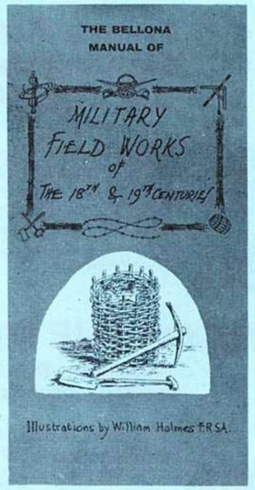
ARMORED VEHICLES by George Bradford — a highly detailed reference book covering the development of the tank, this is traced year by year. Under each illustration is listed, country of origin, main armament, weight and designation.
All the drawings are produced to a constant scale of 1:192.
Size 11 x 5 in. Card cover. Wire stitched.

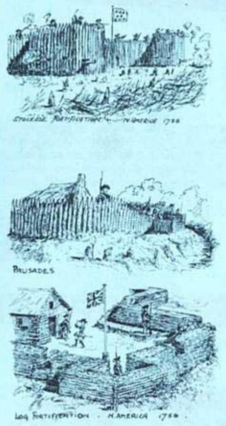
**40p**

## MILITARY FIELD WORKS of the 18th & 19th Century

MILITARY FIELD WORKS of 18th and 19th Century, this highly detailed sketchbook of military field works traces their development through campaigns in Europe, Africa and America. By William Holmes.
Size 10 x 5 in. 24 pages.

**35p**



**MODEL & ALLIED PUBLICATIONS LTD.,**
**13/35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTS.**

# BELLONA PUBLICATIONS HANDBOOKS

MODEL & ALLIED PUBLICATIONS have acquired the book stock and goodwill of BELLONA PUBLICATIONS and, will be continuing the various series of books produced so ably introduced by Bellona.

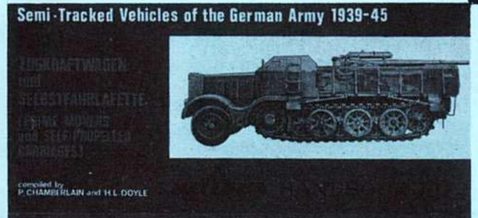
**No. 1 SELF-PROPELLED WEAPONS OF THE GERMAN ARMY 1939 – 45**

Part 1 Weapons on German Built Fully-tracked Chassis.

Contains all the German chassis which were adapted to carry self propelled guns with some sixty illustrations many of which have not appeared in print before.
Part 2 Weapons on Foreign built fully-tracked chassis. Contains the vast range of captured vehicles which were adapted to carry weapons, and has fifty-five illustrations. Both books contain a glossary of German terms and the English translation.
Size 11 x 5 in. 24 pages. Card cover in two colours. Wire-stitched.

Price (each part) 40p







**No. 2 SEMI-TRACKED VEHICLES OF THE GERMAN ARMY 1939 – 45**

Part 1 Prime Movers and Self-propelled Carriages

A huge variety of semi-tracked vehicles were used in WW II. These originated as artillery tractors and Part I contains Artillery Prime Movers, self-propelled guns, cranes, an armoured fire control centre for V-2 rocket launching units. Also captured French tractors used by the Germans. 28 pages 81 illustrations.
Part 2 Light Armoured Personnel Carriers.
Devoted to armoured troop carriers developed just at the outbreak of war. There were 36 officially listed major variations on the two most important types, plus basic models. 50 illustrations. List of vehicles (English and German) and abbreviations. 24 pages.
Size 11 x 5in. Card cover in two colours. Wire stitched.
Part 3 Is in active preparation for Mid summer 1971.

Price (each part) 40p

**No. 3 TRANSPORT USED BY THE BRITISH ARMY 1939 – 45**

Part 1 Tank Transporters, Recovery Vehicles, & Machinery Trucks.

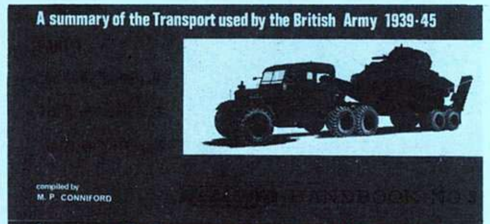
Includes not only vehicles of British manufacture but also vehicles from other countries, and covers Tank Transporters and trailers up to 40 ton pay load, recovery vehicles and machinery trucks giving a complete picture of all forms of vehicle recovery and refit. 56 illustrations. German/English glossary.
Size 11 x 5 in. 28 pages. Card cover two colours. Wire stitched.

Price 40p

Part 2 Gun Tractors, Bridging, Vehicles, Ambulances.

Gun tractors includes gun towing vehicles of all sizes from light a.a. gun haulage to giants such as 8-inch howitzer. Bridging Equipment vehicles include Australian Canadian and British pontoon and raft carriers, Ambulances include British and Canadian types. 75 illustrations.
Size 11 x 5 in. 28 pages Card cover two colours Wire stitched.

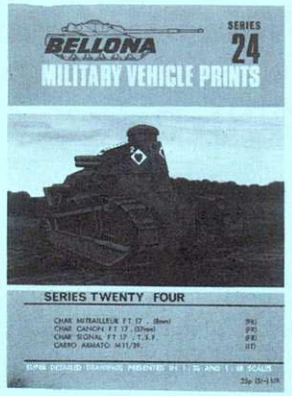
Price 40p




# MILITARY VEHICLE PRINTS

Nos. 1-19
12 pages. 9 x 6½ in. each **20p**

Nos. 20-24
16 pages. 9 x 6½ in. each **25p**




**1** Tank Mk 1 – 1916 (UK); Medium Mk A 'Whippet' 1918 (UK); PzKpfw 1 B/Pz Jaeger 1 – 1934/41 (GE); Jagdpanzer 'Tiger' (P); 'Elefant' – 1943 (GE).

**2** M. SPW Sd. Kf3 251/1 Semitrack APC 1938/42 (GE); Pz Kpfw 'Tiger' II (Porsche turret) 1944/45 (GE); SU 100 – Tank destroyer – 1945 (SU); CHI-HA Medium type 97 – 1937/42 (JA).

**3** Matilda Mk IV – 1940/41 (UK); TE-KE Tankette type 97 – 1937/45 (JA); M 18 GMC 'Hellcat' – 1943/45 (US); M 7B1 HMC 'Priest' – 1942(US).

**4** Stu. Pz IV 'Brummbaer' – 1944 (GE). Jagdpanzer 38 (t) 'Hetzer' – 1944/45 (GE); T 34/85 – 1943/46 (SU); Klimenti Vorsihilov 1 and 11 1940/42 (SU).

**5** M24 'General Chaffee' – 1944/50 (US); M4 'Sherman' 105mm Howitzer HVSS – 1944 (US); 10.5 cm PzFH 18 auf Pz II (SF) 'Wespe' 1942/44 (GE); Volkswagen Personenwagen, 2 versions 1940/45 (GE); Volkswagen Schwimmwagen1942/44.

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

**7** Sherman VC (17-pdr) 'Firefly' 1944/45 (US/UK); M 41 155mm HMC 'Gorilla' – 1944/55 (US); Pz Kpfw III F – 1940/41 (GE); SU 85 Tank destroyer – 1944 (SU).

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

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

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

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

**12** S. Pz Spaehwagen (8 rad) Sd Kfz 232 (FU) 1939/42 (GE); M 3AI 'General Stuart' III and IV – 1942 (US); Australian cruiser Mk I 'Sentinal' – 1942 (A). Opel 3-ton Trucks (1937/49) (GE). Maulbiger 1941/43 (GE).

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

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

**15** M 3 'General Lee Mk 1' – 1941/42 (US); Armoured Car 'Daimler Mk I' 1941/44 (UK); T 82 105 mm HMC – 1942/43 (US); Pz Spaehwg II 'Luchs' Sd Kfz 123 1942/43 (GE).

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

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

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

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

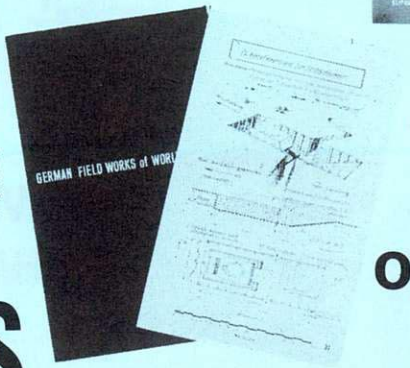
**20** The German PzKpfw III – Late models. Ausf L–1941/42. Ausf M 1942/43; 7.5cm 'Sturmpanzer-III' Ausf N 1942/42. Ausf M 1942/43; the 7.5cm tank A 13 – A 13 Mk I/Cruiser tank Mk III–(Reworked); A 13 Mk III and IICS/Cruiser tank Mk IV and Mk IV/CS and A 13 Mk IVA-IVACS/Cruiser tank Mk IVA-Mk IVACS.

**21** The German tank destroyer – 7.5cm PAK 40/2, auf Sfl II 'Marder' 1942/43 early and late models based on the PzKpfw II chassis; British 'Tortoise', 1942/47; British light tank Mk IA – with drawings of the A4E6, A4E7, A4E8, A4E9, A4E10, 1930/35 American Howitzer Motor Carriage T 3 based upon the Combat car M1 1939.

**22** American heavy 155cm Gun Motor Carriage M 12 with the GMC T6 prototype and 155mm GMC M 12 production model; Cargo Carrier M30 and the T 14 prototype. 1941/44 ISU 122 – 1944/45 Soviet Assault Gun Motor Carriage ISU 122 – D1-9S and A 25 S versions, 1944/45.

**23** Special Bundeswehr main battle tank – Kampf-Panzer 'Leopard' Issue drawings prototype II–(Group A) Production Kampfpanzer 'Standard' – Leopard; Recovery and Engineer Vehicles Berge-pazner 'Standard' and Pionierpazner 'Standard' J-962/70.

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



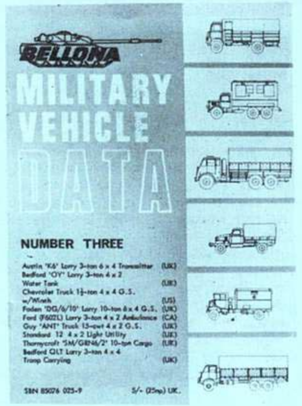

# GERMAN FIELD WORKS OF WORLD WAR II

A series of magnificent drawings of fortifications including fire trenches m.g. trenches, mortar weapon pits, anti-tank gun weapon pits, field gun positions – semi-static and static field fortifications, field structures above ground, m.g. bunkers, accommodation bunkers, a.a. weapon towers, anti-personnel obstacles, anti-tank obstacles, concealment techniques. Notes in English on German sketches. Military terms German-English glossary.

8¾ x 5½ in. 78 pages, drawn-on card cover, profusely illustrated.

**90p**

# MILITARY VEHICLE DATA




**3** Austin 'K6' Lorry 3-ton Transmitter (UK); Bedford 'OY' Lorry 3-ton Water Tank (UK); Chevrolet Truck 1½-ton G.S. w/Winch (US). Foden 'DG/6 10' Lorry 10-ton G.S. (UK); Ford (F60L) Lorry 3 ton Ambulance (CA); Guy 'ANT' Truck 15-cwt G.S. (UK); Standard 12 Light Utility, (UK); Thornycroft 'SM/GRN6/2' 10-ton Cargo (UK) Bedford QLT Lorry 3-ton Troop Carrying (UK).

**4** Bedford MWD Truck 15-cwt. G.S. (UK); Crossley IGL 8. 3-ton Searchlight (UK); Dodge T 110 Lorry 3-ton Stores (C); Leyland 'Lynx' Lorry 3-ton G.S. (UK); Chevrolet (C60S) Truck 3-ton Dump (C); Thornycroft 'Tartar' Lorry 3-ton (UK); Karrier 'K6' Truck 3-ton (UK); Ford CIIAD Heavy Utility (C); Morris-Commercial Truck 15-cwt. Wireless (House Type) (UK).

**1** Ford (F60L) Portee 3-ton (CA); Leyland Hippo G.S. 10-ton (UK) Dodge T 110-L-5 Water Tank 3-ton (CA); Dennis Tipper 3-ton (UK); Guy FBAX Wireless 3-ton (UK); Dodge T214 Weapons Carrier (US); Chevrolet (C60L) Office 3-ton (CA); Morris CS8 Water 15-cwt. (UK); GMC DUKW Amphibian 2½-ton (US).

**5** Adler '3GD' Car Medium 4x2 Kfz 12 (GE); Daimler-Benze 'G5' Car Medium 4x4 (GE); Daimler-Benz 'G3a' Truck Light 6x4 (GE); Steyr-Daimler-Punch '1500 A' Truck Light 4x4 (GE); Daimler-Benz 'L3000 S' Truck Medium 4x2 (GE); Adam Opel 'Blitz 3t' 3,6-6700 A Truck Medium 4x4, (GE); Faun 'ZR' Tractor wheeled heavy 4x2 (GE).

**2** Albion 'FT 11' Lorry 3-ton (UK); American 'BRC' 4x4 Light Recce Car (US); Bedford 'OYC' Lorry 3-ton X-Ray (UK); Diamond T Lorry 4 ton G.S. (US); Ford 'WOA2' Heavy Utility (UK); Mack 'NR 4D' Lorry 10-ton G.S. (US); Thompson 500-gallon Fuel Tender (UK); Maudslay 'Militant' Lorry 6-ton G.S. (UK); White 'M3A1' Truck 15-cwt. Personnel (US).

**6** Chevrolet Truck 1½-ton 4x4 Telephone Maintenance (US); Leyland 'Hippo' 10-ton 6x4 Printing (UK); Ford 'WOT 6' Lorry 3-ton 4x4 G.S. (UK); Morris 'CDF' Lorry 30-cwt 6x4 G.S. (UK); Standard 14 4x2 Light Ambulance (UK); Bedford 'RL' Lorry 3-ton 4x4 G.S. Cargo (UK); Chevrolet (C30) Truck 30-cwt. 4x4 Slave Battery (CA); Humber 4x4 Heavy Utility (UK); Morris Truck 8cwt. 4x 2 F.F.W. (UK).

As many as nine vehicles may be covered in each issue by way of 1:76 scale sketches, brief historical details, full technical specification and photographic coverage of each vehicle.
9 x 6¾ in. 20 pages, front and side views, specifications, dimensions, etc. **25p**

Add postage 7½p on orders under £1. Orders value £1 and up POST FREE.

# BINDERS

Beautiful blue P.V.C. reinforced semi-stiff covers BELLONA MILITARY REFERENCE LIBRARY embossed on the spine. To take up to 24-copies of Military Vehicle Prints or Data on wire retainers that enable books to be removed or replaced in a moment.

Equally suitable for Vehicle PRINTS &/or DATA

**£1**


## A Guide to MILITARY MUSEUMS

This useful work by Terence Wise lists the principal military and regimental museums in the U.K., with opening times, prices, special features, publications and in many cases regimental badges. Now includes 4-page supplement covering alterations and additions for 1971 season.
9 x 6 in. 32 pages. Card cover in colour. **25p**

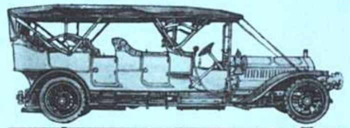
## French Armoured Fighting Vehicles BATTLE TANKS

Gives a brief description and photographs of French tanks including 1917 Schneider CA I, Saint Chamond; 1918 Renault FT 17; 1921 F.C.M. 2C; 1931 Renault DI; 1936 Renault D 2, Renault R 35; 1940 Renault R 40; 1936 BI BI bis; 1933 A.M.R. Renault 19-33; 1935 A.M.R. 35; 1939 A.M.C. 1935 ACGI 1937 Somua S 35, 1938F.C.M. 36; 1936 Hotchkiss H35; 1939 Hotchkiss H39; 1950-A.R.L. 44; 1953 A.M.X. 13; 1967 A.M.X. 30.

9 x 6 ¼ in. 30 pages, 51 photo illustrations
Full colour card cover **60p**


# DEVELOPMENT OF THE MOTOR CAR — 1770-1910

Designed by Roy Chambers, ATD MSIA,
Notes by Peter Blair Richley.



THE DEVELOPMENT OF THE MOTOR CAR FROM 1770 TO 1910
Designed by Roy Chambers Notes by Peter Blair Richley A Bellona Handbook

The book is one of the most comprehensive studies on the development of the Motor car ever produced, containing over 151 two colour line illustrations of the most interesting, rare and unusual vehicles of this period, many appearing in print again for the first time for over 50 years.

11" x 5" 32 pages **40p**

BELLONA

USE THIS HANDY ORDER FORM

To: **MODEL & ALLIED PUBLICATIONS LTD., 13/35 BRIDGE STREET, HEMEL HEMPSTEAD, HERTS, ENGLAND**

HOW TO ORDER: Fill in titles of books wanted with prices, total up and enclose Postal Order/Cheque to cover. Add postage 5p to orders totalling less than £1. ORDERS VALUE £1 & OVER POST FREE.

Name ........................................
Address ........................................
........................................
........................................

Use plain paper if you need more space. Do not forget name and address

Spring '71 ........................................ Date ................