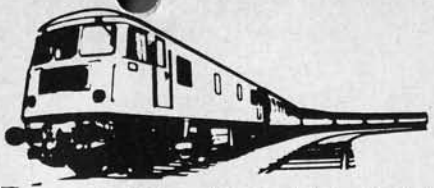
November 1979 45p
(U.S.A. & Canada $2.00)

# Model Mechanics

MAP HOBBY MAGAZINE

## MECCANO
## SCALING PLANS
## V–2 CYL
## STEAM ENGINE


## MODEL RAILWAYS FOR ALL



# worth turning this page round for these prices

# RAILMAIL
## MODEL RAILWAY CENTRES

**NEW:** HORNBY HAVE PRODUCED A LIMITED EDITION WAGON. BUY ANY HORNBY LOCOMOTIVE FROM US AND WE WILL GIVE YOU A WAGON FREE OF CHARGE.

| HORNBY LOCOS | RRP | OUR PRICE |
|---|---|---|
| R041 GWR Pannier | £10.25 | **£6.80** |
| R052 LMS Tank | £10.95 | **£7.35** |
| R058 BR Tank | £10.75 | **£7.35** |
| R063 Britannia | £19.75 | **£13.25** |
| R065 Evening Star | £20.85 | **£13.99** |
| R066 Duchess | £20.75 | **£13.99** |
| R077 GWR Tank | £7.25 | **£4.85** |
| R078 GWR King | £18.75 | **£12.50** |
| R353 LBSC Tank | £11.25 | **£8.49** |
| R761 Kneller Hall | £15.25 | **£9.99** |
| R842 LMS Class 5 | £19.45 | **£12.99** |
| R845 Scotsman | £17.75 | **£11.85** |
| R852 Ivatt Green | £15.75 | **£10.75** |
| R866 LNER B12 | £14.35 | **£9.99** |
| R073 Class 47 | £16.45 | **£11.99** |
| RO68 Type 25 Blue | £11.95 | **£7.99** |
| R072 Type 25 Green | £11.95 | **£7.99** |
| R074 Hymeck | £11.25 | **£7.65** |
| R080 Type 29 Green | £11.25 | **£7.65** |
| R084 Type 29 Blue | £11.25 | **£7.65** |
| R156 Diesel Shunter | £8.75 | **£5.75** |
| R352 Western Diesel | £16.45 | **£11.99** |
| R751 Co Co Diesel | £12.55 | **£7.99** |

| HORNBY COACHES | RRP | OUR PRICE |
|---|---|---|
| R921 Intercity Coach | £3.65 | **£2.50** |
| R922 Intercity Brake | £3.65 | **£2.50** |
| R923 Intercity Buffet | £3.65 | **£2.50** |
| R924 Intercity Sleeper | £3.65 | **£2.50** |
| R429 GWR Coach | £3.65 | **£2.50** |
| R430 GWR Brake | £3.65 | **£2.50** |
| R431 SR Coach | £3.65 | **£2.50** |
| R432 SR Brake | £3.65 | **£2.50** |
| R433 LMS Coach | £3.65 | **£2.50** |
| R434 LMS Brake | £3.65 | **£2.50** |
| R435 LNER Coach | £3.65 | **£2.50** |
| R436 LNER Brake | £3.65 | **£2.50** |
| R437 BR Coach | £3.65 | **£2.50** |
| R438 BR Brake | £3.65 | **£2.50** |
| R439 I/C MkIII Coach | £3.65 | **£2.50** |
| R428 I/C MkIII 1st | £3.65 | **£2.50** |
| R454 GWR Rest. Car | £3.65 | **£2.50** |
| R449 Lighting Unit | £1.85 | **£1.20** |
| R413 Royal Mail Set | £5.95 | **£4.80** |

| TRACK | RRP | OUR PRICE |
|---|---|---|
| R612 LH Point | £1.95 | **£1.50** |
| R613 RH Point | £1.95 | **£1.50** |
| R640 LH Point | £2.65 | **£2.20** |
| R641 RH Point | £2.65 | **£2.20** |
| R663 Remote Control | £2.85 | **£2.25** |

| MAINLINE LOCOS | RRP | OUR PRICE |
|---|---|---|
| Peak Green | £13.99 | **£9.99** |
| Peak Blue | £13.49 | **£9.99** |
| Preserved Scot | £21.38 | **£15.99** |
| LMS Scot Black | £21.00 | **£15.00** |
| BR Scot Green | £21.00 | **£15.00** |
| LNER J72 Tank | £9.80 | **£6.99** |
| BR J72 Tank | £9.30 | **£6.99** |
| Blue Grey Coach | £3.45 | **£2.60** |
| Blue Grey Brake | £3.45 | **£2.60** |
| Maroon Coach | £3.45 | **£2.60** |
| Maroon Brake | £3.45 | **£2.60** |
| Choc/Cream Coach | £3.45 | **£2.60** |
| Choc/Cream Brake | £3.45 | **£2.60** |
| Cream/Crimson Coach | £3.45 | **£2.60** |
| Grey/Crimson Brake | £3.45 | **£2.60** |
| LMS Coach | £4.30 | **£3.30** |
| LMS Brake | £4.30 | **£3.30** |
| Red Cream 57' | £4.30 | **£3.30** |
| Red Cream Brake | £4.30 | **£3.30** |
| 6 Assorted Wagons Our Choice | | **£6.00** |

| AIRFIX | RRP | OUR PRICE |
|---|---|---|
| LMS Royal Scot | £19.50 | **£13.00** |
| BR Royal Scot | £19.50 | **£13.00** |
| Fowler Black BR | £13.75 | **£9.99** |
| Fowler Black LMS | £13.75 | **£9.99** |
| 14 XX GWR Tank | £11.95 | **£8.99** |
| 14 XX BR Tank | £11.95 | **£8.99** |
| GWR Prairie | £12.50 | **£7.99** |
| BR Prairie | £12.50 | **£7.99** |
| ALA Diesel Blue | £11.50 | **£6.99** |
| ALA Diesel Green | £11.50 | **£6.99** |
| Intercity Coach 1st | £3.75 | **£2.60** |
| Intercity Coach/Brake | £3.75 | **£2.60** |
| GWR B Coach | £3.75 | **£2.60** |
| GWR Autocoach | £4.25 | **£3.30** |
| BR Autocoach | £4.25 | **£3.00** |
| LMS Coach Corridor | £3.75 | **£2.60** |
| LMS Coach Brake | £3.75 | **£2.60** |
| BR Red Cream Coach | £3.75 | **£2.60** |
| BR Red Cream Brake | £3.75 | **£2.60** |

**H & M POWER CONTROL UNITS**

| | RRP | OUR PRICE |
|---|---|---|
| Duette | £19.99 | **£16.00** |
| Clipper | £14.50 | **£11.00** |
| Multi Pack | £8.50 | **£7.00** |
| H & M Rocket | £8.50 | **£6.50** |
| H & M Flyer | £10.99 | **£8.00** |

| LIMA | RRP | OUR PRICE |
|---|---|---|
| Green Deltic | £9.90 | **£6.99** |
| Blue Deltic | £9.90 | **£6.99** |
| J50 Black | £8.99 | **£5.99** |
| J50 Green | £8.99 | **£5.99** |
| GWR Prairie | £10.95 | **£6.99** |
| BR Prairie | £10.95 | **£6.99** |
| GWR 94XX | £10.95 | **£6.99** |
| BR94XX | £10.95 | **£6.99** |
| Type 33 Blue | £9.90 | **£6.50** |
| Type 33 Green | £9.90 | **£6.50** |
| GWR King | £17.60 | **£11.99** |
| BR King | £17.60 | **£10.99** |

RELCO TRACK CLEANER
SPECIAL PRICE **£6.00**

**'N' GAUGE CORNER**

| | |
|---|---|
| BR Pannier | **£8.50** |
| BR Hall | **£14.00** |
| BR Prairie Green | **£11.50** |
| BR Prairie Black | **£11.50** |
| BR Tank | **£8.50** |
| SR Tank | **£8.50** |
| LMS Red Tank | **£8.50** |
| Black LMS Tank | **£8.50** |
| SR Diesel Shunter | **£7.50** |
| LMS Diesel Shunter | **£7.50** |
| 5 PO Wagons Our Choice | **£4.00** |

**LIMA LOCOS 'N'**

| | |
|---|---|
| ALA Diesel Blue | **£7.99** |
| ALA Diesel Green | **£7.99** |
| AL6 Overhead Loco | **£7.99** |
| Minitrix 2-10-0 Black | **£22.00** |
| Minitrix Dock Tank | **£8.99** |

# RAILMAIL
## MODEL RAILWAY CENTRES

**65 VICARAGE ROAD, WATFORD, HERTS. 0923-46966 (3 lines)**

**165A ST. VINCENT ST., GLASGOW, C.1. 041-221-3111.**

**24-Hour Answering Service**

**MAIL ORDERS TO WATFORD ONLY**

ACCESS, BARCLAYCARD, HOBBYCARD Welcome. Simply send number or dial 0923-46966 for your fast line to RAILMAIL.

ORDERS OVER £6.00 POST FREE
UNDER £6.00 ADD 50p P&P

All orders will be despatched subject to stock availability by return of post. Allow 21 days for delivery. E & OE. All items subject to availability.
Personal Shoppers welcome to inspect our complete discount range of model railways. Compare our prices and see what you save!

# Model Mechanics

**Volume 1 Number 10**
**November 1979**


Cover pictures: Top, a selection from the Hornby stable and below, an Airfix locomotive.

This month I have given a large amount of space to model railways. James and Rita Vanderbeek, both very enthusiastic model railway experts, have covered the wide range of ready-to-use systems available in their review "Model Railways for all". Here's a specially compiled feature designed to help the newcomer to the hobby to choose the best system for his or her requirements. Obviously, space available and the eventual cost plays a big part, but getting to know what is available must be the starting point.

A good way, of course, to find out about any hobby is to visit a specialist exhibition. The 6th European Festival of Model Railways was a fine example. This is an annual Exhibition which is held over the last week of August at the Central Hall, Westminster, and as usual, this year's was a fascinating event. There were railway systems right across the range on show, from live steam to the Fischertechnik Construction system for 3-year-olds upwards.

One display that caught my eye was the Märklin "mini-club" Z gauge automatic three train lay-out with working crossings and opening and closing shed doors.

The beauty of such a small scale layout as this (it is only 1/220th scale), is the scenery and buildings, giving a very good atmospheric effect.

Of course there were superb examples of layouts and rolling stock from all the big names, Flesichman, Hornby, Airfix, Lima, Palitoy and Faller to mention a few. I can almost certainly recommend all of you interested in model railways, to visit any of the exhibitions where you will see the latest developments and additions to the hobby.

The next exhibition is at the Cornfield Hall, Taunton, Somerset, run by the E.M. Gauge Society on the 1st December 1979, then the Manchester Model Railway Society have their big 43rd show on the 14th, 15th and 16th of December 1979, at U.M.I.S.T. main building, Sackville Street, Manchester 1.

For everyone with an interest in modelling, it will soon be time once again for the Model Engineer exhibition. This will be opened by His Royal Highness, The Duke of Gloucester and will be held at the Wembley Conference Centre from 2nd January until 12th January 1980 (excluding Sunday). Here you can see the world's best in over fifty different categories of model subjects and visit over a hundred stand holders whose job it is to make your modelmaking all the more enjoyable.

The Conference Centre is right next to the world-famous Wembley Stadium, just a few minutes walk from either Wembley Central or Wembley Park underground stations—or if you travel via Marylebone, there is a station for the Wembley Complex almost next door!

Don't miss this show—it is going to be the most memorable in many years. Of course, if you would like to be part of the show and want to make an entry, there is just time to send for the entry forms. Exhibition Manager Peter Freebrey (c/o the Editorial Offices) will be pleased to supply more information. If you live a long way from Wembley, Peter will endeavour to assist in arranging transport for your entry, so there is no excuse in saying you're from outer Glencoe and can't get the model to Wembley!

As ever, it will also be truly International, with models from Japan, Germany, France, U.S.A. etc.—make note of the dates, January 2nd-12th. Meanwhile, enjoy this month's review on small scale railways.

**Editor**

## Contents



Editorial Director Ron Moulton
**Editor** **Colin Rattray**
Managing Director Gospatric Home
Advertisement Manager Gordon Miles A.int.M.
Group Advertisement Manager Michael Merrifield

**Advertisement Offices:** Model & Allied Publications Ltd., P.O. Box 35 Bridge Street, Hemel Hempstead, Hertfordshire HP1 1EE. Tel: Hemel Hempstead 56117.
**Subscription Department:** Remittances to Model & Allied Publications Ltd., P.O. Box 35, Bridge Street, Hemel Hempstead, Hertfordshire HP1 1EE (subscription queries Tel: 0442-51740). **Direct subscription rate** £7.50 per annum, including index, $15 (U.S.) for overseas subscriptions.


Second-class postage rates at New York, N.Y. Registered at the Post Office for transmission by Canadian Post. American inquiries regarding news stand sales should be sent to Eastern News Distributors, 111 Eighth Avenue, New York, N.Y. 10011 U.S:A. Telephone (212) 255-5620 and Hobby Shop Sales to Bill Dean Books Ltd., 166-41 Powells Cove Boulevard, Whitestone, New York 11357, U.S.A. Telephone (212) 767-6632.

*Model Mechanics* is printed in Great Britain by New Avenue Press, Feltham, Middx., Mono Origination and Phototypesetting by Derek Croxson Ltd., Chesham, Bucks, for the proprietors and publishers, Model & Allied Publications Ltd. (a member of the Argus Press Group), 13/35 Bridge Street, Hemel Hempstead, Herts. Trade sales by Argus Distribution Ltd., 12/18 Paul Street, London, E.C.2, to whom all trade enquiries should be addressed.

Published on the second Friday of each month.



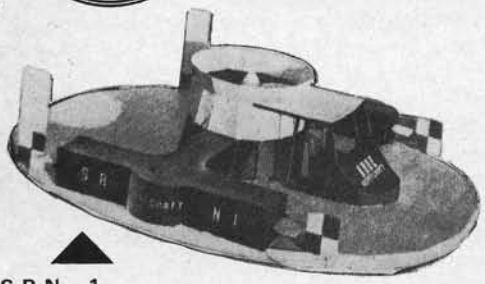
*Also publishers of*
**RADIO MODELS**
**AEROMODELLER**
**SCALE MODELS—MODEL ENGINEER**
**MODEL BOATS—MODEL RAILWAYS**
**WOODWORKER—MILITARY MODELLING**
**MOVIEMAKER—PHOTOGRAPHY**
**GEMCRAFT—CLOCKS**
**OLD MOTOR**
**POPULAR ARCHAEOLOGY**
**UNDERWATER WORLD**
**PUZZLERS DIGEST**
**PUZZLERS WORLD**

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

**Model & Allied Publications Ltd**

**P.O: BOX 35, BRIDGE STREET, HEMEL HEMPSTEAD, HERTS. HP1 1EE. Tel: Hemel Hempstead 41221 (Mon.-Fri.)**

# Model Mechanics PLANS SERVICE



**S.R.N.—1**
A semi-scale model hovercraft. Powered by any 2½-3½cc engine. The model gives a spectacular performance over land or water, hovering at 1-2 in., while moving forward at 5-10 m.p.h. Suitable for R/C. Size 40in. × 30in., all-balsa.
**MM/583** **Price £1.50**

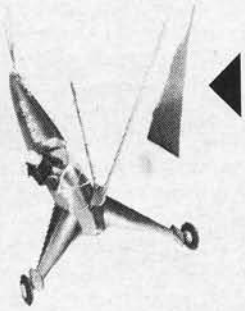
**SNO-CAT**
Unusual caterpillar model of trans-Antarctic Expedition vehicle, using simple electric drive and suitable for miniaturised radio. Scale ¾ in. to the foot, length 14in. Simple construction throughout.
**MM/529** **Price £1.10**


**MR. ROBOTHAM**
An ingenious 2ft. high walking robot, powered by two small electric motors. Balsa and card construction; causes a sensation whenever it appears in public!
**MM/406** **Price £1.10**

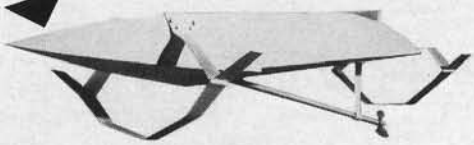
**HOTFOOT**
Most unusual three point hydrofoil airscrew driven boat for up to 1.5cc. Extremely fast for tethered or free-running. Simple balsa construction, overall length 15in.
**MM/476** **Price 80p**


**RECOVERY**
An unusual amphibian model with both wheels and waterscrew continually driven with 1-2cc motor. Construction mostly from sheet balsa. Suitable for radio control adaptation. L.o.a. 19in.
**MM/554** **Price 80p**

**SAND FAIRY ANN**
Smart land yacht model capable of very high performance and incorporating such ingenious devices as a crew ballast swinging out to windward by an amount proportional to wind pressure on the sail. Simplified vane gear, easy and very inexpensive construction, length over all 17in., height 30in.
**MM/466** **Price £1.10**

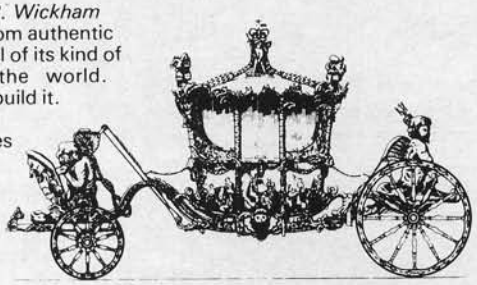


**LECROFOIL**
An experimental electric powered hydrofoil 30in. in length and 4½in. hull beam which planes on its foils under electric power and with lightweight accumulators is capable of carrying R/C.
**MM/1021** **Price £1.50**



**R/C MOTOR SCOOTER**
Amazing free-lance R/C motor scooter design, using simple all-metal construction. Approximately 25 in. (635mm) long, and 16in. (406mm) high to top of handlebars, this machine has created curiosity and interest wherever and whenever it has been demonstrated. Control action is exactly as full size, and employs R/C equipment with two proportional functions for steering and throttle. Balance is achieved simply by motion as in full size and does not require outrigger stabilisers. Machine banks to turn just like the real thing. May use 1-2.5cc air-cooled diesel or glow motors. A true show-stopper wherever it is displayed.
**RC/1177** **Price £2.25**


**CORONATION COACH** *By P. R. Wickham*
A 1/16th scale model designed from authentic sources. The most amazing model of its kind of the oldest State Coach in the world. Simple tools only are required to build it. Included are copies of the original 1953 booklet containing 12 pages of comprehensive step-by-step instructions.
**MM/260** **Price £1.50**



**TEAL**
*By Peter Holland*
Described as a Tripedal Electronic Ambulatory Locomotive, this is a futuristic space model powered by a small electric motor, and it actually walks. Simple construction with wire cranks, etc.
**MM/380**
**Price 80p**


**MODEL MECHANICS PLANS SERVICE** Model Mechanics Nov. '79
**Model & Allied Publications Ltd.**
**PO Box 35, Bridge Street, Hemel Hempstead, Herts.**
Please supply the following plans:

| *Plan No.* | *Name* | *Price* |
|---|---|---|
| | | |
| | | |
| | | |
| | *TOTAL* ... ... | |

NAME (in block caps) .....
ADDRESS (in block caps) .....
.....
.....

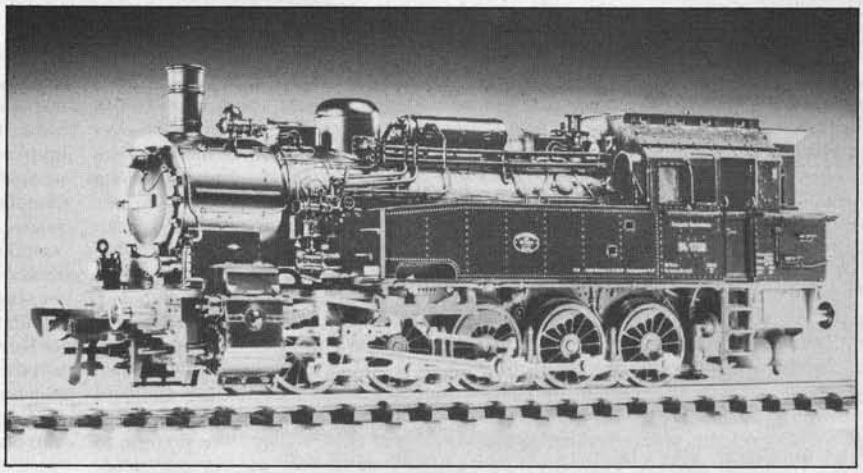
**POSTAGE**
INLAND: Orders up to £2.00 add 20p; from £2.00 to £3.50 add 30p; over £3.50 post free
AIRMAIL: Add 50 per cent to order value.

# FLEISCHMANN

# Quality Speaks Louder Than a 1,000 Words

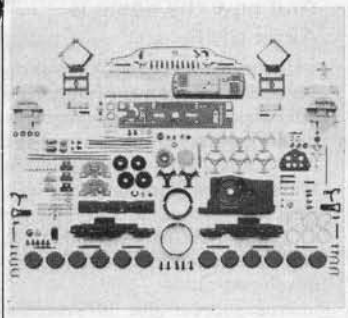
*HO/OO Gauge*
No. 4094
**Price £46.20**

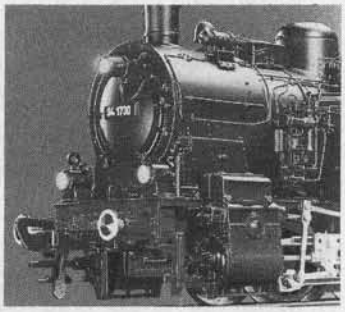
*'N' Gauge*
No. 7094
**Price £39.00**



Heavy tank loco 0-10-0, Class 94—nicknamed the 'Black Buffalo'. Fully working 'Heusinger' valve gear—triple headlights, full detail.

*Exquisite reproduction of the exterior pipework so typical of Continental locomotives!*






### Is there a standard of quality in model railways?

FLEISCHMANN have imposed upon themselves just such a standard. And this is especially stringent!
Taking the electric loco 103 for instance, it needs exactly 237 quality tested parts, before the "fastest on the DB" becomes a FLEISCHMANN super-model. After all those parts have been assembled and the model has passed all its tests, the 103 electric loco receives the "all clear" from Herrn Kolb.
Now we can release it to you — just like the larger prototype, the DB — to go into service on your hobby layout.

### Is it possible to have top quality precision in ready-to-run models?

Yes — from FLEISCHMANN! The latest creation from FLEISCHMANN is perhaps the best example.
The HO version of the BR 94 has been chosen by the readers of the magazine "Eisenbahn magazin" as the "Model of the Year".
Another example of FLEISCHMANN quality: — the consumer magazine "Stiftung Warentest" in their edition 4/76 tested 12 model locomotives of various makes. Only two received the award "Very Good". The BR 55 (Cat. No. 4145) and the BR 110 (Cat. No. 4335) from FLEISCHMANN!

# INVEST IN FLEISCHMANN AND ENJOY THE INTEREST!

*Catalogue and full range available at top quality model shops.*

*Sole U.K. Importers:*
**M&R (Model Railways) LTD.,**
**27 RICHMOND PLACE,**
**GRAND PARADE, BRIGHTON.**
Tel: (0273) 655129/604059.

# Model Railways for all

## the first Model Mechanics guide to the ready-to-use systems

by James & Rita Vanderbeek

*R-18 Royal Scot – the Rivarossi HO scale.*

These words are intended less for the specialists than the many thousands of people who have a basic interest in model railways, would like to know more and who, quite possibly, are faced with the task during the coming months of purchasing or extending some sort of a layout. The words "some sort" are very important, for never before has there been so many types to choose from, in so many price brackets, and with so much heavily biased information offered to potential buyers.

Because competition is so intense in the main U.K. scale (00; 4mm:1ft), it is fair to say that there are no bad models around. In fact, all are very good, because development has been speeded up, with the mass-market manufacturers in U.K. and abroad all busily engaged in trying to give, in effect, more and better models for less money. In the same way, these ready-to-use models (and in the other scales too) are in no way "toy" trains any more. They are beautifully detailed replicas of the full-size machines, with standards of construction and finish that are equalled only by very few of the models produced at very much higher prices for the specialist market.

Choosing the locomotives and rolling stock for a new layout is something which should not be rushed. The obvious planning decisions which must be made include gauge and scale, overall size, the period, the types of motive power and rolling stock to suit its geographical setting . . . even choice of country, for with such widespread knowledge and experience of foreign railroads, more and more layouts based on European or U.S. settings are being built up in Britain. Even concentrating on our own railways, the choice of LMS, LNER, GWR and SR types, before getting involved with the steam and diesel haulage of British Rail, can be a daunting task – best overcome by the judicious purchase of a general book or two, followed by discussions with other enthusiasts or local model stockists. The latter can and will provide a great deal of help – but be fair and remember that one good turn deserves another when it comes to giving that dealer a share of your business.

These parameters apply also to the other gauges, with the space limitations of so many modern homes well catered for in N-scale. Progress has been so rapid that these 9mm gauge trains now parallel in scope the 00/HO ranges. Where space permits – indoors or in the garden – the larger scales have a great deal to offer but, inevitably, choice is much more limited and prices are high, with the exception of the Limit 0 gauge range which, as ever, is astonishing value.

In many instances it is possible to combine the products of a number of makers on one layout, albeit with, occasionally, a change of coupling type. In Britain most of the 00 gauge ranges have couplings which are reasonably interchangeable, so that problems are few. The N-gauge ranges all have a nominally standard coupling but it must be said that some are better than others. Models of European types are often provided with a quick-change facility – alternative coupling types being readily available.

Offering specific advice on model train control has long been a case of 'where angels fear to tread', but the long heralded arrival of the two-wire electronic systems has further complicated the issue, by their very claims of simplicity! Like most model press representatives we have attended demonstrations and been duly impressed by the results achieved and, for the future, the extension potential. However, we have not yet been given an opportunity of carrying out our own independent tests and so must, in fairness to all concerned, delay detailed comment. Having made that point, it should be said, also, that the concept is thoroughly modern, with well developed equipment and the backing of highly respected manufacturers. For larger layouts, particularly those with intensive train operation over complex trackwork, the two-wire systems must have definite operating advantages. We will witness their introduction with great interest, for they are too important to fail.

In looking towards the two-wire schemes, one must not assume that the present control systems are in any way obsolete. Our own opinion is that reliable standard controllers, such as those by AGW or H & M, will go from strength to strength, just as the advanced, conventional, train control systems (Fleischmann and Jouef are good examples) can be expected to flourish for many years yet.

Several other important choice factors come to mind, starting with the question of the servicing and repair facilities offered by the makers or their agents. This is a serious matter and is treated as such by all concerned. The larger makers offer a form of guarantee, whilst their factory or local service agents are capable people, able to deal with just about anything that can happen to a model. Initial product quality is still important, because the old saying that "you get what you pay for" has to apply to model railways as much as to other sorts of high precision electrical or mechanical goods.

A point which comes up regularly, is that of how and where models should be bought, and at what prices. The two are linked. Probably the most important thing is to decide, firstly, what sort of buying service you require. We have already mentioned local dealers and that they can provide valuable, expert advice – this is often worth having and, equally, worth paying a little extra on the price of your models. Because there is no price maintenance by law, many shops and mail-order houses are able to offer really cut prices – when measured against the recommended figures which, these days, are increasingly meaningless. As in everything else, there are good and bad stores of these types and practical experience is, as ever, the best tutor. Certainly no buyer should be 'put off' by cut prices, for they should be accepted as tangible benefits of competition in the retail trade. There are many highly competitive model shops and mail order firms which have been in business for years and who have reputations to defend – try them.

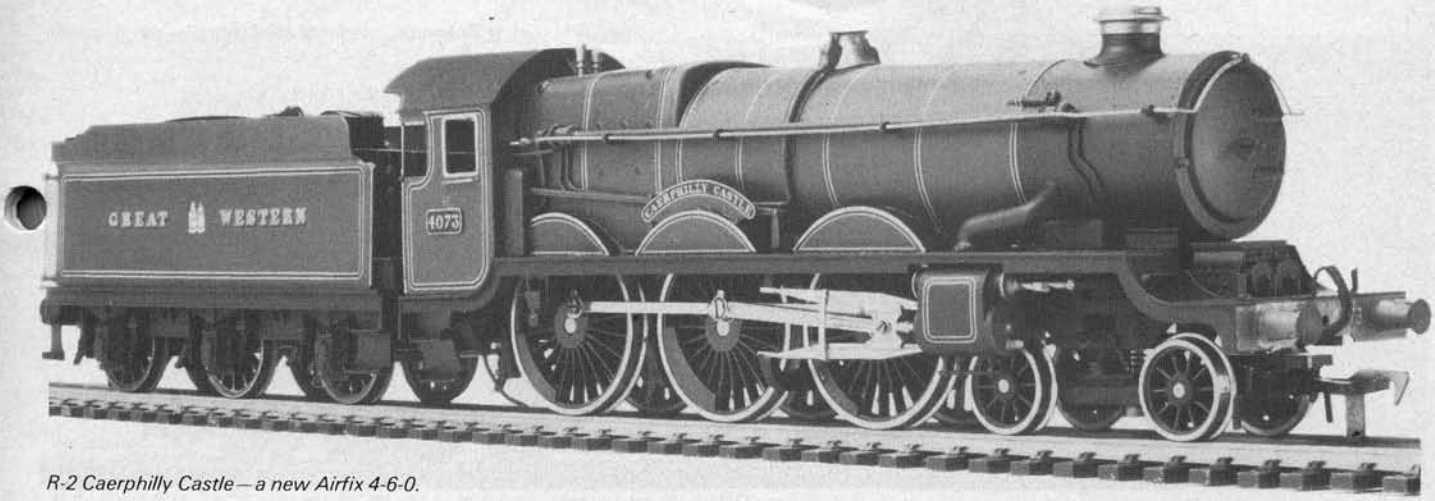
The following paragraphs describe the latest models from the railway specialists. We know them all and, as it happens, have test samples from five makers on our desk at this moment. Checking them out will, we are sure, provide us with interest, pleasure and satisfaction, for that is what model railways are all about.

### And now the name is Airfix GMR

The earliest stages of the Airfix 00 scale system were perhaps a little uncertain, but now there is no doubt that this range, backed as it is by the Airfix organisation, is firmly on the right rails. It has a new title – Great Model Railways – and a host of new models to high quality specifications is being developed.

Promised for the 1979 season are the GWR Caerphilly Castle and BR Pendennis Castle 4-6-0s, plus LNER and BR versions of the N2 0-6-2 tank locomotives which did such good work on suburban services. In addition there are new GWR/BR Centenary express coaches, a big group of company and BR freight wagons, plus two special types in the Syphon G and H bogie vans. Some of these items have already reached the shops.

Also prominent in the new GMR 36-page catalogue is the Airfix Multiple Train Control System, which employs modern electronics to provide control of up to sixteen trains on a layout, any four simultaneously, and without the complexity of individual wiring circuits. The master unit incorporates four individual controllers which have flexible, coiled leads so that, if necessary, four separate operators can work the trains on the layout. The locomotives require only the




*R-2 Caerphilly Castle – a new Airfix 4-6-0.*

installation — a simple matter — of miniature electronic chips to adapt them to the Train Control System, whilst the fact that there is constant voltage through the track means that loco and coach lighting remains illuminated.

Also described in the new Airfix catalogue is the latest selection of plastics construction kits, including non-powered locomotives, rolling stock, trackside units, buildings and even scale model figures and station platform accessories. These items are worth looking for. They are very well produced and reasonable in price.

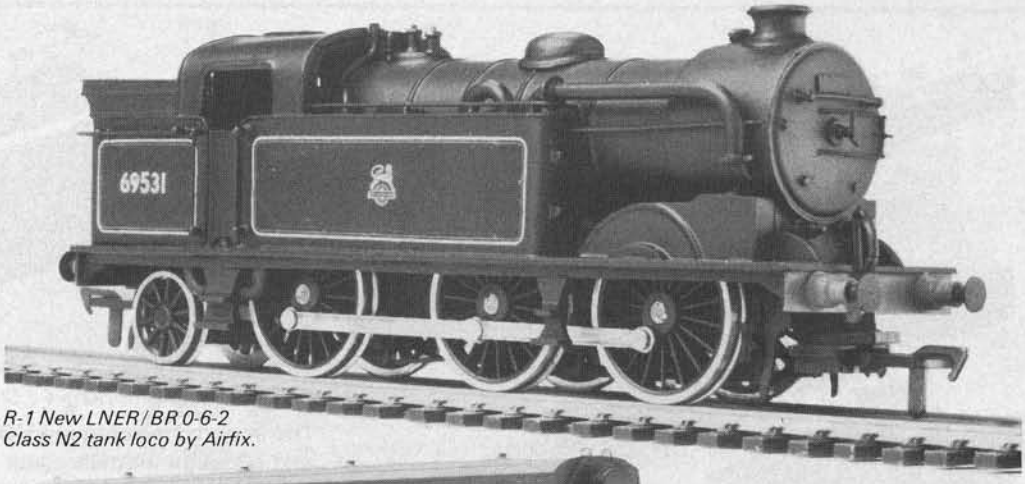
A final word on the locomotives and rolling stock in the Airfix range is perhaps appropriate. The LMS, GWR and BR locomotives have been well chosen and include some of the best examples of their types. The larger models feature tender drives but even the GWR 14XX model is capable of hauling remarkably heavy loads. Airfix GMR is very good value.

## European outline models by the originators of N-gauge

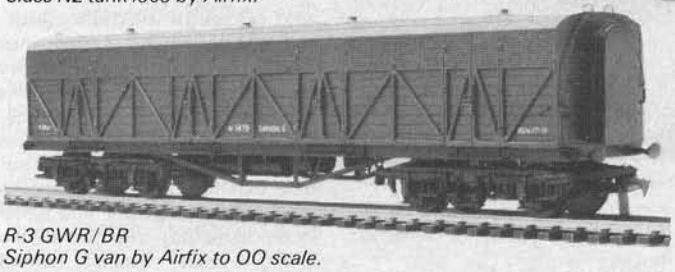
The first N-gauge model railways to be quantity manufactured were introduced by Arnold back in 1960. The range has grown to the point where it needs a 50-page catalogue to illustrate and describe its many models and features, so it is quite obvious that the Arnold system remains one of the world leaders in this small and very demanding gauge.

Offered as standard are models representative of all types of rail services including railbuses for local traffic, electric multiple units, pantograph equipped streetcars and trailers, plus steam, diesel and electric outline locomotives used in a number of European countries.

Backing this huge loco selection is an equally well developed range of passenger and freight cars which, in true Arnold style, includes a number of unusual vehicles such as private travel agency coaches, old Prussian Railways coaches, and others representative of the Rheingold expresses and local train stock in special colours.




*R-1 New LNER/BR 0-6-2 Class N2 tank loco by Airfix.*



*R-3 GWR/BR Siphon G van by Airfix to OO scale.*

*R-4 A&B Airfix OO scale GWR Centenary coaches.*

New models for this year include one of the most remarkable N-gauge locomotives ever put into quantity production — the 2-6-6-2 Crocodile of the Swiss Railways. This fully articulated model has side rod transmission from layshafts through all six driving wheel axles and a choice of current collection from track or pantographs. Various other steam and electric locos are becoming available, as are items such as a group of latest type tourist coaches, a station building kit and, of special interest to all potential N-gauge enthusiasts, the Starset, with double track layout, plus crossover and two sidings.

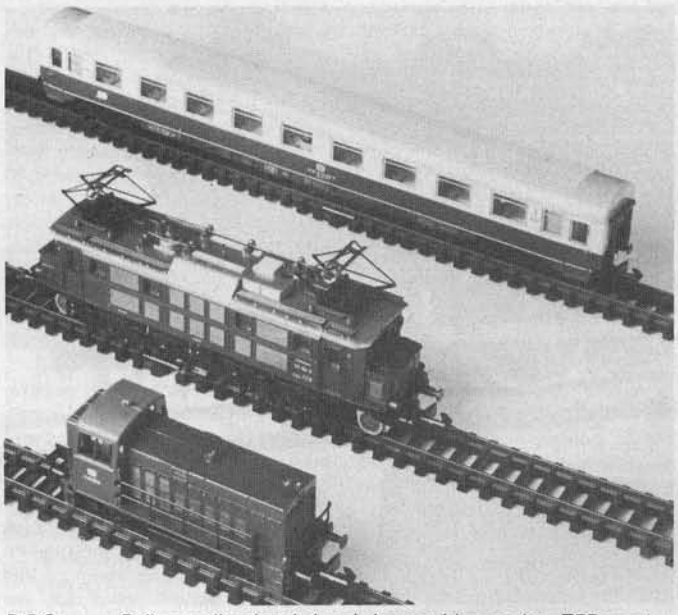
Arnold models are not amongst the lowest priced on the market, but are made like watches and represent superb value for the connoisseur.

## Three gauges in the Lima high value range

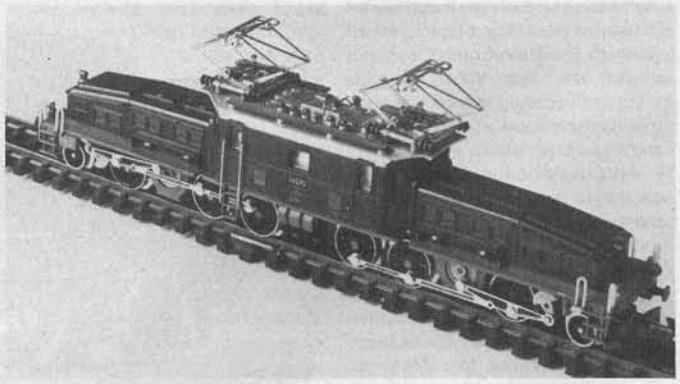
The changeover a few years ago from HO to the British standard 00 scale involved Lima in a huge programme of re-tooling. The benefits to enthusiasts in U.K. are now being fully enjoyed, for the current Lima 00 system is providing extremely good quality models at prices which are far lower than most. Lima have achieved this by working to relatively simple and well established mechanical and electrical standards and, in addition, achieving the full benefits of modern production methods to keep prices down. There is certainly no shortage of prototypes in the Lima range, rather is it one of the largest of all in terms of locomotives — steam, diesel and electric, of the pre-Nationalisation companies and British Rail.

Amongst the latest Lima products is a Class 87 Bo-Bo electric loco, City of London, which is equipped to utilise a newly introduced catenary system, plus Western diesel locos (as reviewed in the September issue of Model Mechanics) and a very well


*R-7 Lima OO model of BR Class 87, City of London.*



*R-5 German Railways diesel and electric locos with a modern TEE coach. All N-gauge by Arnold.*



*R-6 This Swiss Railways 2-6-6-2 Crocodile loco is one of Arnold's best yet.*

chosen group of freight wagons, ranging from 50 ton hopper wagons, through parcels vans and private owner coal wagons to two jumbo size vehicles, with transformer or BSC molten steel loads.

Several new British outline lineside buildings also are making their appearance. They have full colour printed card walls which slot together to form structures such as a country halt station and platform, an engine shed, signal box, village stores or detached house.

Of special interest is the Lima, nickel silver, standard geometry track system which can be used in conjunction with others already available, and which brings all the advantages of the corrosion free rail sections to this market, together with a new turntable having manual or optional electric actuation.

The Lima range is worth looking at!

## The superb Fleischmann HO and N-gauge models

The Fleischmann system has deservedly become a world leader for models in the HO and N scales which combine efficiency, accuracy of outline, long-term reliability and a choice which not only extends through vintage to modern steam, electric and diesel locomotives but includes all the rolling stock, train control systems, signalling, operating features for the lineside and even special purpose buildings. The HO system is now provided with an optional nickel silver railed track, whilst individual units such as high speed points with moving frogs demonstrate the technical standards achieved as normal.

In the smaller scale and 'piccolo' models are celebrating the tenth anniversary of their introduction, and the development and tooling of these high precision miniatures must rate as one of the biggest tasks undertaken by a model railway manufacturer anywhere.

Although predominantly of West German prototypes the two Fleischmann ranges also feature the locomotives and rolling stock of various other European countries. French, Belgian, Swiss, Dutch, Swedish and Danish models are all listed, with colours and markings absolutely true to type. In both scales the very latest German Railways Bo-Bo electric locomotive of DB Class BR 120 will make its appearance, with other new models including the 0-10-0 mixed traffic tank locos of Class Eh2, and the beautifully proportioned DB Class 614 diesel railcar set in the current ocean blue/beige livery. On recent test we found this model to be so quiet that the click of the wheels over rail joints was easily the most predominant sound.

Special mention must be made of the British outline Fleischmann models to HO scale. The British Rail Warship Class Bo-Bo hydraulic loco is available in either the original green or present blue livery, whilst there are also three versions of BR Bulleid express coaches as operated on the Southern Region and, therefore, in green livery.

In both HO and N scales Fleischmann offers a wide selection of starter sets — many with transformers included and

*R-8 Pathfinder — a new Lima BR(WR) Warship Class loco.*


*R-9 Lima's new Tartan Arrow parcels van — to be available in both N and OO scales.*

there are other supplementary track packs and Toporama landscape mats on which quite ambitious layouts may be built up.

### Graham Farish, a U.K. leader in British outline N-gauge

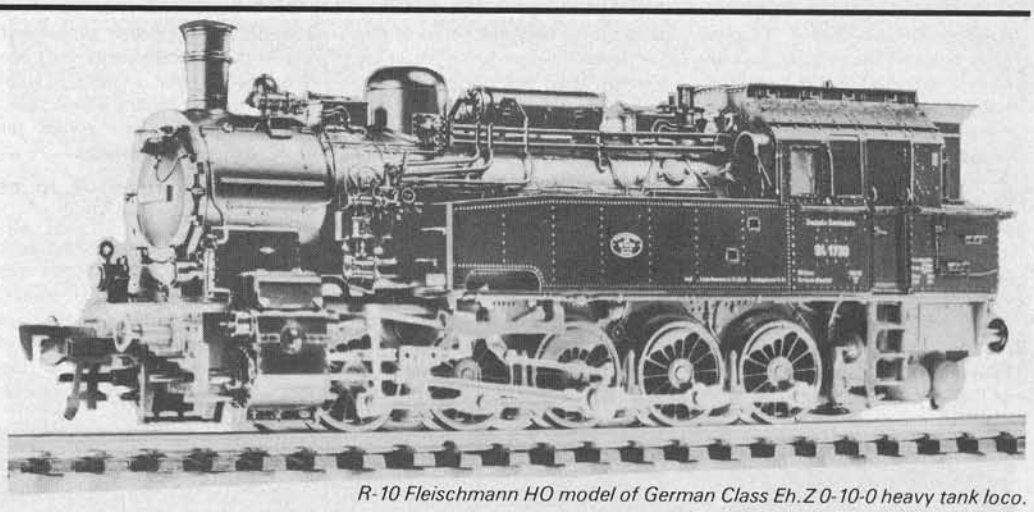
Long established on the British model railways scene, Graham Farish models have been improved greatly over the last few years and this higher quality and reliability, coupled with realistic price levels and continuity of supply, has resulted in the GF Masterpieces in Miniature (to see the makers' own name for them) becoming extremely popular with N-gauge modellers.

The GF loco range already features Hall, Merchant Navy, Battle of Britain and Class 5 express locos, plus 2-6-2 and 0-6-0 tanks in BR and company liveries, and a wide selection of suburban, corridor and 4-wheel passenger coaches, a pair of Pullmans and a fine variety of goods vans, wagons and brakes.

Amongst the latest GF products, the four brand new versions of the BR Class 01 0-6-0 diesel shunter must stand out. This loco has a brand new, closer coupled chassis with diecast body and choice of LMS or BR black liveries, BR green or present day blue finishes. These are very efficient little locomotives, striking in appearance with their yellow and black striped ends and adaptable to almost every layout.

Other new N-gauge vehicles include two new open bogie wagons — GWR loco and NE brick — plus four new private owners' vehicles, three vans and one steel bodied mineral wagon.

With this apparent emphasis on N-gauge stock it would be only too easy to forget the Graham Farish 00 scale range which, similarly, includes a really worthwhile selection of suburban and corridor coaches, pullmans and one of the most interesting groups of private owner vans and wagons available. They are all equipped with standard type auto-couplings, so that they may be used with success in conjunction with the locos and rolling stock of other marques.



*R-10 Fleischmann HO model of German Class Eh.Z 0-10-0 heavy tank loco.*

A final product group to merit special mention necessitates a further look at the Graham Farish N-gauge range. The first models in a new series of lineside buildings include a country halt station, straight platform units with ramps and a beautifully modelled signal box. All these are supplied completely finished and ready to use — at prices which are surprisingly reasonable.

### Royal Scot and European models in latest Rivarossi range

A very interesting HO (approx) scale model of the LMS 4-6-0 Royal Scot locomotive in its original, un-modified form with parallel boiler and single chimney, is now available in the Rivarossi range. This long awaited model is very highly detailed — externally and in the cab — and has shaft drive to the loco wheels from a tender mounted 12v motor. The Royal Scot is finished in the original LMS livery.

Also in the huge Rivarossi range, which involves N, HO and 0-gauge models, are Italian manufactured replicas of vintage and modern locos and rolling stock as operated in many of the European countries. These models are all of high quality — by reputation and in fact — and include prototypes which otherwise are very difficult to come by. Again prices are not low, but reflect the care that is taken during every manufacturing stage to produce top quality models.

### Hammant & Morgan power

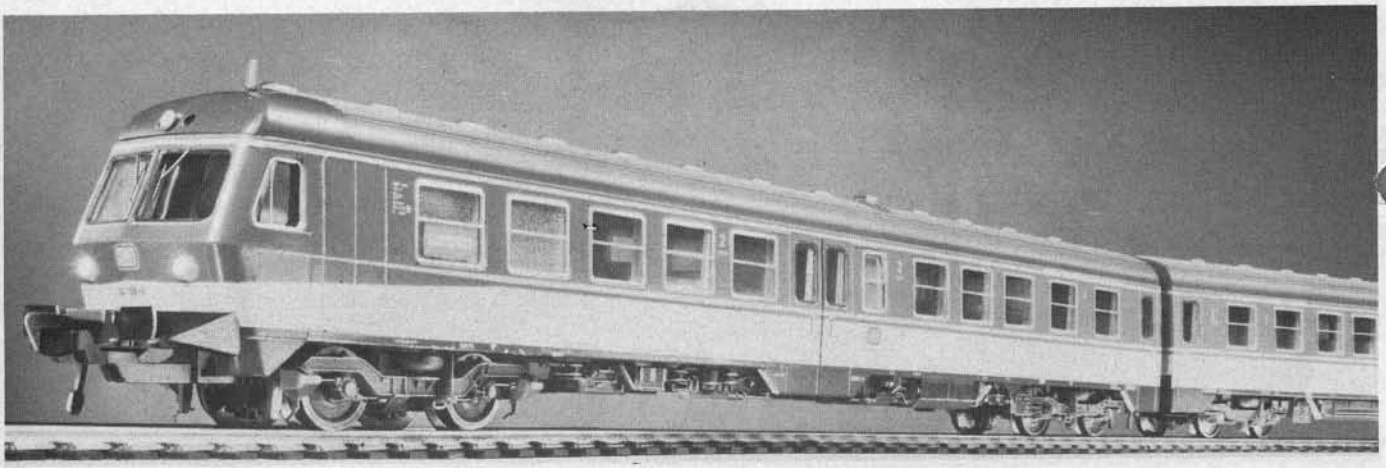
Claimed in all modesty by its makers to be "space-age styled" and the "ultimate in conventional model railway transformers", the HM3000 is, nevertheless, a neat and efficient controller. Its features include variable inertia and variable load compensation which enable the performance of a train to be maintained at realistic, near scale levels, whilst other facilities include track power with regulator and brake controls, a direction change switch and for an external AC power source to be plugged in where the normal 1 amp at 12v DC output is insufficient. There is a separate 16v AC output for accessory power, whilst a row of light emitting diodes set along the top of the casing provides visual indication of the state of play.

The new HM3000 is an addition to the existing range of power control equipment for all sizes of model railway layout. H. & M. is a specialist company with, besides it controller range, a fine assortment of point motors, switch consoles and similar accessories.

Quite different and indicative of H. & M's diversification policy is the company's introduction of a range of good quality lineside materials from USA — Woodland Scenics. Intended to provide materials from ground level to the tops of trees, the series includes two grades of coal, a comprehensive turf range and no less than eight different types of tree, with metal trunk castings. These Woodland Scenics items are necessarily relatively expensive, but are of high quality.

### Interesting new models for Hornby Railways

Many important developments have taken place in the Hornby Railways 00 gauge system since it was first introduced in the early 1950s. Few, however, have had such a long period of advance publicity as the Zero 1 2-wire train control system. It provides for up to sixteen locomotives to be accommodated on the layout and the installation of a chip in each of these allows them to respond to the individually coded signals transmitted through the layout from the master control unit. The system is being phased in through progressive product introductions and Zero 1 will later allow the operation of points, colour light signals and other electrical accessories directly from the keyboard. In its final, fully



*R-11 Two-coach diesel railcar of DB Class 614 by Fleischmann in HO scale.*

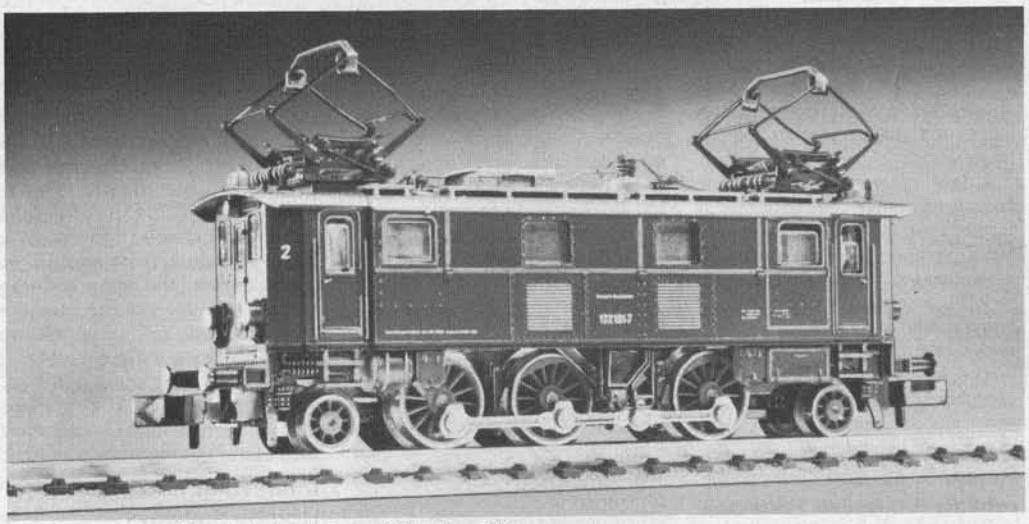
developed, form Zero 1 will even offer sound effects and a pre-set form of automatic layout control.

Zero 1 is promised for general release well in time for the 1979 modelling season but at our early August date of writing examples have not been made available for press purposes.

Other new items for Hornby Railways include the holder of the world steam speed record — the LNER 4-6-2 locomotive, Mallard — plus an LMS Patriot 4-6-0, Duke of Sutherland, and the E2 0-6-0 tank of the railway which rejoiced in the name of the London, Brighton & South Coast and which painted its engines in a most attractive lined-out livery — as now provided on the Hornby model. For modern image enthusiasts there is the tremendously popular BR(WR) Class 52 diesel hydraulic loco, Western Courier, and the re-introduction of the original two-tone green colours on the BR Class 47 diesel — a Class also operating on the Western Region.

New wagons with new chassis and body mouldings are also being released, including two of the latest 45 ton GLW vehicles and a GWR 7-plank wagon with sheet rail for the support of a tarpaulin cover. There are also new lineside accessories including an island platform canopy and series of new semaphore signal sets, whilst the Hornby Train Set range is also up-dated, with everything from vintage steam through to the classic expresses and the High Speed Train.

The Technical standards of Hornby Railways have improved considerably in the last two or three years and innovations — such as the recent change on some stock to scale buffer height — will enhance the appeal of this long-established and very popular system.



*R-12 Fleischmann 'piecolo' electric loco of DB Class 132.*

## New loco variants for Hornby Minitrix N-gauge

The British outline N-gauge range of Hornby Minitrix has perhaps not been developed as much as it might have been but two new variants — a BR Warship diesel in early green livery and the one and only green Class 9F 2-10-0 locomotive are now added to the range. There are also some new points in standard and large radii.

Existing locos start with the very versatile 0-6-0 dock tank and progress to the 4-6-2 Britannia and the Black 9F. There is also a Class 27 Bo-Bo diesel, again in the original green. The rolling stock range features chocolate/cream, maroon and blue/grey coaches, whilst freight vehicles include both BR and private owner types. For new N-gauge enthusiasts there are two starter sets — one a local freight hauled by the 0-6-0 tank, and a diesel hauled express for modern image enthusiasts.

## A good year for new Jouef HO scale models

The Jouef HO scale range is made in France and includes one of the largest selections of steam, diesel, electric and even gas turbine outline models available in europe. Obviously most of the range is based on French prototypes — with models from the middle of the last century onwards — but it also includes locos and rolling stock from many other countries to make it a truly European model system.

The standards throughout the Jouef range are very high in relation to the retail prices of the models, so that as a range it is one that may be recommended to all enthusiasts for this type of product. There are many new items to come this year, from the fascinating little 0-6-0 Boer tank locomotive of the late 1800s and which has, to match, the remarkable 4-wheeled coach with open upper deck seating and a pair of staircases for access to the very draughty top deck. Other new models which should be in the shops by now include an 0-6-0 diesel electric shunter, a magnificent SNCF 2-10-0 heavy freight locomotive and a number of new items of passenger and goods rolling stock. One of special interest if a first class Pullman coach as used for the Golden Arrow service between London (Victoria) and Paris.

Further new Jouef HO scale items include plastics kits for various types of lineside buildings, a service station of modern design, an impressive high-level girder bridge and a number of town buildings.

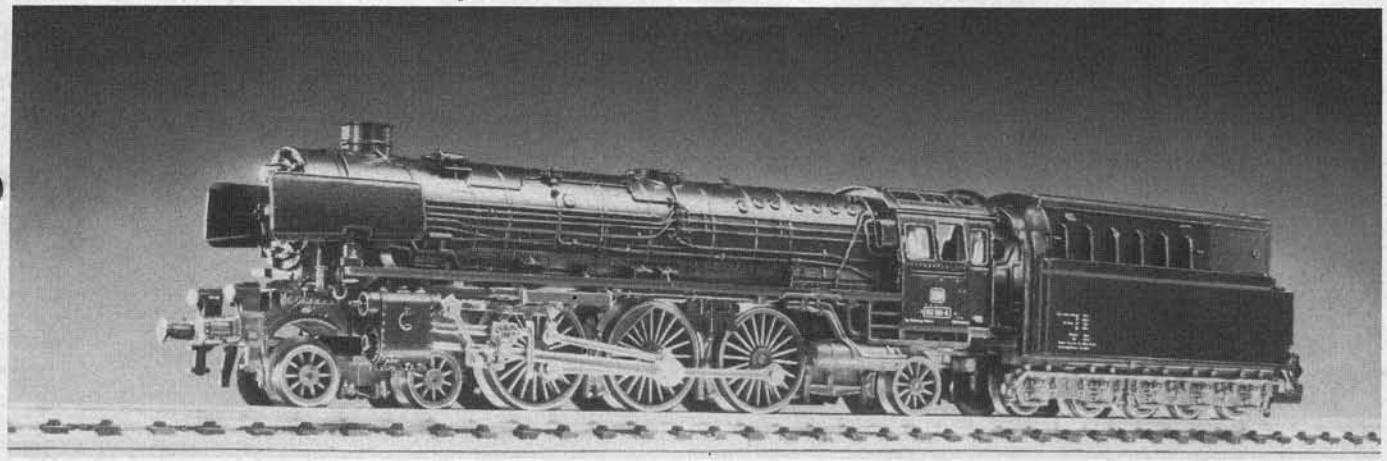
Train control has always been a strong point of the Jouef system and now there is a new electronic traffic controller which works in conjunction with colour light signals. Jouef track is now also available with nickel silver rail sections and it is particularly adaptable, offering two types of double slip and various other points and crossovers, including new curved electric points.

The recently commenced Jouef range of 00 scale British Rail diesel electric locos and coaches got off to a good start. The first loco is the impressive 1Co-Co1 of BR Class 40, available in both the original green and the present rail blue liveries. Technically this model has a lot to recommend it, in particular the way in which the long bogies cope with the relatively tight curves of normal layouts.

To match the Class 40 diesel are first and second class BR Mark III coaches in blue/grey livery. These are scheduled to be joined by a matching Mark III buffet car, which should be in your model shop by the time these words are printed.

## Roco International System

We have a firm impression that the Roco International range of HO, HOe and N-gauge railways is being somewhat underrated by some enthusiasts in U.K. The tests which we have carried out on these Austrian manufactured models have been notable for their interest and success, due in no



*R-13 DB Class BR 012 4-6-2 N-gauge loco by Fleischmann.*

small part to the special 5-pole motors, combined with weighty flywheels and spring cushioned drives, which added considerably to the smooth acceleration and deceleration of the models. Add to this a standard of external detailing and finish which we regarded as way above average and perhaps our personal liking for these European outline steam, electric and diesel types may be understood.

The range fills a 76-page catalogue and, besides the choice of locos and matching selections of rolling stock, the Roco name is to be found on a new and fascinating group of pantograph-equipped trams of typical Continental design. Also very distinctive is the HOe group of narrow gauge models — including an 0-6-0 tank loco, diesel shunter and eight different types of freight wagon. Apart from individual items Roco offers a choice of four complete train sets.

### British and Continental types in the Liliput standard and narrow gauges

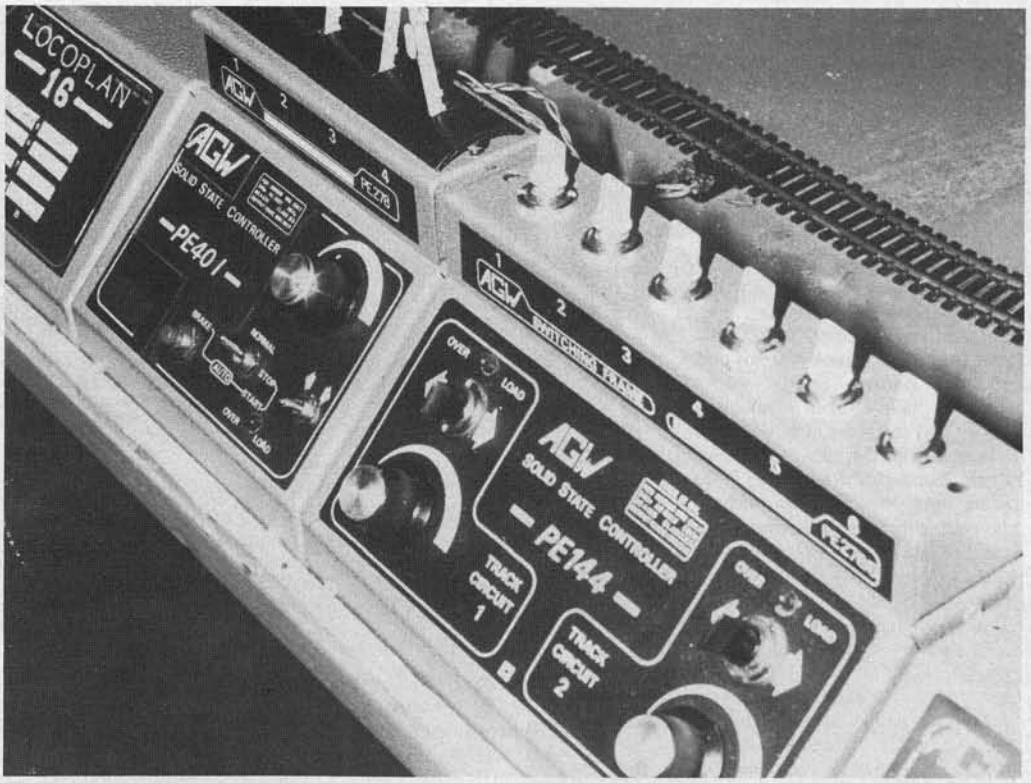
A number of British outline 00/HO scale locomotives and freight vehicles are produced by Liliput in UK and this company also handles the Austrian manufactured range of European steam and electric prototypes, plus an equally well chosen selection of passenger and goods stock. Also in the Austrian product range is a group of HOe narrow gauge models, with choice of diesel and electric locos, goods and passenger stock.

### Numerous new models for Palitoy's Mainline 00 system

The Palitoy Mainline 00 range has long been of special interest to us because the locos and rolling stock which we have tested have been of uniformly high specification, with resulting good performance. Now a number of new models will be finding their way into the shops, including a new variant of the re-built Royal Scot in LMS crimson livery as now on show at the Bressingham Museum, whilst further types — the rebuilt Patriot and the Jubilee Class 5XP will be available in both LMS livery and in later BR schemes.

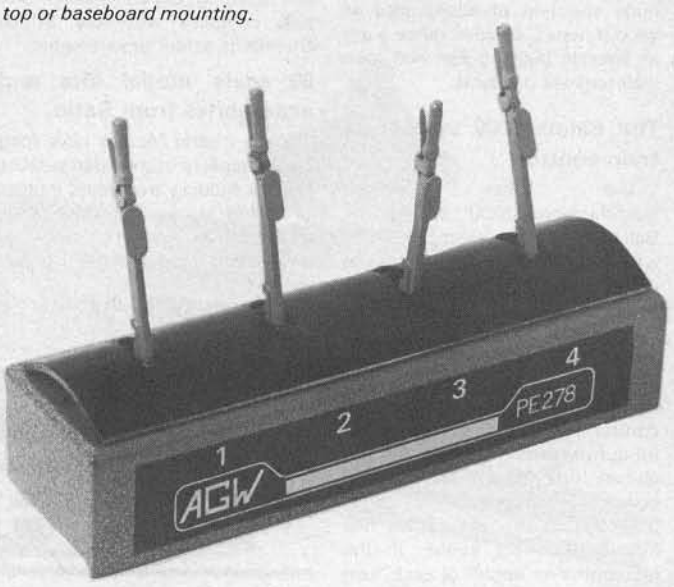
Another locomotive to look for is the BR Western Region's Warship Class diesel-hydraulic. This will come in both the green and blue liveries, and the models feature illuminated headcodes and lights, driver figures at one end, plus the superb body detailing expected on all Mainline locos. New locos now have an improved green finish, so that wherever this colour is used it will be darker than previously and have a slight sheen. It was seen initially on the GWR Collett 0-6-0 tender loco and is certainly attractive.

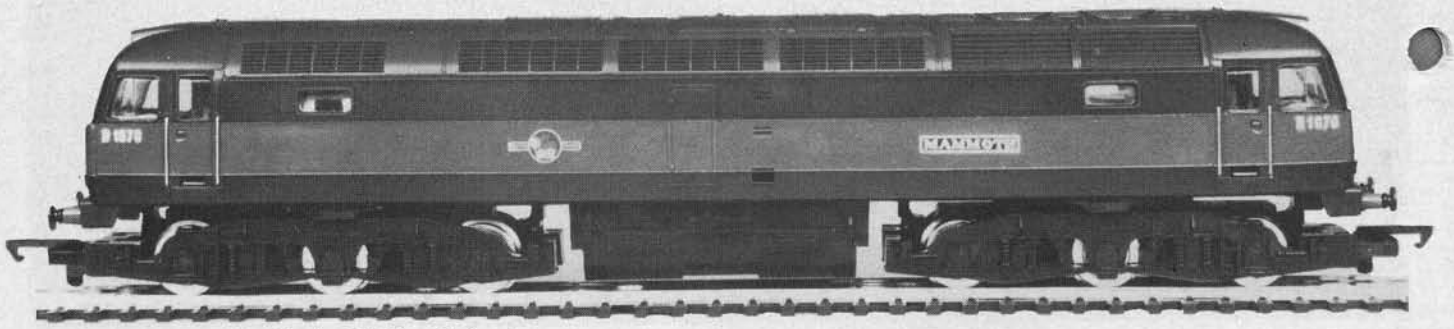
Various new items of rolling stock are in the pipeline, including 14 new goods wagons ranging




*"The AGW Locoplan 16".*

*R-35 AGW Electronics lever frame for controller top or baseboard mounting.*





*R-20 Latest version of the Hornby OO Class 47 diesel.*

from 30 ton bogie ballast wagons to freight vans, ore hoppers and coke wagons, whilst a type RB buffet car will come in both the blue/grey and BR maroon liveries.

### Multi-gauge models, kits and accessories from Peco

Modellers who, correctly, consider that good trackwork is vital to an efficient model layout are frequently attracted to the Peco ranges of Streamline and Setrack which cover N, 00/HO and O-gauges, plus the 9mm and 16.5mm narrow gauge tracks which have been specially developed for these models. Also available are the new ranges of Peco Wonderful Wagon kits in 00 scale and which now include several with "dirtied" effects on the printed bodies, plus ready-to-use N-gauge freight vehicles, of many types and equipped with Elsie auto-couplings for reliability.

Peco has also specialised in the development of kits of parts for locomotives, coaches and wagons for narrow gauge railways, and the most recent introductions are the 0-16.5 scale tram loco and Hunslet tank. There are 4-wheeled coach and wagon kits, in white metal like the locos.

The Peco range also includes a huge selection of accessories of various types, besides items such as lineside building kits and loco maintenance products.

### The Salota 5300 system of train control

The West German manufactured 5300 system by Salota is another example of the way in which modern electronics developments are being used for advanced forms of model control. This one is suitable for 12v DC powered trains in N, HO or 00 scales and provides for the simultaneious, independent control in speed and direction of up to five trains — even if they are all on one track! The control console measures about 9¼ × 9¼ × 3 in. and carries five individual control knobs. In the locomotive or tender of each train


*R-19 New HM 3000 power controller from Hammant and Morgan.*

to be linked to a 5300 channel must be one of the miniature (40 × 25 × 17 mm) receivers, for it is this unit which identifies transmitted signals.

The system is adaptable to any electrically continuous track layout, is protected by a built-in, self-resetting circuit breaker and also complies with the British Standards safety requirements.

### 00 scale model kits and accessories from Ratio

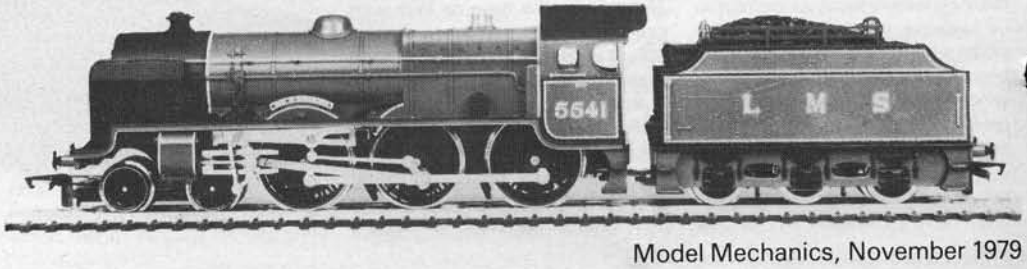
Ratio Plastic Models have long been suppliers of moulded plastics kits for bulding true scale models of rolling stock. The 1979 range includes a fine selection of 4-wheeled and bogie goods vehicles, plus a rapidly growing selection of passenger coach kits for older type vehicles, such as those of the LNWR. This product group was started a few years ago with three types of 4-wheeled GWR vehicles and these are still amongst the most popular. Ratio's first and successful attempt at a locomotive kit was the recently introduced LMS, ex-Midland Railway, 2-4-0 Johnson designed tender loco which, in prototype form, had a working life of 74 years.

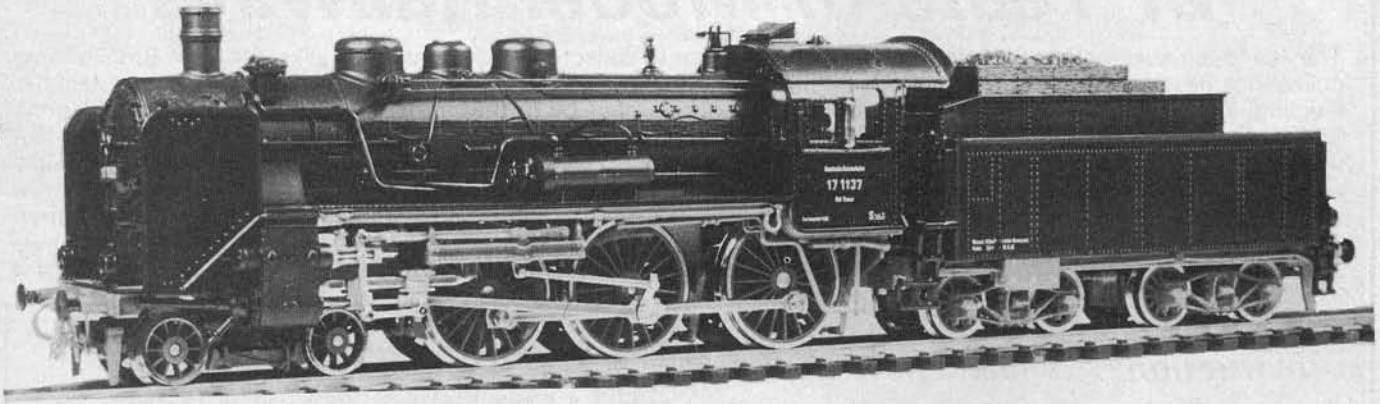
The latest Ratio products are true scale signals, based on those of the LMS, LNER and GWR, with some of them part assembled and supplied complete with operating lever for cord actuation so that electrical control units are rendered unnecessary. These work well, are very attractive and can do almost as much as any lineside units to improve the realism of a working railway.

### A choice of three gauges with Marklin

As recently noted in Model Mechanics, the German manufacturer, Marklin, is one of the longest established in this field. Nowadays, the Marklin range consists of the smallest electric railway system, Mini-club, with a scale of 1:220, the huge HO scale range which covers modern and vintage trains from most of

*R-21 Hornby OO 4-6-0, Duke of Sutherland.*



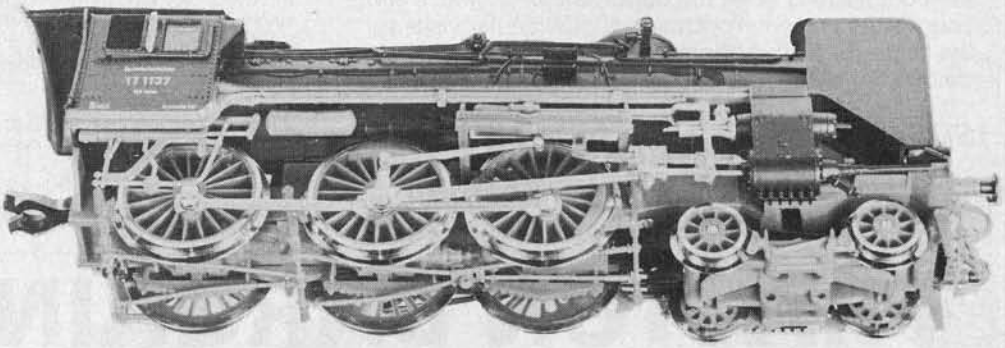


*Roco 4115 4-6-2 wheel arrangement DB Steam Loco Type BR17 HO.*

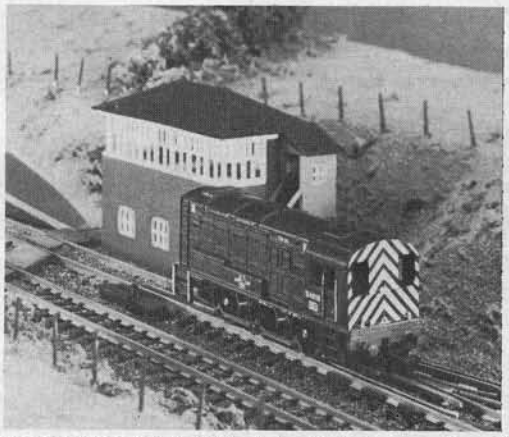
Europe, and the 1:32 scale gauge 1 models. This largest group is finding rapidly increasing popularity with enthusiasts who are able to operate garden railways, and it now includes some very fine examples of these large scale locomotives and rolling stock.

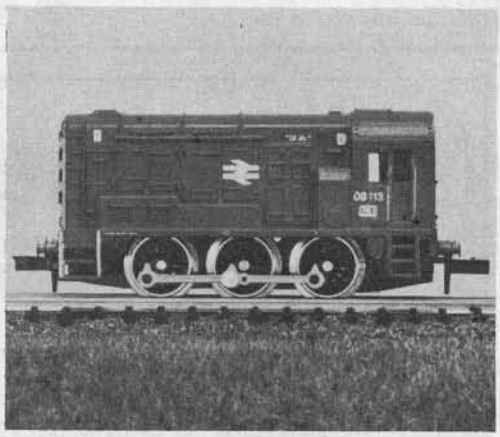
The HO system is almost unique in U.K. because it employs a 3-rail (stud contact) current collection system, with alternating current rather than the more usual DC. This set of technical differences makes Marklin a complete alternative — a very satisfactory one — to the more usual U.K. systems and it has many special operational advantages of its own. Marklin models are all built to very high standards and, on the Continent, this system is one of the major contenders for the lead in this very big market. Over here, Marklin is being widely discussed and sales are growing rapidly.

Many new HO gauge models have been added to the range for this year but the most important of these must be the huge German Railways locomotive of the World War II period which was never built. This 2-6-8-0 machine was designed by the famous makers, Borsig, and was to feature two sets of driving wheels with their



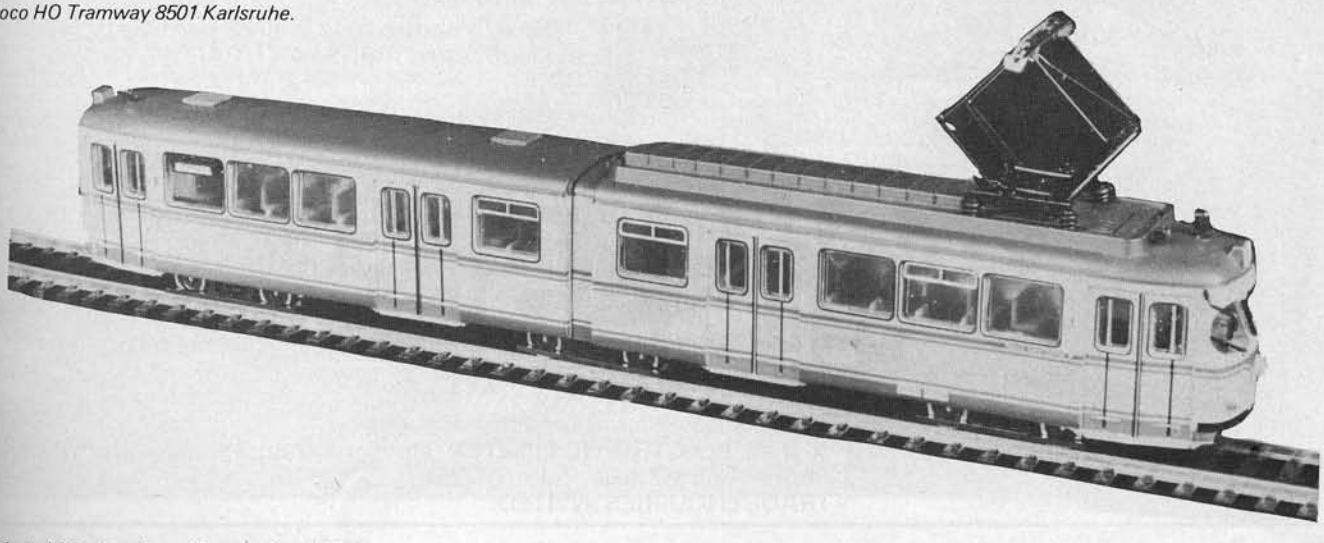
*Roco 4115 HO Detail under view.*





*R-14 BR Class 08 0-6-0 diesel shunter in N-gauge from Graham Farish.*

*Roco HO Tramway 8501 Karlsruhe.*



# 21 Years of Model Railways

The key to our success has been the service we have given to collectors and enthusiastis alike. Many of Britains large collections have had their roots in our secondhand department. Model Railways, today second only in popularity to Angling, is regarded by some as a modern hobby but nothing can be further from the truth. Even we are a youthful firm in comparison with Märklin's 120 years (they celebrated their centenary in 1959!). However,, when we first started in 1957 solid plastic or metal tracks were just beginning to give way to "see-through sleepers". Hornby Dublo and Triang were in process of embarking on a duel-to-death (which Triang eventually won only to secumb itself a few years later to be replaced by the much more successful contemporary Dunby-Combex-Marx brand of Hornby). Accuracy of scale was often suspect and scenery almost always non existant — how different from now. Today we expect almost an extreme of realism while the advent of tomorrow's computer control ("Tomorrow?" it is so close it is almost "Tonight!") leaves very little to the imagination.

### *Instruction, Advice, Know-how*

Call it what you will, the help of a very knowledgeable staff is needed to guide you through the complexities of all the opportunities available for your future enjoyment. Our staff pay regular visits to the factories both at home and in Germany and are trained to Fleischmann Advanced Course Standards.

***so***
***Come Frattonising Folks***
***WITH CONFIDENCE***

*— or use our unique "Altogether Now" trading system.*

*— and for the Modeller with an eve for a Bargain —*

## *"ALTOGETHER NOW"*

This is a unique method of trading, using the *Model Railway Magazines* as our "Catalogue". We will honour (subject to being in stock) any price quoted in the current (Nov.) Issues only. Why send to several suppliers when one cheque will do? With a credit card a single phone call gets immediate attention.
IMPORTANT EXCEPTION. For security reasons new releases and goods marked at less then 5% net above manufacturer's trade price will not be supplied.

***This offer is not automatic so must be claimed —*** merely state items, prices, magazine and pages they appear.

*Postage.* Overseas at cost. Inland 85p or post free over £25. All orders dispatched by return of post (refunds for items not actually in stock at moment of processing).

# FRATTON BARGAIN SHOP

*Hours: 9—6 (8 Fri.)*
*Open Lunch Hours*

**165-173 FRATTON ROAD**
**PORTSMOUTH PO1 5ET**
**Telephone (0705) 27117/750774**

*Ample Free Parking*
*Six Day Week*

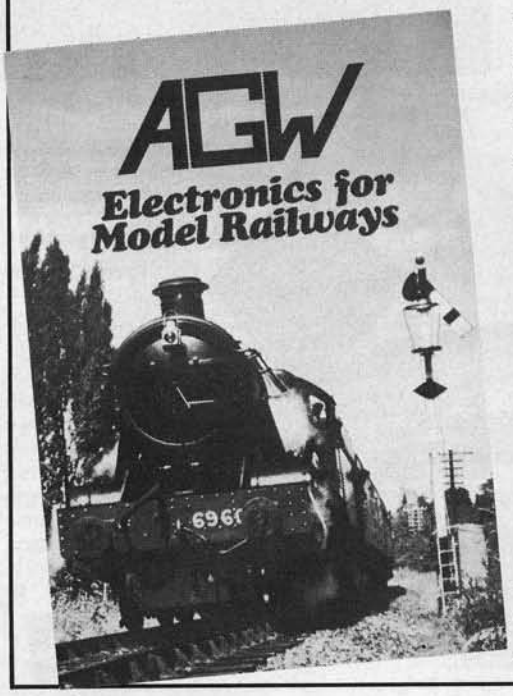
# NEW COLOUR CATALOGUE!

## AGW MODEL RAILWAY PRODUCTS NOW INCLUDE

Four controller types, single and dual. Whistle/horn unit. Steam sound/whistle unit — Auxiliary 2A AC/DC power unit. 5 Amp controller booster for gauge O — Scale signal box lever switches.

**AND THE LATEST! — OUR-LOCO-PLAN 16 — Train** Selector permits selected control of any one group of up to 16 easily modified locos, unmodified locos can still be used. All units are compatible in use and appearance.

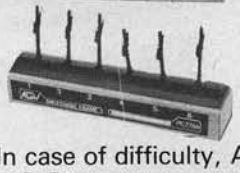
*". . . this is a very good controller that can be recommended for N, OO and HO gauges."* (PE404. MRC AUG '78).





*"The AGW power unit is a fine example of sound modern design."* (INSTANT RAILWAYS, SEPT. '79).

PE 109 Whistle horn unit giving four whistle types and two tone British diesel horn sound. R.R.P. inc. VAT **£20.60.**



PE 278/4, PE 278/6. 4 or 6 way miniature lever frame.
R.R.P. inc. VAT 4 way **£10.53,**
6 way **13.60.**

In case of difficulty, A.G.W. units can be obtained direct by post at the R.R.P.

*Send large SAE for new colour catalogue to:*
**A.G.W. ELECTRONIC LIMITED, Hayford Way, Staveley, Derby.**
**Phone: 024-687 3086. Telex 547757.**
TRADE ENQUIRIES INVITED.

# 'N' Gauge for the Space Age.

Not outer space, but inner space – that 'hard to spare' house space.

Just think! You get twice as much as 'OO' in the same space, or just as much in half the space, retaining realism and detail. You can see for yourself.

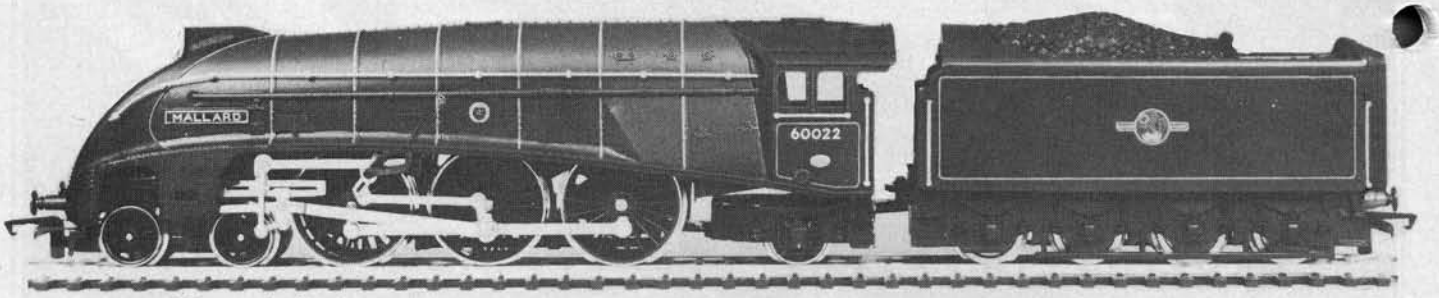
Graham Farish make well over a hundred lines in 'N' Gauge and there's room for more to come. Much more.

Join the Space Age TODAY, ask for Graham Farish 'N' Gauge.

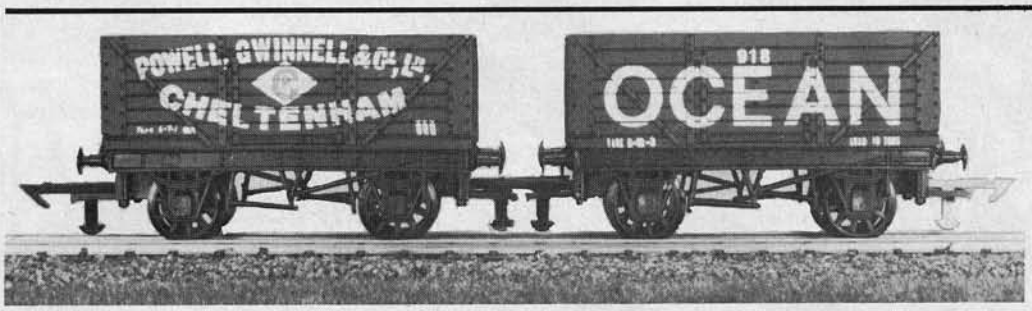
**GRAHAM FARISH**

*Masterpieces in Miniature*

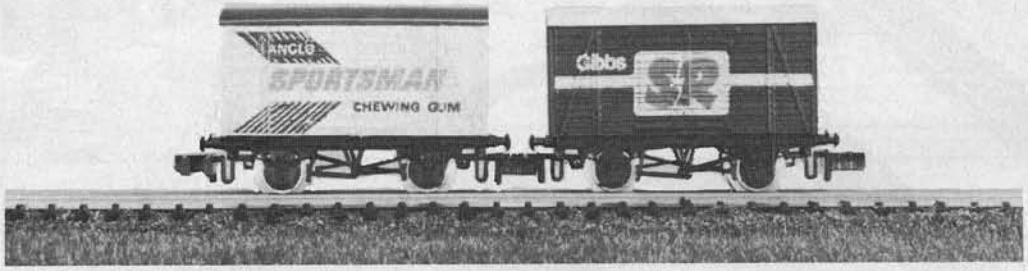
Romany Works, Wareham Road, Holton Heath, Poole, Dorset BH16 6JL.




*R-22 Mallard in OO gauge by Hornby*

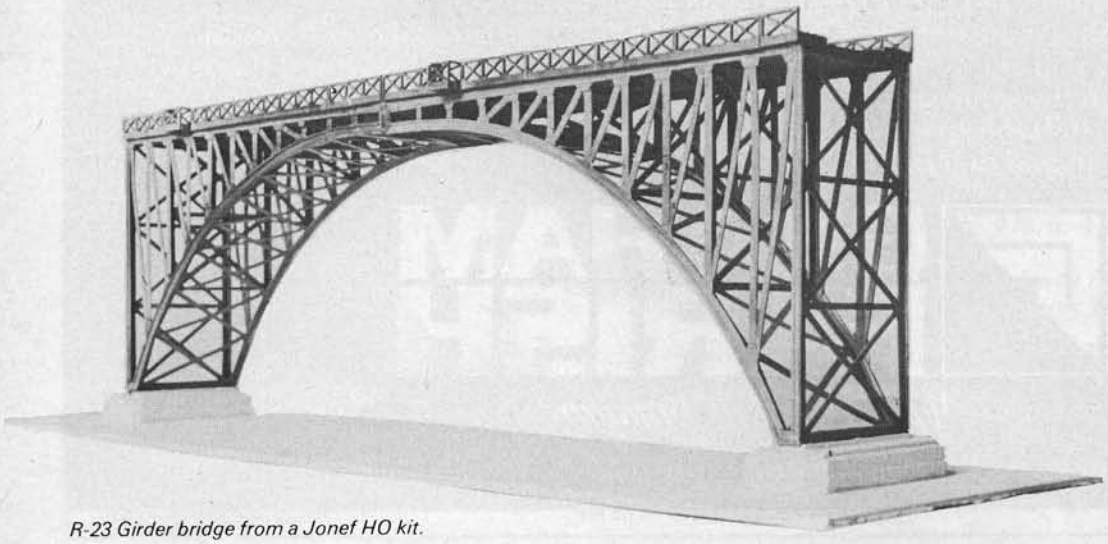



*R-17 Graham Farish OO scale private owner's wagons.*




*R-15 Two of Graham Farish's new N-gauge vans.*


*R-16 Bogie loco coal wagon in N-gauge by Graham Farish.*



*R-23 Girder bridge from a Jonef HO kit.*

associated side motion and cylinders. Had the design ever reached fruition, the Roco could have dealt with even the heaviest military trains which the war conditions demanded. As an example of steam loco development this new Marklin model is well worth seeing.

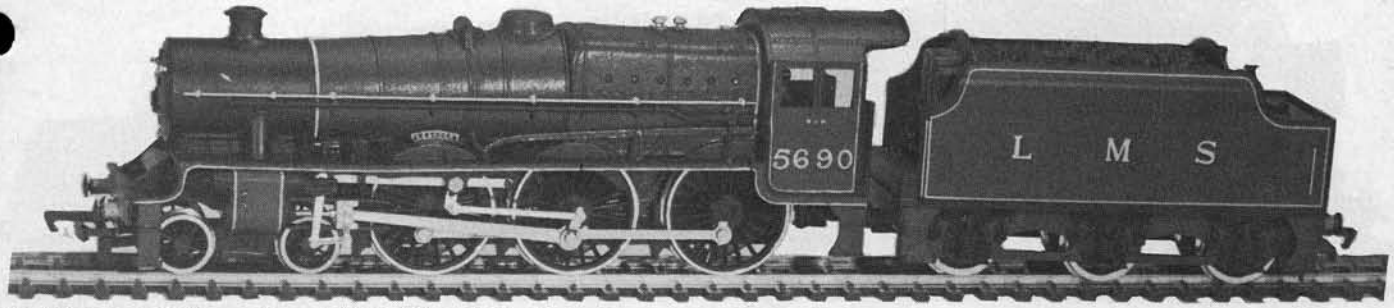
New Marklin Mini-club '-gauge models include a quite remarkable scale model of the Swiss Federal Railways 2-6-6-2 articulated Crocodile loco, besides a new 4-6-2 of the Royal Bavarian Railways Class S/6 in green livery. This latter model is used also to haul an express train in one of the new Z-gauge sets.

Besides all these standard models, it is useful to remember that a number of HO scale locomotives is available with DC current motors, under the Marklin Hamo name. All are fitted for 2-rail operation and so, even with auto-coupling changes in some instances, are compatible with many of the other systems.

### Wrenn Railways — those with the diecast metal loco bodies

This is a noteworthy 00 scale range, because so many of its locomotives are not only developed from the original Hornby Dublo system, but have the heavy diecast metal locomotive bodies which have proved so successful over the years. Available from Wrenn stockists are locomotives covering all the pre-Nationalisation Companies, ranging from 0-6-0 tanks and diesel shunters through to the Stanier and Gresley Pacifics, with the latter including Mallard, the 4-6-2 which even today holds the world steam train speed record. Models in special liveries are also a feature of the Wrenn range so that, although Mallard is in the post-war standard BR green livery, the same locomotive type is offered, as Golden Eagle, in the original LNER apple green which was used only on a few of the Class A4 Pacifics.

Besides the loco stud, Wrenn offers a big selection of freight




*Variation on a 4-6-0 theme, the main line Jubilee OO Class loco.*

rolling stock — excellently detailed and, in many cases, with diecast metal underframes — which also includes many private owner vehicles. There are also several 00 Pullman cars and, promised for some time in the future, are powered and non-powered versions of the classic Brighton Belle motor brake/second vehicles.

### Train controllers from AGW

A range of train control equipment of which we have, as noted elsewhere, long experience is manufactured by AGW Electronics Ltd. It includes single and dual transistorised power units with, in the case of the PE404, inertia and braking facilities which render it one of the most versatile that we have handled. There are also units for supplying power to AC operated lineside accessories and the PE103 unit, which is intended specifically for point motor operation and can operate u to six motors at once. New is a whistle and horn sound generator, with two steam and two diesel tones, and there is also a remote sound actuation kit comprising loudspeaker, reed switch and magnet for fitting in a locomotive.

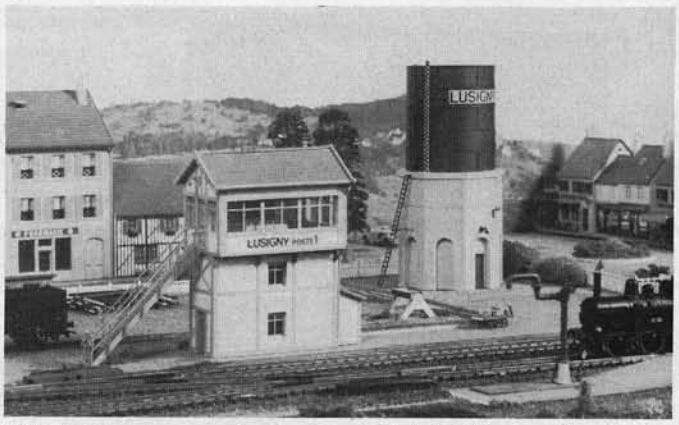
Further new AGW units are signal level switches and switch frames — both with scale Saxby and Farmer signal box levers — and electrically competent to deal with most signal and/or point requirements. An uncannily realistic source of steam sound is the AGW Steamsound '79 unit, with locolink adaptor, which reproduces 2, 3 or 4 cylinder combinations, at different regulator settings.

AGW's answer to the two-wire control systems is locoplan 16, with which up to 16 locos may be individually selected and operated — on existing layouts if so desired. Locoplan seems to be a very interesting concept, with a number of good, practical features, so is worth a long, hard look before deciding to discard conventional power units.

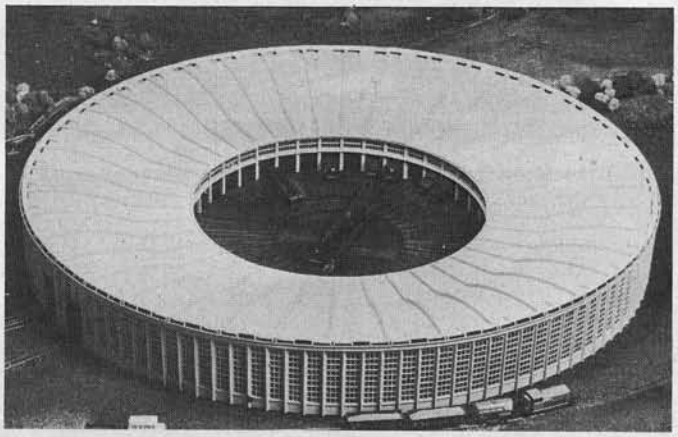
### Models from Yugoslavia and East Germany

Some model shops may well have examples of the interesting Mehanotehnika ranges of HO and N-gauge models, which are based primarily on North American prototypes and cover a quite wide selection of steam and diesel locomotives, with rolling stock to match. Mehanotehnika train sets are also very reasonably priced — perhaps a fact to be related to their Yugoslav origin.

Piko and Vero offer remarkably large product ranges, with the former being one of Europe's largest HO scale systems. It involves complete train sets, a full range of steam, diesel and electric outline locomotives of both vintage and presently operated types, besides railcars and a first class range of rolling stock, controllers, block signals and working catenary system. Under the Vero brand name are many moulded plastics kits in HO, TT and N scales, with almost every type of structure found on or near a European railway included.




*R-25 Vintage rail scene using Jonef track, Boer 0-6-0 tank and lineside kits.*

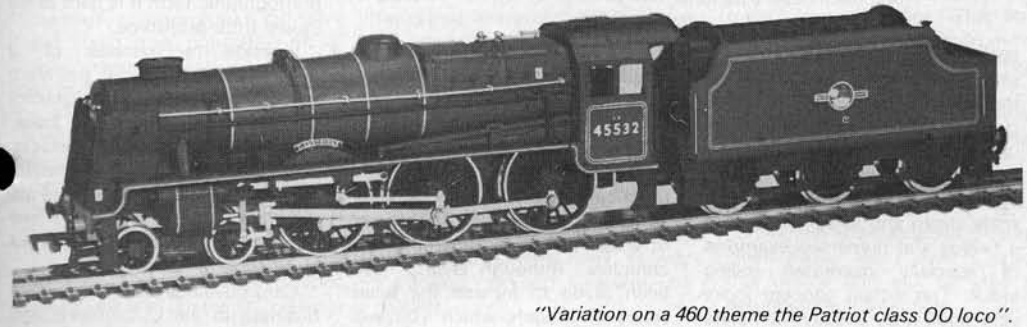


*R-24 Remarkable HO Roundhouse built from Jonef Kits.*

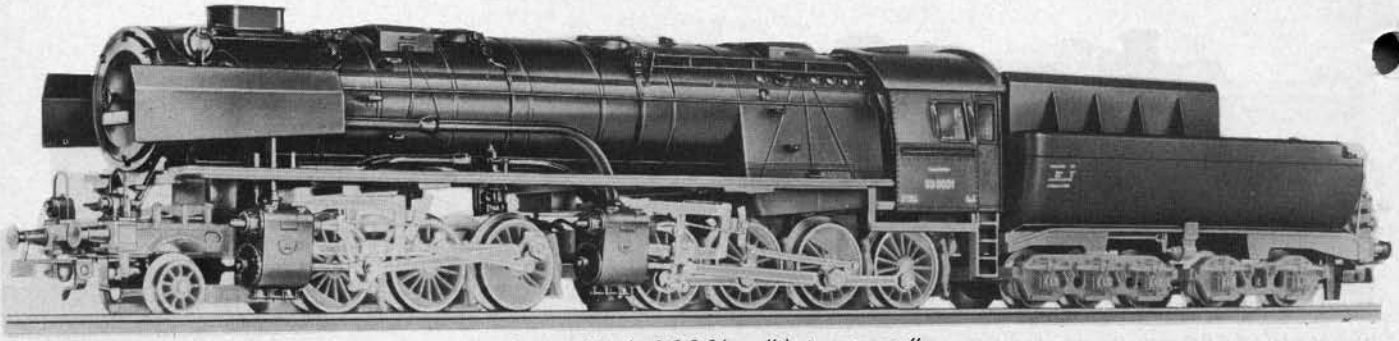
Other, not so widely available, components are featured in the Vero series and include moulded windows, doors, roofs, fences and walls, besides road signs, road and rail wagon loads and both HO and N scale model vehicles.

### Trains and lineside building kits from Faller

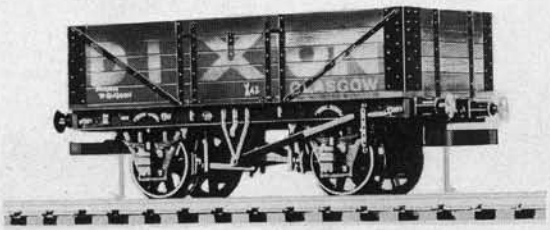
The word 'huge' is perhaps the only adjective appropriate to the size of the Faller HO and N gauge ranges of kits for lineside buildings and other structural and landscape features. Whilst the prototypes are all European rather than from U.K., many of them are so close to the British equivalents that they may be used with great success with no, or only slight, modification. The range covers modern and vintage stations, goods depots, container terminals (complete with flat wagons carrying 20 ft boxes), industrial complexes and a remarkable assortment of modern and old time buildings — from a greenhouse to

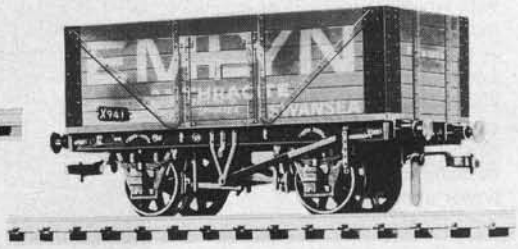



*"Variation on a 460 theme the Patriot class OO loco".*

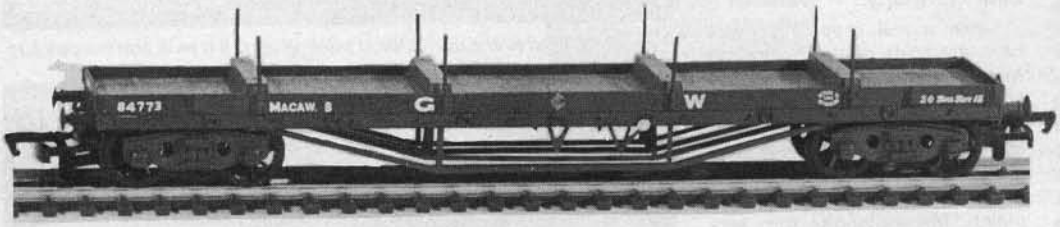


*R-32 The mighty Marklin . . . an HO scale replica of the German Borsig 2-6-8-0 loco "that never was".*

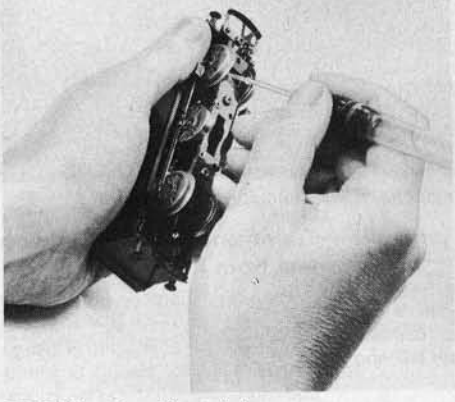




*R-29/R-30 Two of the latest Peco OO scale wagons with "weathered" appearance.*



*R-27 Palitoy Mainline GWR Macaw B bogie bolster wagon.*



*R-28 Using Pero Electrolube.*

*R-31 Ratio OO rolling stock, signal, fencing and track make a picture.*

a castle. Landscaping units include many types of trees, shrubs and hedges, whilst a recent Faller development is the provision of prefabricated layout tables with all the necessary fittings.

A Faller development which has been very successful on the Continent, but which has not received the attention it deserves in U.K., is the HiT Train 0-gauge series of models for younger enthusiasts. These all have special, simplified, operating features, so that points and various other switches can be easily and safely operated on the track. Brand new from Faller is the e-train system, again 0-gauge and featuring near-scale steam and diesel locos, plus a railbus and numerous examples of specially decorated rolling stock. The e-train concept looks very good and, already, complete train sets are available with a simplified electronic power unit.

## And so many more . . . . . .

This Model Mechanics buyer's guide to the commercially produced model railway systems and accessories cannot, in the way of these things, be anything like complete. Although efforts have been made to include the main series of models which you will find in the shops during the coming months, there are many more specialist product groups which space does not allow us to cover here in detail.

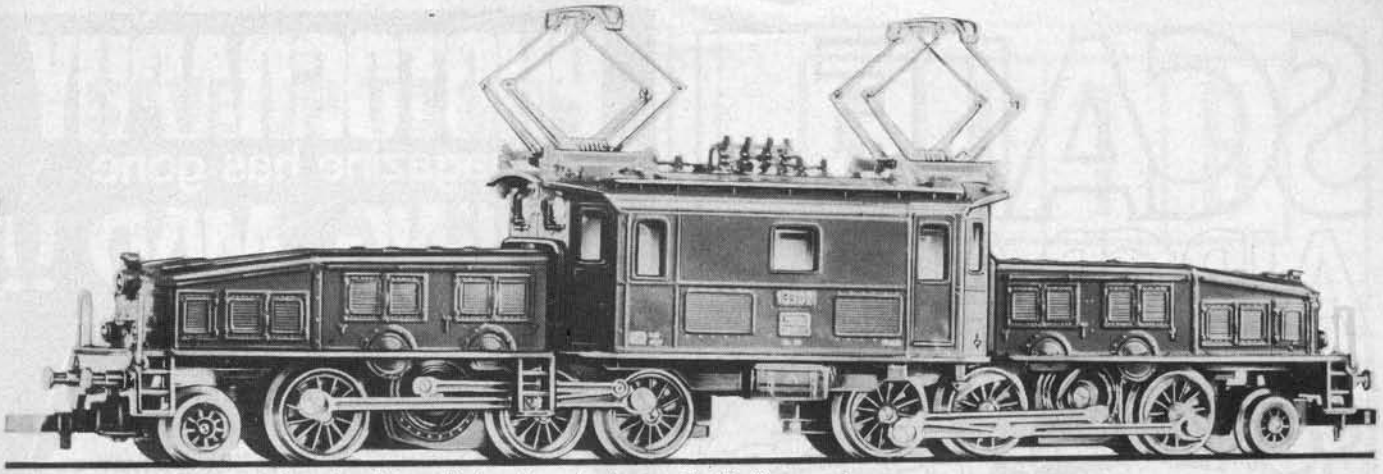
The Danish maker Heljan offers a most attractive range of lineside building kits and even includes a number of British outline station and similar structures. This first UK group may be well the forerunner of things to come but, in any case, the kits are well made and very accurate.

Baseboards for layouts are a speciality of several firms, of which one of the best known is Noch. Not only do these come completely assembled, but the working surfaces are ready fitted with various topographical features including tunnels and embankment. They are available for HO, N and even Z-gauge layouts and are, of course, perfectly adapted to the Noch series of landscape settings, trees, tunnels and other scenic accessories. From Ireland comes a similar range of Ryan Foldaway baseboards, complete with mountains, lakes and tunnels, and fully dressed in flock finish for 00 and HO gauge models. These boards measure 40 × 56 in. when opened out, but fold into triangular packs which measure only 40 × 24 × 8 in.

Vehicles for correctly landscaped layouts are no longer the problem that they used to be. In HO and N scales the Viking series covers all types — from cars to heavy goods vehicles — besides construction equipment and historic types. So perfectly detailed are these models that in photographic form it is hard to tell model from prototype.

Lineside accessories of a different type come in the Merit range — diecast metal and plastics replicas of goods loads, passengers and rail staff, vehicles and masses of other useful miniatures — which otherwise are difficult to build or appallingly time consuming. The Merit versions are excellent alternatives!

Card buildings have become big business in the U.K. market and



*R-33 The Swiss 2-6-6-2 layshaft equipped Crocodile loco brought down to Marklin Z-gauge size.*

several firms offer series of models which are accurately printed in full colour on sheets of board, with their outlines cut and creased exactly to shape. Everything from station buildings to signal boxes, bridges or engine sheds is available, besides non-railway buildings ranging from a row of terraced cottages to a bank or a church. These are in both 00/HO and N scales.

Fairly recently introduced but already very popular, is the Linka system of producing cast structures to 00 scale. These models are quite different in concept from printed card or plastics leits and several Linka sets are available, each containing moulds, materials and accessories for various types of old and modern structures. They are certainly worth looking at for building these replicas is almost a complete hobby in itself, and offers unlimited scope.

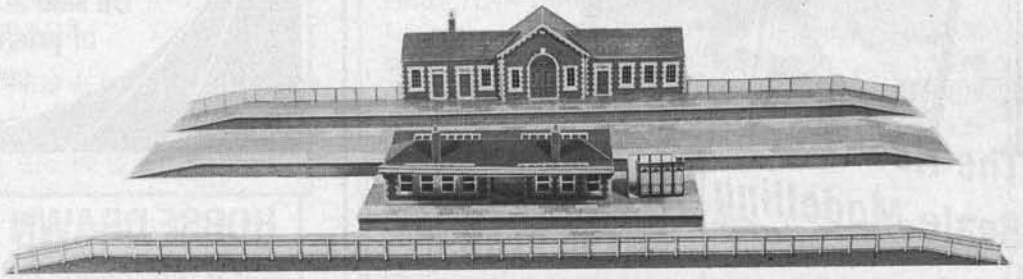
There are several ranges of model railway paint finishes generally available, with the best known being Humbrol Authentic Colours. Standard size tinlets contain carefully matched versions of the original Company and BR colours but, equally, many of the other matt and gloss colours — even military camouflage shades — have direct applications for models and layouts. Also interesting from Humbrol is a series of airbrushes — the recently announced Studio 1 being a superb spray-finishing aid — and other craft tools such as knives, razor saw, file and tweezers.

No mention of Humbrol can reasonably omit reference to adhesives and other surface coatings — from epoxy adhesive and liquid glue right through to polystyrene cement in tube and liquid form.

Although many of the specialist kits for locomotives and rolling stock involve white metal gravity diecastings and, therefore, are beyond the scope of this feature, it is perhaps appropriate to mention briefly the N-scale kits by D. & M. Castings. They include loco types which are not otherwise available in this scale and, because of their great simplicity and economy of parts, are ideal for beginners to try out this type of kit assembly. Models available include the LMS Royal Scot and Jubilee Class 4-6-0 locos, plus the J39 0-6-0 tender loco of the LNER and, possibly in the shops by the time these words are printed, the interesting little J52 tank. All are designed to be powered by unmodified Graham Farish N-gauge chassis so that there is nothing difficult involved in powering them.

There is a further kit range deserving of special mention — that produced by Slater's Plastikard and which covers models in N, 00 and 0-gauge. Slater's is one of the specialist firms and, therefore, concentrates on items which are of very accurate outline and authentically detailed, whether they be goods rolling stock, lineside buildings or even sheets of pre-formed modelling materials. The Slater's catalogue is a very interesting publication and contains a great deal of useful information for those wishing to extend their railway modelling beyond ready-to-use models.

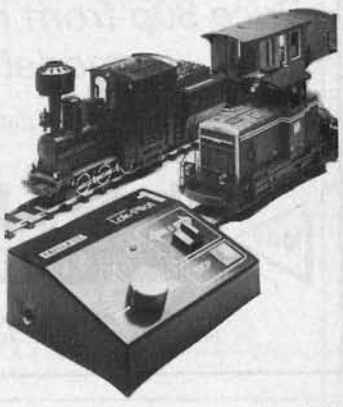

*R-34 Marklin gauge 1 flat car loaded with a pipeline section.*



*R-36 Gilmour OO scale printed card kits built into platforms and station buildings.*

*R-37/R38 Some of the new Faller E-train O gauge models with an electronic Lok-Pilot controller.*

A final model railway product which has received considerable publicity is the Relco electronic track cleaning device. This little black box takes its power from the controller and converts it to high frequency current, at a very low power level. Then the unit ionises any air gap that develops between the driving wheels of the loco and the surface of the rails when the latter are dirty, until a good connection is established through clean track. Many dealers stock this device and will be able to demonstrate it in action.



# SCALE AIRCRAFT


A Radio Control Models & Electronics SPECIAL

## The How-To of Radio Control Scale Modelling

**WITH FULL SIZE Fw190 PLANS!**

The genuine true-to-scale radio controlled model has long been regarded by the majority as the 'ultimate' in aeromodelling. Increased reliability of modern control systems, plus the added number of control functions available, has attracted many newcomers to the scale competition scene. Yet very little has been available to the beginner in radio controlled scale aircraft models by way of special advice from the experienced model flyers — the experts have been reluctant to reveal the results of their skills — UNTIL NOW! This R.C.M.&E. Scale Special is positively crammed with articles by the leaders in the field of R/C scale. They cover selection of the subject, building, flying, preparing for competition; plus competition organisation and judging. Sections are also devoted to the new trend of 'giant size' scale models. Not only will this publication fill a gap for the beginner-to-scale, but it is also of great interest to the spectator, and should encourage even more R/C modellers to 'have a go' inscale competition.

*On sale September 21st — Price 80p from newsagents and model shops*

*or direct from the publisher (add 20p p&p)*

**Model & Allied Publications Ltd**

P.O. BOX 35, BRIDGE STREET, HEMEL HEMPSTEAD, HERTS, HP1 1EE. Tel: H.H. 41221

# PHOTOGRAPHY magazine has gone RAVING MAD !!

**Buy a copy of the October, November and December issues and see what they are giving away absolutely FREE.**

October: A film speed reminder and exposure calculator for every reader in the U.K. **FREE**
November: 500 simple to operate 110 cameras to the first 500 readers who write in **FREE**
December: 1,000 six-month membership to the Bureau of Freelance Photographers to the first 1,000 readers who write in **FREE**

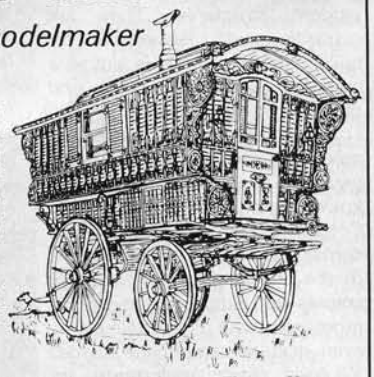
Photography is the monthly magazine that tells you how to take and make better pictures. Pages for beginners and experts alike explain how to get the best out of your camera.

From your newsagent or on subscription at £8.50 ($19) per annum from Subscription Department, Model & Allied Publications Ltd., P.O. Box 35, Bridge Street, Hemel Hempstead, Herts. HP1 1EE.

**On sale at 50p third Friday of previous month to cover date**

## HORSE-DRAWN VEHICLE PLANS

*—for the serious modelmaker*



The authentic plans of this Ledge caravan, built by Dunton in 1910, will enable the modelmaker to construct an exhibition standard replica. In 1/8th scale the 18 inch long model is most impressive, and the interior can be fitted out. Set of 10 sheets include many photos, price **£4.50** includes packing in tube ($12 for Air Mail to U.S.A.).

Illustrated catalogue of over 40 plans, with guidance on the hobby, free with plan, or send 4 first-class stamps ($1 to U.S.A.).

**JOHN THOMPSON** (Ref. MM), **1 Fieldway, Fleet, Hants.**

ACCURATELY DETAILED
***MEASURED WORKING DRAWINGS***
IN 1:8 SCALE

**CARTS, WAGGONS**
**FARM & FORESTRY IMPLEMENTS**
**CARRIAGES**
**BUCKINGHAMSHIRE WINDMILL**

ILLUSTRATED CATALOGUE LISTING NEARLY 50 ITEMS, PLUS LIST OF RELIABLE BOOKS AND OTHER USEFUL INFORMATION **25p** (U.K.) ONLY. OVERSEAS ENQUIRERS PLEASE ADD APPROPRIATE POSTAGE).

# DAVID WRAY

**LITTLE COLDHARBOUR FARM, BERKHAMSTED COMMON, BERKHAMSTED, HERTS. TELEPHONE: LITTLE GADDESDEN 2242**

# Meccano 1905 Rolls Royce

## Jorge Catella's remarkable model from Argentina: Part 2

by Bert Love

This concluding article on Jorge Catella's fine model of the 1905 Three-cylinder Rolls-Royce deals with the engine details, clutch, gearbox, transmission, steering and brakes. Fig. 11 shows the engine details from the "off-side" (U.K.), basic parts being attached to a 2½" Square Plate as the engine-bed with the cylinders mounted above and the Meccano Powerdrive Motor with integral six-ratio gearbox, slung underneath the plate. Each cylinder is rolled from a 5½" × 1½" Flexible (or Black Plastic) Plate and carries a standard Coupling by its centre bore in one hole at the base of the cylinder. This gives an outboard anchoring for the four-hole cover plates at

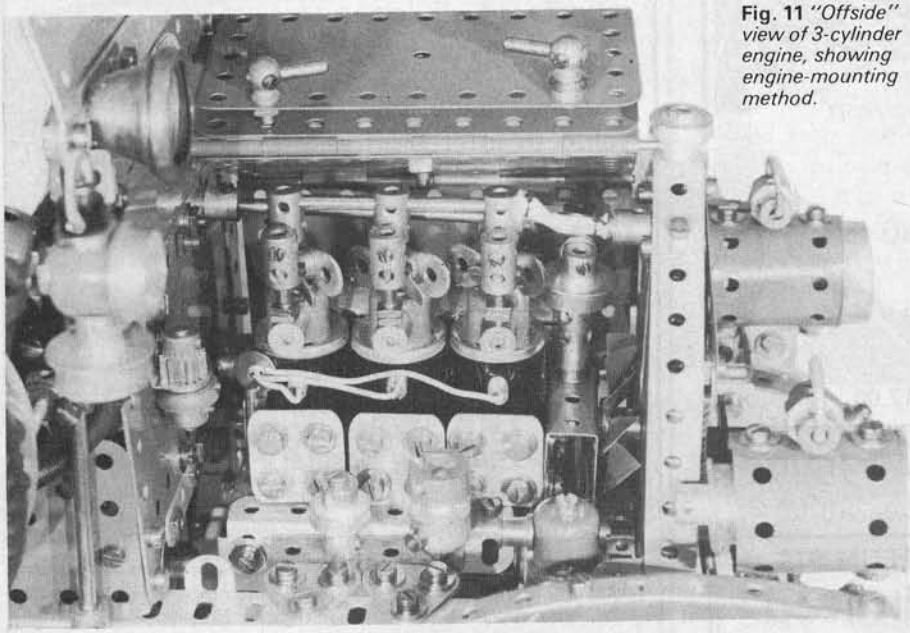
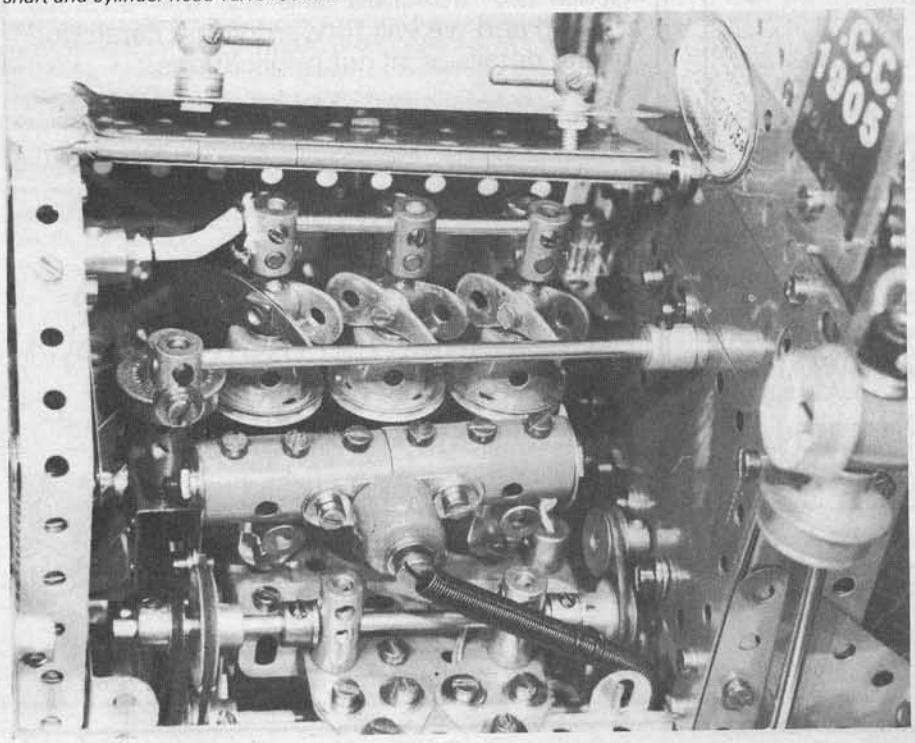


**Fig. 11** *"Offside" view of 3-cylinder engine, showing engine-mounting method.*

**Fig. 12.** *Close-up of engine fittings on nearside showing exhaust manifold, note magneto drive shaft and cylinder head valve rockers.*




the side of each cylinder, the bottom Bolts with Washers being screwed through the small plates into the tapped bores of the Couplings while the upper Bolts are held in place by standard Nuts. Three cores from Meccano Grease-Cups form the sparking plugs as shown in Fig. 11 and these are attached by internal Nuts in side holes at the top of the cylinder walls. Each cylinder is capped by a Chimney Adaptor on a 1" Loose Pulley held in place by Screwed Rods fixed in a Collar at the top and by a Nut under the bed plate, the first two of these Screwed Rods also trap part of the electric motor moulded base below the Plate. Rod Sockets are fixed by internal Nuts to each Chimney Adaptor and carry short Threaded Pins vertically to which a Short Coupling is secured by Grub Screws. A further three Short Couplings are mounted at the side of the first three on short Axle Rods or Meccano Clock Pallet-Pins and these are joined by a 3" Rod to form the top section of the water circulation system. Further details of this are seen in Fig. 12. Main mountings for the engine unit are pairs of 1" Triangular plates attached horizontally to the side-irons of the chassis in the position shown in Fig. 11 and these, in turn, hold 2" long Girder Brackets, the flanges of which point downwards and are bolted to 3" Angle Girders secured to the 2½" Square Plate forming the engine bed. On the "off-side", these Girder Brackets carry Meccano Collars, Pulleys and a Socket Coupling simulating the Royce single updraught carburettor while further "brassware" over the fan block simulate the hot-water feed to the upper bank of Short Couplings over the cylinder heads which act as the heated induction manifold. Fig. 12 shows further engine details from the "near-side" and this time the Girder Bracket carries two Threaded Couplings fixed by bolts from below and very carefully aligned to act as bearings for the 4½" Axle Rod acting as the magneto drive shaft. This shaft is actually driven in the model by a rubber belt from a secondary shaft below, driven in turn from the motor pulley. Two Sleeve Pieces make up the exhaust manifold, each one mounted on a Slide Piece trapped by a Fishplate to the base of the first and the last cylinder and set for critical "scale" height before tightening up the bolts holding the Fishplates. A Double Arm Crank links the Sleeve Pieces and carries a Chimney Adaptor trapped in place by a Pivot Bolt locked in the boss of the Crank by a Grub Screw available through a hole in the side of the Chimney Adaptor. Joined Tension Springs take the exhaust down to the massive silencer running almost the entire length of the chassis below. The composite cylinder of the manifold is completed by a 3½" Screwed Rod and a pair of ¾" Washers to seal either end. Push-rod rockers for each cylinder are represented by pairs of Pawls-without-boss bolted through the Collars on the top of each cylinder. A water

temperature rod runs back to the scuttle (bulkhead) secured to the small Flanged Wheel over the fan block via a Short Coupling and by a Rod Socket to the scuttle. Fig. 12 also shows the 6 BA screw passing through the scuttle into the rear end of the Meccano Hinged Plate forming the bonnet lid and the profusion of the long hinge-pin into the tapped hole of the ½" Fixed Pulley forming the radiator cap.

Forerunner of the Silver Ghost of world-wide fame, these 1905 prototypes already sported the distinctive Rolls-Royce radiator which Jorge Catella has reproduced well in standard Meccano parts as can be seen in Fig. 13. No less than 30 4½ Strips are used to simulate the parallel cooling fins and these are mounted on 3" Screwed Rods, each strip being separated from its neighbour by dead-flat selected washers to maintain accurate spacing. The registration number shown is correct for the only surviving prototype. Note the child's watch strap used to steady the cranking handle. Massive detachable lamps are made from pairs of 2½" × 1½" Flexible Plates rolled into a composite cylinder, mounted by a short Threaded Pin in Slide Pieces and capped by a large Flanged Wheel at the front, a small one at the back and a Wheel Disc, all mounted on a 2" Axle Rod. Pivot Bolts act as hand adjusters for locating the short Threaded Pins in register on the double thickness of Fishplates bolted on the chassis dumb-irons with a one Washer raising. This permits the lamps to be quickly removed for servicing or daylight running.

**Transmission**

At the rear end of the engine bed-plate, 1½" Angle Girders are fitted, running downwards, bolted to the rear of the 3" Girders already mentioned. These hold a 3" Formed Slotted Strip by Obtuse Angle Brackets as shown in Fig. 14 forming a curved protective bridge below the engine "sump" (Black Plastic Plates). A 1½" Pulley fixed to the motor shaft drives a ½" Pulley on the secondary shaft providing the magneto drive. Bearings for this shaft can be seen in Fig. 14 and comprise a Collar bolted to a ½" Angle Bracket, stood off on a 1" Comer Bracket fixed to the bottom end of the 1½" Angle Girder and a Threaded Coupling bolted under the Girder Bracket engine-mounting. Set the Threaded Coupling carefully to align the secondary shaft fore and aft and then adjust the ½" Angle Bracket by its slotted lug and packing washers to give optimum position to the Collar for free running. The ½" Pulleys at either end of this secondary shaft pass on the drives by rubber driving bands. If it is found that standard Meccano Driving bands provide too tight a coupling for free-running, use domestic rubber bands selected from a "variety" pack. The forward end of the engine "sump" is blocked in by a 2½" Semi-Circular Plate suspended from a 2½" Angle Girder plus a 2½" Flat Girder and the semi circular plate carries a free-running 2" Pulley on a pivot Bolt. A miniature pulley on the short fan shaft is linked to a similar pulley on the main magneto shaft and to the 2" Pulley by a long rubber band so that when the motor runs, fan, pulleys and magneto all run at the same time. If miniature pulleys are not available in the positions shown, standard ½" Meccano Pulleys may be used but the one mounted inside the fan block (A Channel Bearing) will foul unless its diameter is slightly trimmed with a file by mounting the pulley on a short shaft in the chuck of an electric drill.

In the prototype a leather lined cane clutch was employed but the Meccano model uses a 1" Pulley with boss carrying a 1" Motor Tyre and held by two locking Grub Screws in the forward cup of a Socket Coupling. A short length of the protruding motor shaft runs inside the boss of the 1" Pulley and thus forms a forward locating spigot in line with the clutch. Bolted under the floor of the driving compartment are two 2½" Angle Girders (see Fig. 14), slotted flanges pointing downwards. Angle Brackets hold vertically mounted 1½" Flat Girders in the first and third slots of these 2½"

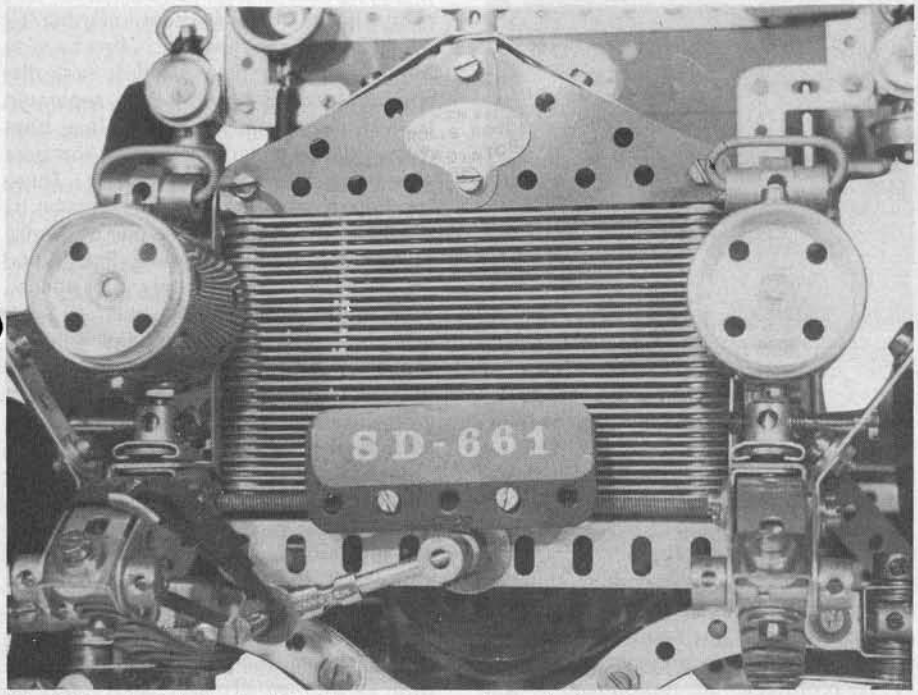



**Fig. 13** *Details of distinctive Rolls-Royce radiator and massive front lamps.*

**Fig. 14** *Clutch, steering gear and 3-speed gearbox details, note twin selector rods.*

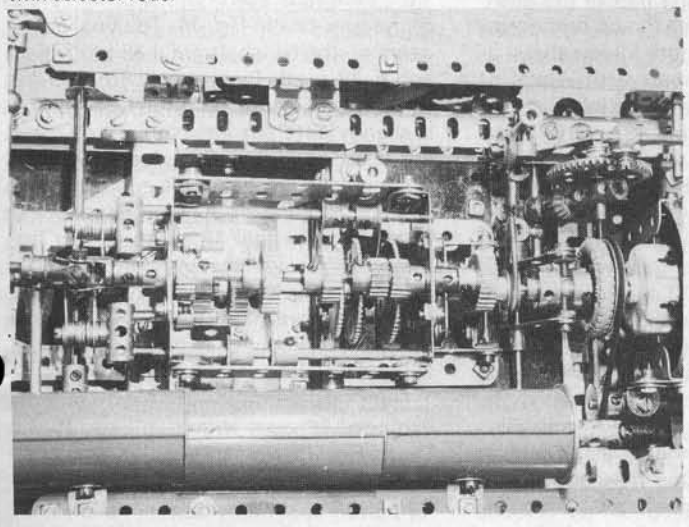
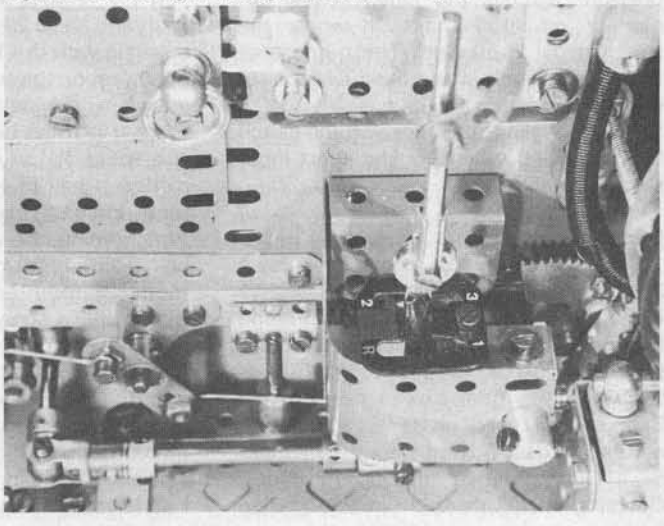


**Fig. 15** *Outboard gear linkage showing "H" gate and first link-rod.*



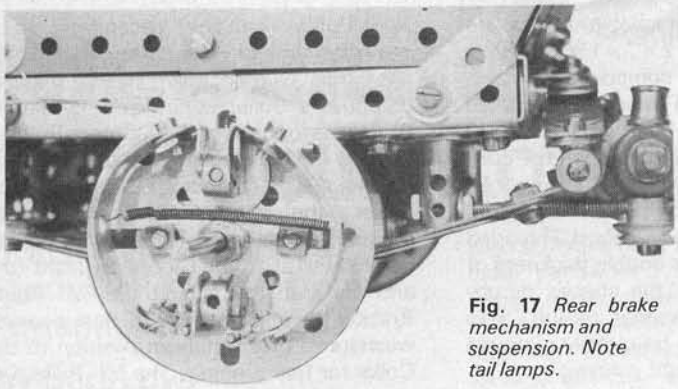


**Fig. 17** *Rear brake mechanism and suspension. Note tail lamps.*

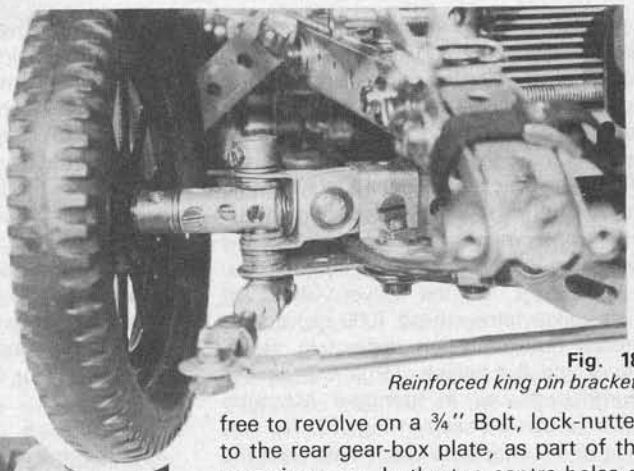


**Fig. 18** *Reinforced king pin bracket.*

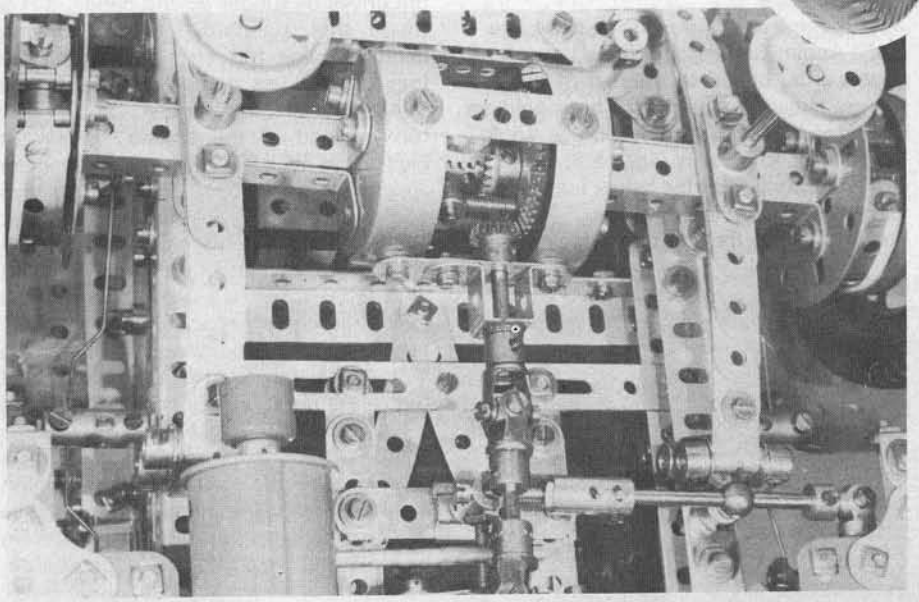


**Fig. 16** *Rear axle construction and double-slide under-chassis gear linkage. Note exhaust tail, double universal couplings and suspension spring shackles.*

Girders and form rear bearings for the short clutch shaft. Spacing between these small Flat Girders permits the entry of a 19 tooth Pinion, followed outside (forward) by a ½" Fixed Pulley acting as the cardan-shaft brake and a Collar locked to the shaft by a special shoulder-bolt taken from the "spider" of a Meccano Universal Coupling. About ⅓ of a Meccano Compression Spring is cut to fit between the fixed Collar and the rear cup of the Socket Coupling. This allows the Socket Coupling to be held in contact pressure against the clutch plate but permits partial withdrawal when the clutch pedal is pressed. The purpose of the shoulder-bolt in the fixed Collar is to maintain engagement in the slot of the Socket Coupling, thus keeping the clutch face revolving whenever the short input shaft is rotating.

**Gear-Box**

Each end of the gear-box is a 2½" × 1½" Flanged Plate fitted with a Double Arm Crank to provide reinforced bearings for the main shaft and these plates are fixed to 3½" Flat Girders forming the gear-box sides. Angle Brackets are used on the rear plate to mount the gear-box on the crossmember 5½" Girder shown in Fig. 14 and a Coupling on a Threaded Pin attached to the rear of the driving compartment floor holds the "off-side" of the gear-box in place. The monster silencer, made from three 3" Cylinders is fixed by Angle brackets to the running boards and above the middle cylinder a Threaded Coupling from the chassis side member, suitable packed out with Washers, holds that side of the gear-box in position. Three forward speeds and reverse, non-syncromesh as in the prototype, are reproduced in the model, using a non-sliding lay shaft and twin selector rods. Assembly is as follows — 1 1½" Rod is the first part of the main shaft and has a 25 tooth Pinion outboard, meshing with the 19 tooth Pinion above it on the short clutch shaft with which it stays in constant mesh. Inboard, a Washer is fitted before a 19 tooth Pinion and about ¼" of the short input shaft is carried in half of the bore of the next 19 tooth Pinion. This is locked to the 3½" Rod forming the remainder of the gear-box main shaft and is followed by a 25 tooth, 38 tooth and 19 tooth Pinions in the positions shown in Fig. 14, due note being taken of the spacing and position of the Pinion bosses. One Washer is fitted after the last Pinion before the main shaft goes through the rear Double Arm Crank, to be fitted with another Washer and a Universal Coupling. One hole above the last 19 tooth Pinion an identical Pinion is free to revolve on a ¾" Bolt, lock-nutted to the rear gear-box plate, as part of the reversing gear. In the top centre holes of the end plates, the Meccano 4" Rod with Keyway forms the lay shaft and the first gear is fixed to this Rod with normal Grub Screws and it is the 57 tooth gear seen in mesh with the 19 tooth Pinion at the forward end of the gear-box. This means that the lay shaft will always revolve at ⅓ of the speed of the first portion of the main shaft. Next, in order, another 57 tooth Gear, boss forward, is free to slide but is keyed to the lay shaft with the special Meccano Keyway Bolt, separated from its neighbour, a 50 tooth Gear, boss rearwards, by a pair of Washers, this gear also being fitted with a Keybolt. These last two gears are moved into position by a selector fork made from a pair of Cranks on a 4" Axle Rod as shown in Fig. 14 and the sides of the gear-box are spaced outwards by single Washers to give clearance to these cranks. Full forward movement of this selector rod engages the second 57 tooth gear on the lay shaft with the first 19 tooth Pinion of the rear section of the main shaft giving no gear reduction between the two parts of the main shaft and hence providing "top gear". Rearwards movement of the selector puts the 50 tooth gear into mesh with the 25 tooth Pinion and provides the first step-down ratio (3:2 ratio). It should be noted that the arms of the selector forks just clear the lay shaft to "kiss" the gear bosses which they shift and the correct angle of the Crank arms is maintained by transverse Couplings and 1½" slide rods seen outboard at the end of the gear-box in Fig. 14. The final pair of gears on the lay shaft are a 38 tooth Gear and a 19 tooth Pinion, free to slide but fitted with Keybolts and the selector fork is slightly different this time. Two Cranks are used again but the rearmost one is dropped to a steeper angle and fitted with a ½" Reversed Angle Bracket to negotiate the final 19 tooth Pinion into mesh to provide reverse (or rather, to disengage it from reverse!). When both 38 tooth Gears are in mesh, the gear-box is in "first gear" (highest step-down ratio, 3:1 for greatest power).

Gear selection is carried out by extended linkages shown in Figs. 15 and 16. In Fig. 15 we can see the gear lever, "cranked" by offset and tightly bolted Rod & Strip Connectors to negotiate the

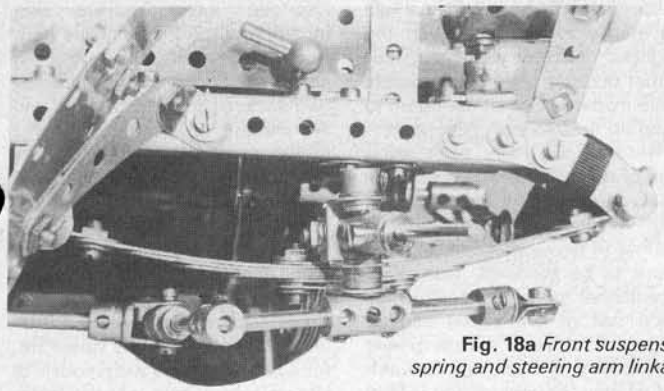


**Fig. 18a** *Front suspension spring and steering arm linkage.*

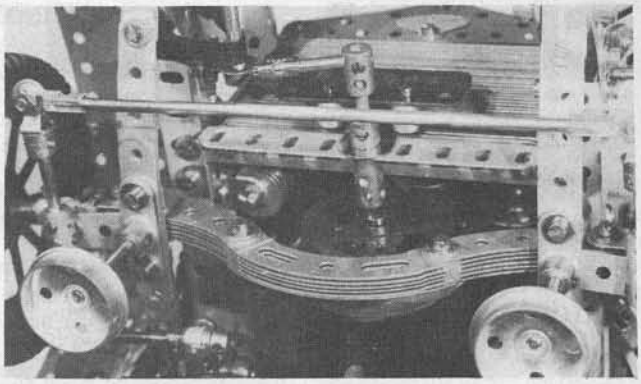


**Fig. 19** *Built-up front axle using staggered curved strips.*

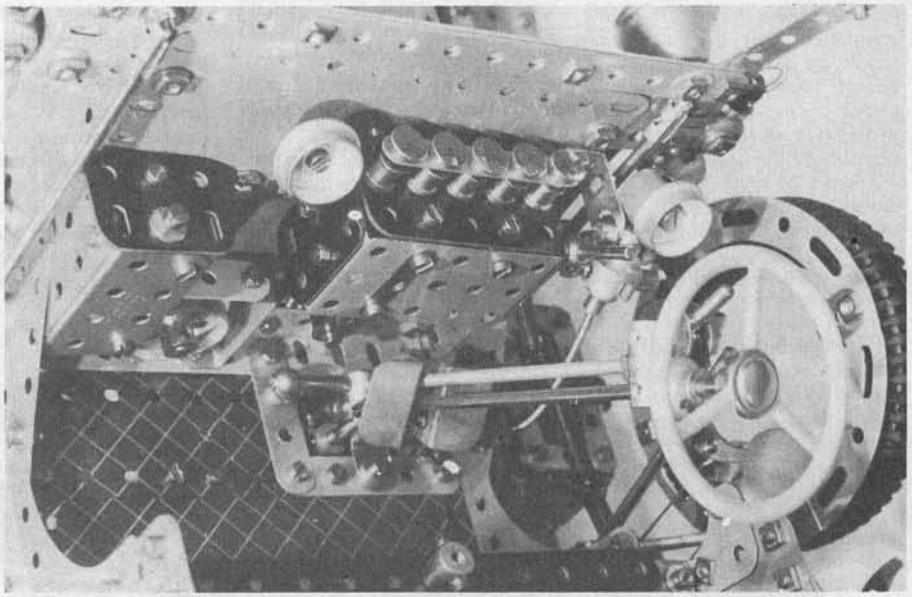


**Fig. 20** *Internal scuttle details showing tremble-coil box, rotary magneto, water temperature dial, drip-feed oil tank, Bowden-drive speedo, steering column and throttle control.*

bulging driver's seat, moving in an "H" gate cut from a fibre Insulating Flat Girder. This gate is spaced upwards by a Collar and washers from a 1" × 1" Angle Bracket attached by further brackets to the chassis. Also bolted to the chassis side member is a Threaded Coupling, pointing outwards horizontally, inside the "gate" box and fitted with a Pivot Bolt at right angles to its outer end. On this Pivot Bolt, a Swivel Bearing is free to pivot and its "spider" holds the gear lever and gives it free swing in the "gate" notches. Linkage is continued by a Handrail Coupling giving a firm "one direction" (fore and aft) movement in the arms of a small Fork Piece on a 3" Rod running to the rear. Another small Fork Piece is free to swivel on the rear end of this rod, held by two Collars and Washer but the internal Collar must be of narrow width (e.g. as the early Meccano "Aeroplane" Collar) to allow the ball of the second Handrail Coupling to swing. Shoulder bolts from Universal Couplings are used at these points to prevent 'slop' in the linkage. Careful study of Fig. 16 shows the continuation of the linkage and double slides. Just in front of the "off-side" rear spring, a Double layer of Fishplates is bolted to the chassis to give a round hole bearing in the side members and a further Handrail Coupling is fitted with a short rod and passed through this bearing to be secured by a Collar. This must be adjusted so that the gear linkage rod passing through the Handrail Coupling cross bore is free to slide but again without 'slop'. Inboard of this 2½" Rod is a Threaded Coupling with long bolt and locknut adjuster to centralise the cross slide shown. The cross-slide is an early pattern Eyepiece, without boss (still manufactured by Marklin of Germany) and slides on a 2½" Strip. This, in turn, slides back and forth on parallel strips secured in place as shown in Fig. 16, on a further pair of Eyepieces. Forks on the gear selector rods are made from Fishplates critically spaced by Washers and tightly secured to the external Couplings by ¾" Bolts. Mounted on the central Eyepiece is a vertical Coupling connected to the transverse gear linkage by its long adjusting bolt. In the central tapped cross-bore of this Coupling, a Screwed Rod is lock-nutted in a forward facing direction and has a Handrail Coupling set vertically and lock-nutted to the other end. It is the ball of this Handrail Coupling which engages between the Fishplate selector forks and follows the motion of the gear lever in the "H" gate. Patience and care is required in setting up the linkages and in ensuring smooth movement without binding or slop but with the motor running at low speed, it should be possible to select each gear in turn by using the clutch pedal and gear lever.

**Suspension, Back-Axle and Steering**

Fig. 16 shows the construction of the back-axle and differential which follows normal Meccano Standard design, equal half-shafts running in either end of the central Coupling. This is "carried" round by a 2½" Axle Rod through the centre cross-bore and a Collar at each end of the Rod partially engaged, but not tightly, on the end of the ¾" Bolts lock-nutted into the large bevel acting as the "crown" wheel. Small Contrate Gears are fixed on the inboard ends of the half shafts to engage with small Bevel Gears carried on the central Coupling by Pivot Bolts screwed into the Coupling. Each suspension spring is semi-elliptic, made of stacked strips fitted at each end with Right-Angled Rod & Strip Connectors running in one fixed and one swinging shackle. Further details are shown in Figs. 17 and 18. A simulated solid forged bow axle at the front is shown in Fig. 19 made from stacked layers, six at a time of 3½" and 2½" Curved Strips.

Steering gear is shown in Fig. 20 and Fig. 15, the view of the driving compartment showing the angle of the steering column set by a 4" Screwed Rod in two Couplings, the lower coupling fixed in a cross rod and held in position by an Obtuse Angle Bracket between the foot pedals. Below chassis, the steering column is further stabilised by another Coupling fixed to a long Threaded Pin secured in a bent Trunnion on the chassis side member. A large Bevel gear is free to turn on this pin and has a Fishplate securely bolted to it, acting as a steering drop-arm. The drag link is fitted to the drop arm via a Collar and small section of a Compression Spring giving enough free movement for all steering angles. Figs. 18 and 19 show further details of the steering links and swivels. Fig. 17 shows details of the internal expanding brake shoes, the upper Collar acting as a cam on a bolt shank and operated by a short lever (double layer Fishplates) connected by wire links and Cranks to the handbrake lever. A small piece of Meccano Spring Cord acts as a return spring. Wheel Flanges on the rear axle, fitted on Bush Wheels, form the brake drums.

# Check and Report

by James and Rita Vanderbeek

## Our Review Models this Month . . .

This issue of Model Mechanics carries the major buying guide to model railways and so it seems appropriate that the rail theme should be extended to Check & Report, even though this may involve our including more reviews of this type of model than would normally be the case.

There is so much activity in the model industry at present — with the resulting competition being good for the consumer — that design, manufacturing and pricing standards are better this year than ever before. The models which we test and review in the following pages represent only a very small proportion of the new items that are being released during the final months of this year, but certainly are good examples of what is being offered.

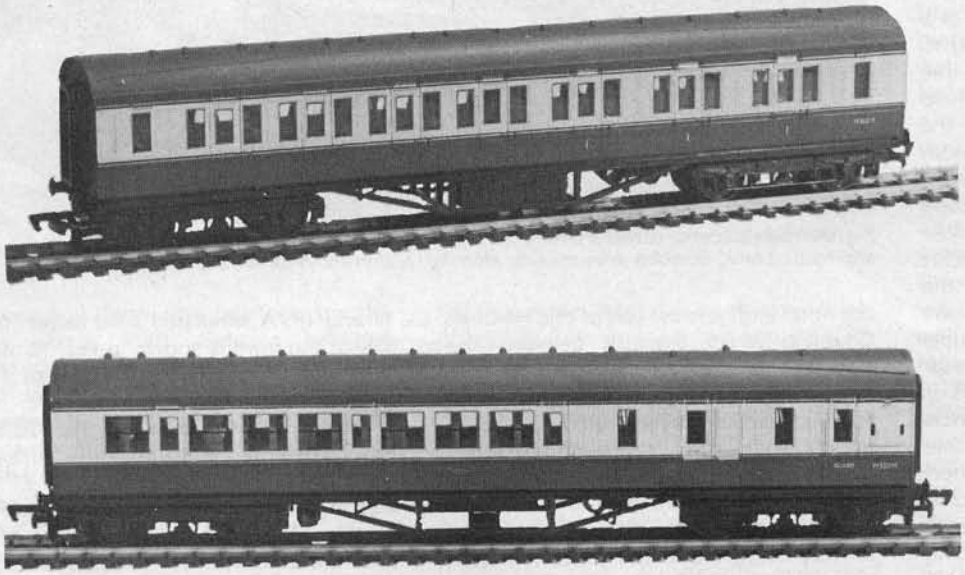
### Everything under control, with the aid of AGW Power Units

For some years we have been using AGW controllers for almost all our tests of N, HO and 00 locomotives and trackwork. During that time we have worked our way through a number of these units — not because we have ever experienced even the slightest difficulty with them, but rather because the manufacturers have made a point of asking us to keep up to date with their range.

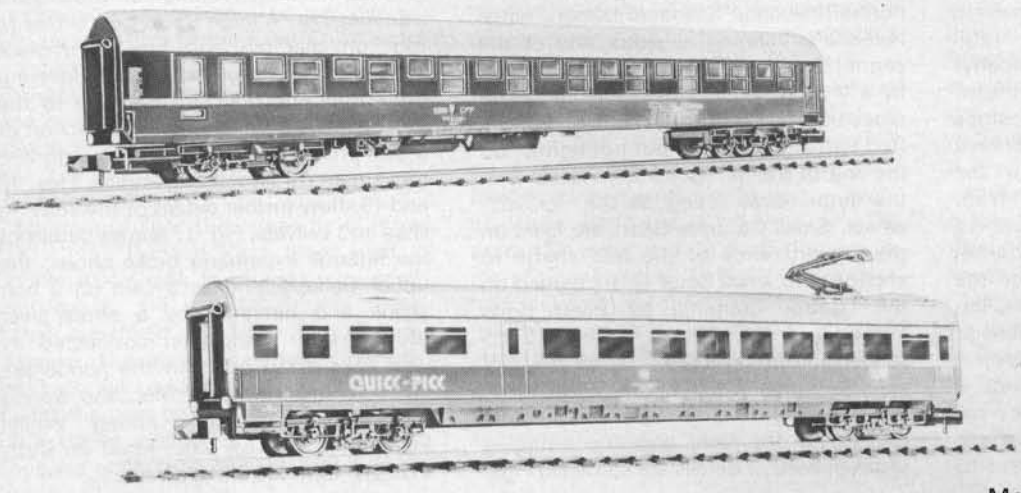
Recently we have been using one of the AGW PE404 solid state dual controllers, a neatly cased unit which enables simultaneous control of two separately circuited trains to be achieved, with three operational modes for each. Thus each half of the PE404 can be operated (a) as a normal power controller with the usual forward-off-reverse switching and speed control, (b) as a unit with inertia control during acceleration and slowing down which is matched to the weight and type of train, and (c) as a fully automatic conventional unit with controlled acceleration/deceleration to or from a pre-selected maximum speed. In addition, each half has a brake button which, in modes (b) or (c), will slow or stop the trains and thus provide fine control when approaching platforms or signals. Overload indicators are also incorporated. A 2-core mains input lead is connected to the rear of the controller and here also are the two socket panels for the DC and AC outputs of each half of the PE404 which are, in fact, 2 × 12v DC and 2 × 15v AC, 10VA. The overall dimensions of the hammer finished steel casing are 7¼ in. × 3¾ in. × 3¼ in. high and with each unit a set of eight wanderplugs is provided.

Our test example of the PE404 has had, already, a very varied life, for it has been used with models of almost every one of the main systems. It has provided very smooth control — using both halves in all three modes — and it is so consistent that the operating characteristics of even a mixed stud of test locos may be translated into switch/controller movements after checking each one for only a minute or so. In overall terms the PE404 is fully representative of the 1979 AGW range and certainly is proving to be trouble free and a pleasure to handle.

*CR-3 Palitoy Mainline OO coaches, ex-LMS, but shown here in BR crimson/cream.*



*CR-10 CR-11 Fleischmann 'piccolo' N-gauge coaches, Swiss T.E.N. Sleeper and German Quick-Pick buffet/restaurant.*




### A superb French kit for a British Aircraft Carrier

The British Fleet carriers were amongst the largest of our naval vessels in service during World War II and so the 1:400th scale of the new Heller kit for HMS Illustrious gives the plastics moulded replica an overall length of 22½ in. — large enough for the model to look as impressive on display as the full-size vessel appeared in the Med.

The other impressive statistic is that there are no less than 276 components in the kit, ranging from the beautifully formed halves of the armoured hull, through superstructure detail and down to the replicas of Swordfish and Martlet aircraft.

Heller kits are always extremely well presented and, in this case, the parts are accompanied by an instruction leaflet which describes and illustrates the correct assembly procedures in French, English and German. It also includes two sets of detail drawings which render the final painting and camouflaging of either Illustrious (or her sister ship Victorious) a relatively simple task. A set of waterslide transfers includes the yellow flight deck markings and a multitude of roundels for the miniature aircraft.

This is an extremely good kit and demonstrates the mastery of marine model development which the Heller engineers have long exhibited in their kit range. It is a particularly happy choice of prototype — Illustrious was a famous ship.

### Palitoy's new Mainline Coaches

Amongst the most recent additions to the Palitoy Mainline 00 scale range are the corridor and

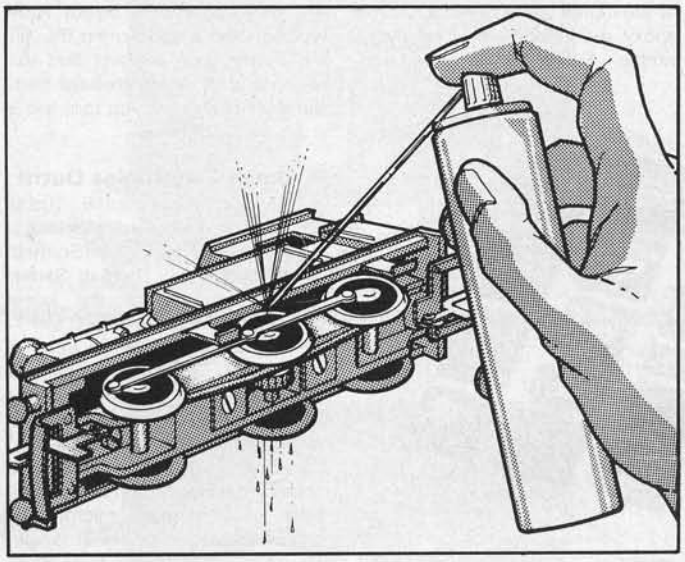
brake/corridor 57ft coaches which were originally in standard LMS maroon livery and, later, in BR cream/crimson colouring.

These coaches have much to recommend them — correct type LMS bogies, flush-fitting window glazing, fully fitted-out interiors and printing which extends beyond the provisions of corridor handrails to include the 'first class' and/or 'no smoking' window stickers. Externally the models — there are two LMS and two BR variants — are finished in a manner which is both accurate and pleasing.

On the track our test rake presented no problems, even when taken through complex pointwork at speeds which were dangerously in excess of scale. Also interesting is the minimal drag of these bogie vehicles, for a scale length Palitoy train is well within the capabilities of even the smallest 00 locos.

## New Rolling Stock for Fleischmann 'piccolo' N-Gauge System

In the ten years of the existence of the Fleischmann 'piccolo' N-gauge system this beautifully made range has been extended to cover most of the types of locomotives and rolling stock established in the larger HO series.



*CR-15 A Peco sketch of Electroclean in action, using the fine tube spray attachment.*

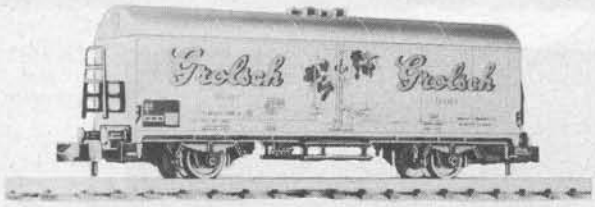
The latest vehicle group for test includes two coaches, a pair of modern image freight vehicles and a cattle truck which is from the earlier era of steam.

Our first coach is the distinctive Trans-Euro-Nacht sleeper, finished in the dark blue livery of the Swiss SBB and which features both the special interior furnishing of the prototype and its quite remarkable arrangement of windows. Corridor side windows are simple, well spaced out, rectangular units but on the other, compartment, side there are twenty smaller windows, all with bright finished frames and positioned to match the two levels of the sleeper beds. The second passenger vehicle is a replica of the latest type Quick Pick buffet car in the correct turquoise/cream livery, and with a single pantograph for the collection of power for the kitchen equipment. This N-gauge model is fully fitted-out with kitchen area, tables, chairs, centre and side gangways plus, as on all 'piccolo' express vehicles, correct type bogies, corridor ends and a full set of very precisely printed operational markings.

An insulated van on 4-wheeled underframe and finished in the yellow, red and black livery of Grolsch Bier typifies a modern European private owner's vehicle, whilst the second freight wagon is a skeletal flat, DB Type LBS598, carrying a perfect replica of a standard 40ft cargo container with opening top. The box is finished in the green, yellow and black Schenker livery. This container wagon has a relatively long wheelbase so to ensure even running through model radii curves has very lightly spring loaded, self-centring axles.

In considerable contrast to these modern vehicles the vintage cattle wagon has a short wheelbase chassis with a finely detailed representation of the 2-deck body used when smaller animals were being transported. The Fleischmann model is finished in standard timber colour, has remarkably small lettering and numbering on its sides and even has working sliding doors. It could be found on any German branch line around the turn of the century.

Fleischmann 'piccolo' vehicles have performed so consistently for us over the last ten years that if we ever come across one which runs badly we will be very surprised. This batch was no exception, so that all five behaved perfectly — with excellent high speed stability, reliable auto-couplings and near silent running.





*CR-12 CR-13 CR-14 Freight stock introduced in the Fleischmann N-gauge system: Grolsch Beer insulated van, vintage cattle wagon and 40ft container wagon.*

## Looking after Locos

One group of Peco model railway products which is being given particular prominence by the makers this year is that devoted to the servicing and general lubrication of locos and rolling stock. As a result of this, Peco sent us for test a tube of the Electrolube PL-64X, an aerosol of Electroclean degreasing fluid, a wheel-cleaning brush and scraper, plus foam plastics cradles in which the models may be supported during the maintenance process.

It is almost inevitable that dirt will gather on loco driving wheels and it is this fact which prompted the introduction of the power connected cleaning brush and scraper. The brush has small brass wire tufts mounted in a moulded plastics case, whilst the scraper consists of a plated metal strip with one end turned through 90°. Both items have thin insulated leads which can be connected to the loco voltage output terminals of a controller. Brush and scraper are then placed against the driving wheel rims, with power switched on for low speed running, and the dirt film can then be removed from each wheel in turn. Obviously the brush should not be used on traction tyres, and when 3-rail locos, such as Marklin, are employed, the scraper must be placed in contact with the centre shoe.

Electrolube PL-64X has long been an effective cleaner/lubricant for use on model railways items. The claims made for it are impressive — that it eliminates electrolytic action, reduces power losses, ensures continuous electrical contact and so reduces wear on electric motor brushes and commutators. It is also safe for use in conjunction with most of the materials and surface finishes used for models.

Linked with Electrolube, but not previously tested by us, is Peco Electroclean. The pressure applied spray may be used fairly universally and the aerosol pack also includes a fine gauge tube to provide a directional cleaning spray. Electrolube and Electroclean were successful under our test conditions and, after using old and suitably disreputable locos as subjects, our impression was that this whole group of Peco maintenance products is a worthwhile modelling investment, particularly for modellers who use their locomotives intensively.

## White Metal N-Gauge Kit for LNER 0-6-0

One of the smaller companies to be covered in the Model Mechanics review is D. & M. Castings and it was this firm which recently provided us with an example of its latest 0-6-0 loco kit. Previous locomotives have been based on LMS prototypes, so the LNER Class J39 represents something of a change of allegiance. Like its predecessors it is designed to fit directly on an unmodified and readily available commercial chassis — in this instance the excellent Grafar 0-6-0 unit as incorporated in that company's ready to run GWR pannier tank. Other Grafar components supplied in the kit include the three axles of metal tyred tender wheels and a pair of standard auto-coupling mouldings.

The castings have been kept to a minimum in number and assembly of the model using cyanoacrylic or epoxy resin adhesive is relatively simple. Some cleaning up and aligning of the units is required, but there are no snags and our test loco involved little call on our available time.

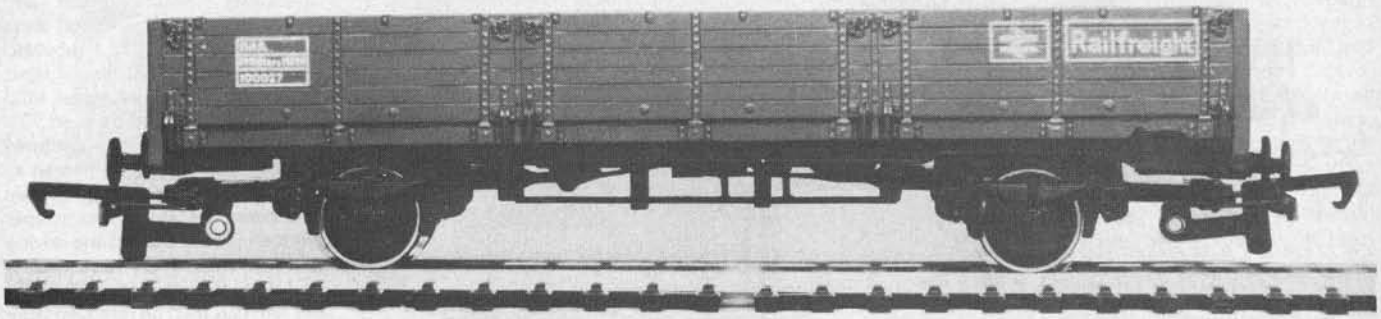
The installation of the chassis is also simple, and the finished model is particularly welcome as an otherwise unobtainable LNER type in this scale.

D. & M. Castings also markets a selection of N scale lineside accessories and sent us the latest one at the same time. It is a cast, white metal, buffer stop, rail-built on its own short length of N-gauge track. The only assembly operation is to glue the separate buffer beam into position. This is a very reasonably priced accessory — one of those which adds much to the appearance of a layout. One word of advice concerning this all-metal stop is to suggest that the rail base is efficiently isolated from the ends of the running rails lest a short circuit develop.

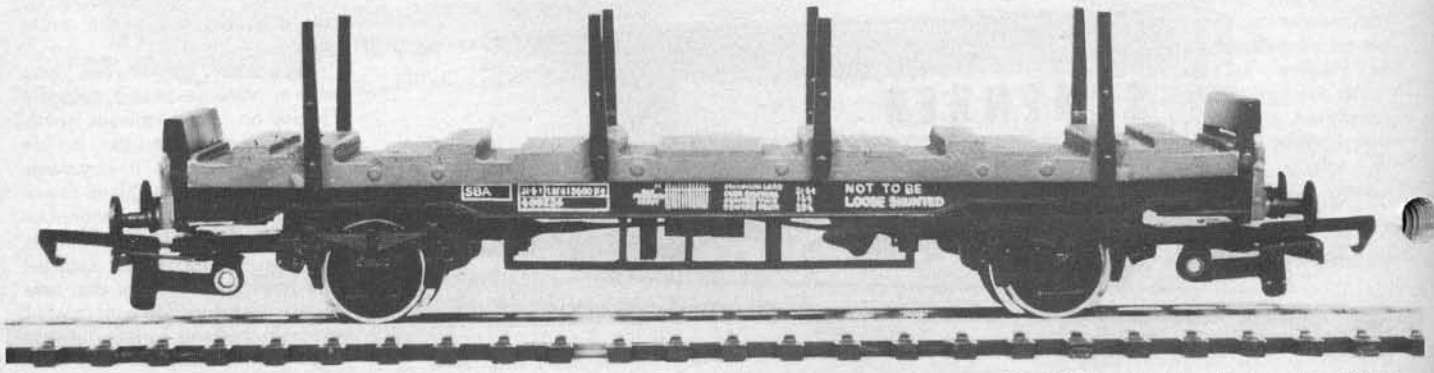

*CR-1 The Salter Electronics 2 outfit, showing the pre-installed components.*

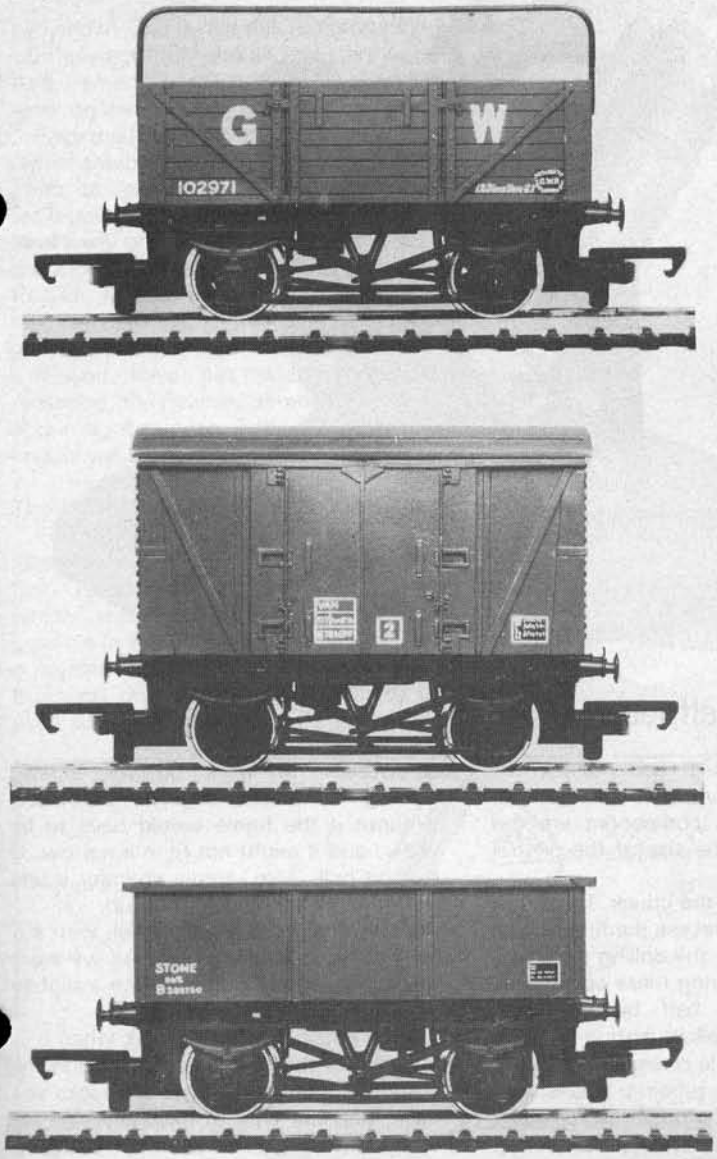
## A Junior Electronics Outfit

Providing experimental outfits for science orientated subjects is something in which a Scottish based company, Thomas Salter, specialises. One of the latest offerings is the Electronics 2 Set — a kit intended to provide a reasonably priced means of assembling rigs which can range from simple exercises in circuit wiring, through to the purpose and use of typical electronics components such as transistors, solar cells, diodes, microphone and loudspeaker, or signal lamps. There is an 85-page instruction book to cover these projects and it is well equipped with theoretical and practical diagrams, plus




*CR-5 CR-6 Hornby OO wagons of BR type 45 ton GLW with open and bolster equipped bodies.*






*CR-7 CR-8 CR-9 Hornby goods wagons on the new 10ft wheelbase chassis. Types are GWR 7-plank with sheet rail, BR ventilated van and mineral wagon.*

comments on each of the experiments. The book also shows exactly how the practical tasks of circuit assembly should be carried out and this makes the Electronics 2 outfit especially suitable for youngsters who need to amass working experience before passing to more involved projects.

This is one of the main reasons for Salter's use of an open pack, with all the components mounted on a printed board, and pre-wired to spring type connectors within an expanded polystyrene tray. Ready cut lengths of connecting wire are provided, all with their ends bared and solder dipped.

Not surprisingly, our checks of this Salter outfit were snag free. Once the circuits are wired up and batteries fitted in place, the results are consistent and easily followed. Science can be pleasureable and this outfit will certainly help younger users to discover that fact.

## New Wagons for Hornby Railways

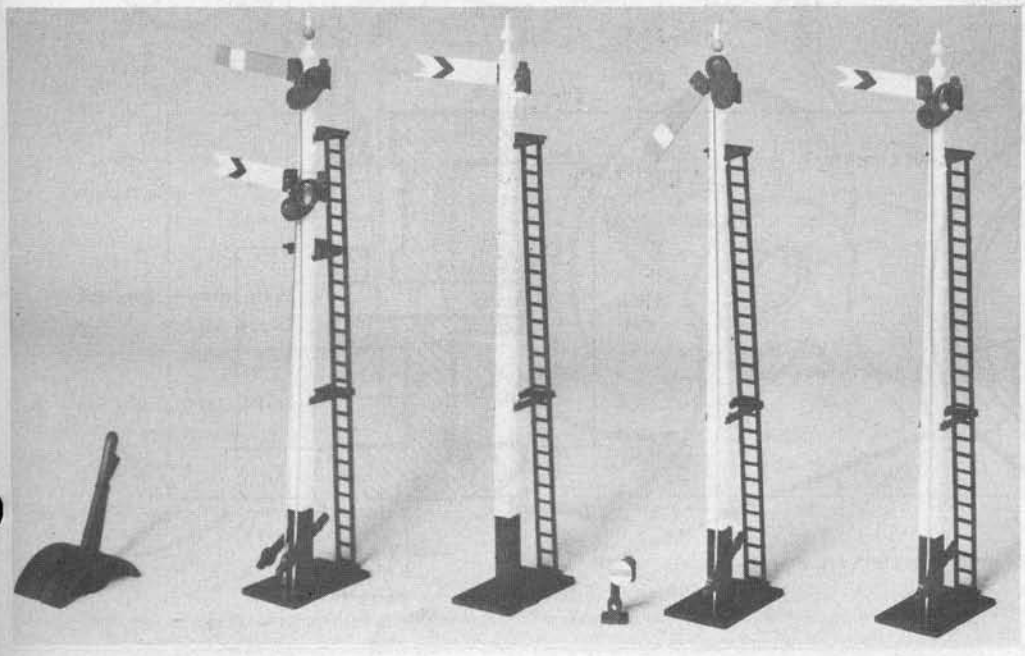
We were pleased to receive this group of five new wagons because, for some reason, there had been a long gap since last we received Hornby test samples of this type. This fact had its advantages, however, because it enabled us immediately to appreciate how improved are these 1979 vehicles.

The types involved are two of the latest 45-ton GLW wagons — one open and one with a flat deck adapted for bulk steel carriage — plus three 10ft wheelbase vehicles on a new type underframe with scale buffer height and comprising a steel bodied BR mineral wagon, a ventilated van and an earlier type, 7-plank, GWR wagon with sheet rail to support tarpaulin covers.

Hornby has most certainly improved its freight wagon tooling, with the result that underframe and body detail is better defined than previously and the open wagons have their interiors finished in contrasting colour. Also improved is the lettering and numbering, with the modern image vehicles carrying correctly styled data panels and, in the case of the 45 ton GLW types, the TOPS panels which provide type coding. These long wheelbase models all have light spring loading to align the widely spaced axles and the connected auto-couplings.

Hornby models have metal tyred wheels and these were satisfactory in running. Under test all these wagons were trouble-free, whilst the long overdue introduction of underframes with correct buffer height indicates how the system is being improved so as to maintain its market position.

*CR-2 Four of the new Ratio OO signals of GWR pattern. Note the countersunk lever.*



## New 00 Scale Signals

Ratio Plastic Models has long been a very useful scource of supply for the model railway builder. The products have an excellent reputation for accuracy and efficient operation and, in addition, Ratio often provides items which are otherwise difficult to buy commercially or even to build.

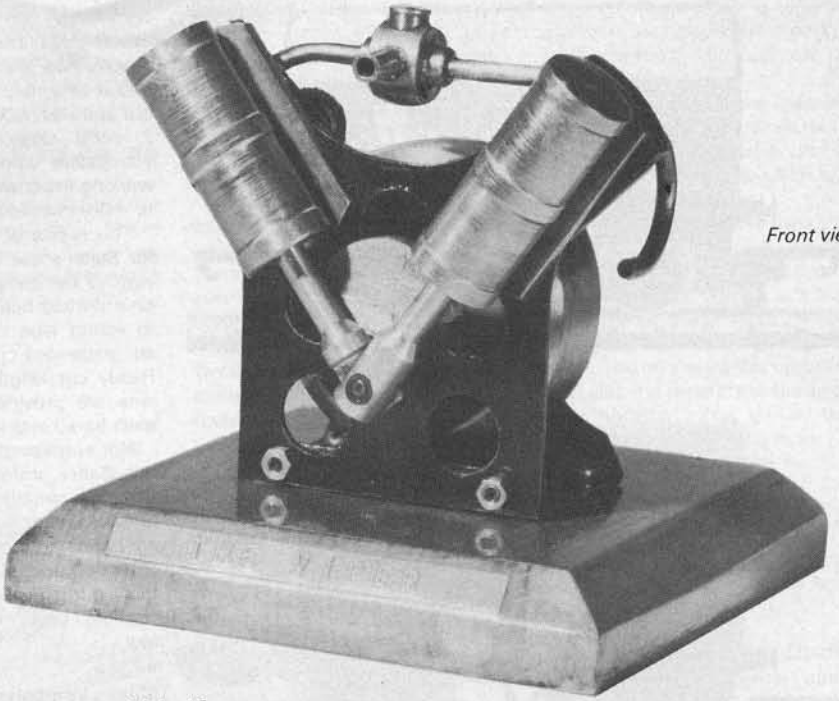
Amongst the most recent is a group of partly assembled GWR signals — each with an operating lever and length of connecting cord. The main signal structure is supplied ready-built, with old type square post, home or distant (or both) arms and correct pattern red and green spectacles. There is a set of moulded components for the access ladder, support brackets and maintenance platform, and even a set of parts to make a separate ground signal. These items are easy to fit, provided that reasonable care is taken, whilst the actuating link between lever and signal involves neither electric motors nor circuitry as it consists only of a length of fine cord. The bases of both signal and lever are designed to fit directly into ½ in. diameter holes drilled in the baseboard, so that the whole installation of one or a group of signals is simple and straightforward.

Ratio provides a well prepared instruction leaflet which is interesting also for the fact that it includes layout and signalling diagrams for typical GWR through, terminal and junction locations.

Another useful item from Ratio is a pack of GWR lineside fencing. This consists of 36 posts — all in black — plus 7 lengths of plastic monofilament which can be fitted into the very fine slots moulded into the posts — so to form the seven levels of fencing wire. The latter is supplied in a rust colour which must be appropriate!

# Viper

## An interesting 2-cylinder steam engine to build on a small lathe. Specifically designed for model boat application.



*Front view*

by Richard Halfpenny

The model steam launch engine "Viper" is named after its Vee cylinder arrangement, and also after the famous turbine torpedo-boat-destroyer VIPER, once the fastest ship in the world. It is hoped something of the smooth running of this vessel may be recaptured by this model.

Designed for appearance, as well as performance, it is called a launch engine because it is meant to be installed in the open, rather than hidden below deck. The object was to create something to look like a piece of Victorian engineering, but it also has such modern refinements as aluminium pistons and piston rods, and nylon bearings.

Let me thank my employers, C. B. Powell Ltd., of Hove, for kindly allowing their facilities to be used for building the prorotype Viper. Also, Mr. Jack Kent, of Worthing, for the excellent photographs.

### The Flywheel

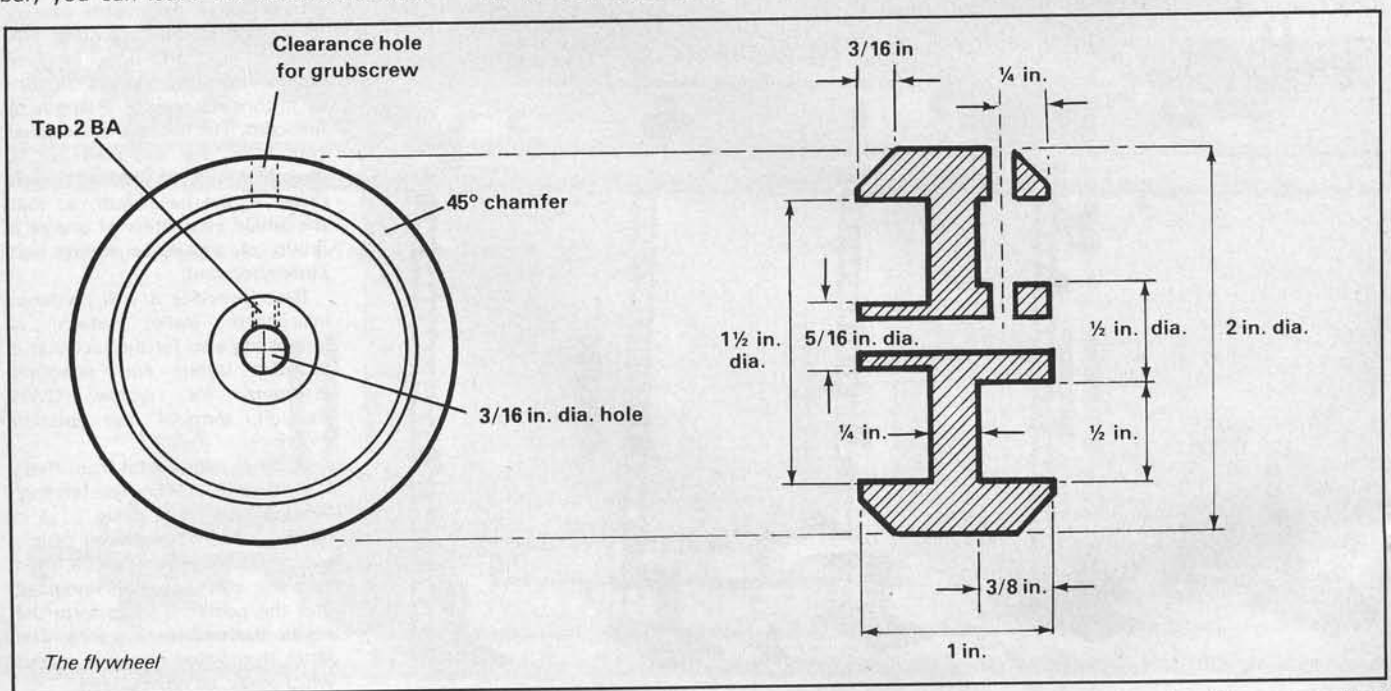
This is the heart of the engine, and also the largest piece of work in it. If you have only a very small lathe, you may have to get it turned for you. However, it is well within the capacity of any three and a half inch machine. I had a piece of forged steel for mine, and this easily gives a good finish. Free cutting mild steel would be fine. If you have a piece of stock diameter bar, you can leave the outside diameter untouched, provided you "clock" it accurately to begin with. The only critical dimentions on this component are the width of 1", and the size of the central hole.

Holding firmly in the chuck, face; turn (if necessary), and recess the first side of the flywheel. Leave the drilling until last, in case it moved during these operations. The deep recess can be cut with something like a shallow parting-off tool, but with considerable clearance on its left side, to prevent it rubbing against the internal diameter. Do not be surprised if you break one or two tools during recessing. I did, anyway . . . Note that one hub is larger than the other. This is to allow enough thread for the grubscrew.

The wide chamfer on the outside of the rim is very important. It allows a thin screwdriver to work on the screws holding down the engine's baseplate. Without it the frame would have to be wider, and it might not fit in a narrow, U section hull. Also, lightly chamfer inside the rim, and the end of the hub.

Centre, and drill the flywheel, with a $\frac{3}{16}$ in. hole for the crankshaft. As we want this to be a good fit, start with a slightly smaller drill.

How you hold the flywheel when it is reversed in the chuck depends upon the size of your lathe; the type of chucks you have, and the type of jaws available for them. However, once you think you have set it true, push a straight piece of $\frac{3}{16}$ in. dia. silver steel rod (the one you will use for the crankshaft will do) into the central hole, so that it projects a few inches. You may be surprised at what this little test




*The flywheel*

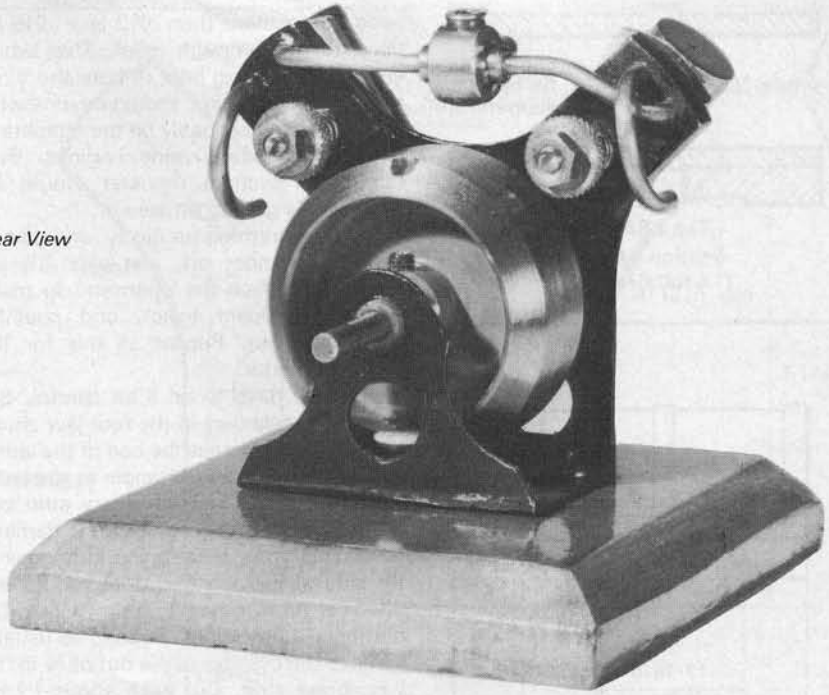
can show! Only when this rod is spinning centrally and truly should you start work. And, remember this trick whenever you work on a similar small flywheel.

Face the flywheel to a width of 1 in. and repeat the procedure as for the first side. Then, to completely finish it, drill a hole, for tapping 2 B.A., right through the rim, as shown on the drawing, squarely into the wider hub. Enlarge the hole in the rim to $\frac{3}{16}$ in., to clear the shank of the tap, and tap the hole in the hub 2 B.A. for the grubscrew.

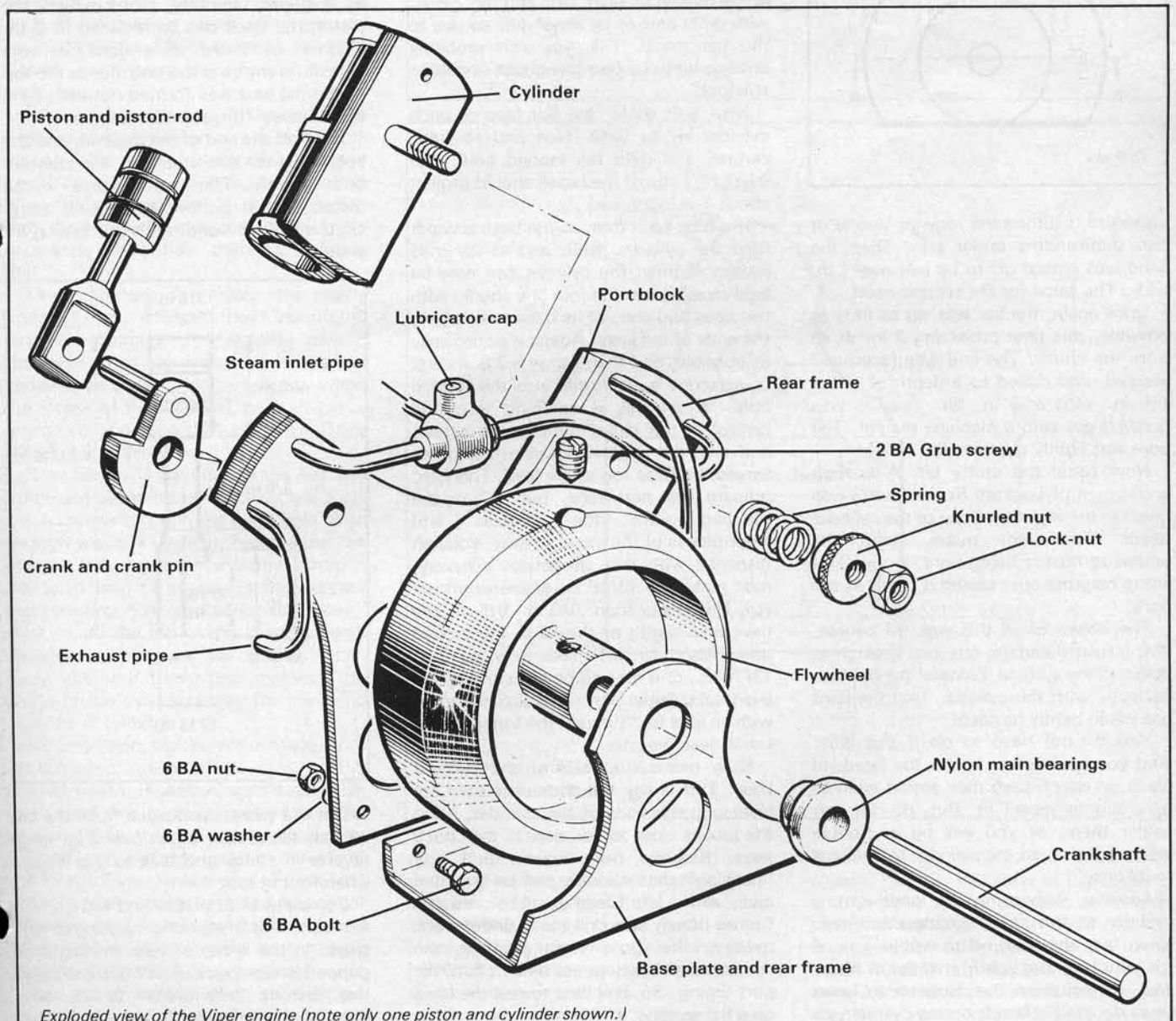
If you have not skimped on the recessing, the flywheel should now weigh about eight ounces. Total weight of the engine will be about eighteen ounces.

### The Cylinders

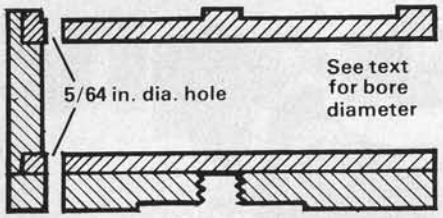
For reasons to be explained, I actually made the heads for my own cylinders first. The end of a $\frac{5}{8}$ in. dia. brass bar, which was set as concentrically as possible in the chuck, was faced off, and a register $\frac{1}{16}$ in. wide was turned on it. Guessing the rather worn reamer to be used for the cylinders would cut a little



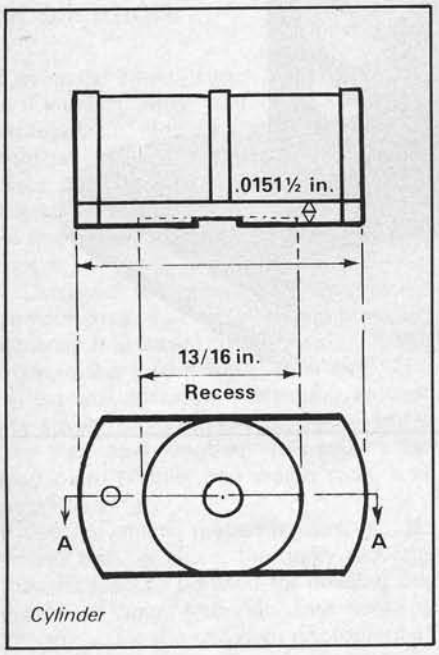
*Rear View*




*Exploded view of the Viper engine (note only one piston and cylinder shown.)*




Tap 2 BA
Section AA
(1.5 full size)




*Cylinder*

undersize, I turned the register to one or two thousandths under $\frac{3}{8}$ in. Then the head was parted off to be just over $\frac{1}{8}$ in. wide. The same for the second head.

Once again, the bar was set as truly as possible, this time projecting 2 in. or so from the chuck. The end was faced and centred, and drilled to a depth of about 1¾ in. with a $\frac{23}{64}$ in. bit. Then it was finished out with a machine reamer. The bore was lightly chamfered.

Now came the crafty bit. A sparing application of Locktite Super Glue 3 was given to the register of one of the cylinder heads. Then, my guess about the undersize reamer being right, a couple of sharp hammer taps seated it firmly in the bore.

The object of all this was, of course, that a light skimming cut, just enough to cover all the surface, blended the head so perfectly with the cylinder, that the joint line could hardly be seen!

You do not have to do it this way. And you could silver solder the heads in place, in which case they would need to be a slightly looser fit. But, do not soft solder them, or you will be in trouble when you re-heat the cylinder to solder it to its base.

Anyway, supposing we have got a cylinder to the state already described. Now, face the head off to within $\frac{1}{16}$ in of the joint line, and lightly chamfer it. Make two undercuts on the diameter to leave three decorative bands on the cylinder, as shown in the illustrations. The undercut need be no more than .010 in. - .015 in. deep to give enough relief. This leaves enough "meat" to later re-bore the Viper to as much as ½ in., should anyone wish to. This would probably be the ultimate in oscillating model marine engines. But, remember such a monster would be exceedingly greedy on steam.

Finish everything up nicely, and part or saw the cylinder off, just over 1½ in. long. Then, face the open end to make the measurement exact, and chamfer inside and out. Repeat all this for the second cylinder.

Now we have to be a bit careful. Set one of the cylinders in the four jaw chuck so that it faces across the bed of the lathe, and is at an exact right angle to the lathe axis. Pieces of reversed emery strip can be used for packing, to prevent damage marks. Carefully take facing cuts against the side of the cylinder, until you have a "flat" of approximately ¼ in. width. Do not make it any wider. Repeat, as usual.

Make the cylinder bases out of ¾ in. by $\frac{1}{8}$ in. brass strip. Cut each about 1 $\frac{5}{8}$ in. long to begin with. Centre punch right in the middle of each. Drill and tap 2 B.A. with great care to be absolutely square to the flat metal. This you can probably arrange with the four jaw chuck and lathe tailstock.

Now soft solder the flat face of each cylinder to its base, nice and straight, central, and over the tapped hole. The overlong ends of the bases should project about $\frac{1}{16}$ in. each end.

It will be seen that, as the base is wider than the cylinder itself, and as its ends project slightly, the cylinder can now be held crosswise in the four jaw chuck, with the sides and ends of its base overlapping the ends of the jaws. Adjust it as centrally as possible, and then screw a 2 B.A. bolt or setscrew quite firmly into the tapped hole. When this is spinning true and central in the lathe, remove the screw, and take the lightest possible facing cut across the base, on a fine feed. This is to prepare the port face, but if you are satisfied with the flatness and smoothness of the metal already, you can dispense with this altogether. Anyway, next make the 13/16 in. diameter undercut. No deeper than .010 in.-.015 in. We have little depth of thread in the tapped hole. Also, do not make it wider than 13/16 in., or it may come too close to the eventual cylinder port. This also has to do with an idea for "tuning" the Viper, which I shall describe later.

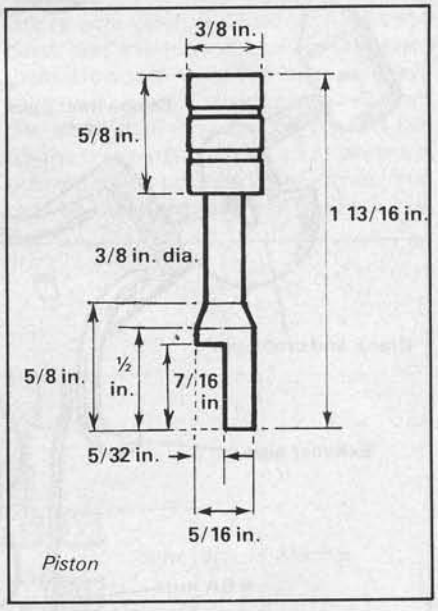
Now radius the ends of the cylinder base. Turn away the ends until they are level with the ends of the cylinder, bring the tool as close as you dare to the chuck jaws. Remove from chuck, and any "flashing" that remains can be trimmed away with a file. Clean up all corners etc. Centre-punch and drill the cylinder port. Initially, this goes right through the cylinder and base, to act as a "pilot" for port timing. So, it is best to rest the base on a flat surface, and punch the top of the cylinder. If you do this just clear of the $\frac{1}{8}$ in. decorative band, a $\frac{5}{64}$ in. drill should go vertically through, just clear of the inside of the cylinder head.

### The Pistons and Piston Rods

These are made in one piece, and are quite a simple piece of turning. Do not be tempted to make them from silver steel, merely becuase stock size will give almost exactly the right diameter for the pistons. It is much heavier than aluminium, and will greatly increase the reciprocating weight. As a Vee twin, with both pistons imposed upon a single crank-pin is a fundamentally unbalanced engine anyway, this would be a bad thing.

Chuck a piece of $\frac{7}{16}$ in. or ½ in. diameter aluminium bar to project about 2 in. from the jaws, and turn the whole length down to a little over $\frac{3}{8}$ in. If you establish the piston diameter now, you can experiment on that part of the bar that will become the piston rod, where mistakes will do no harm. Aim to finish at one or two thousandths over $\frac{3}{8}$ in. The pistons will eventually be lapped to their final fit. Now turn the length of the piston rod to the $\frac{5}{16}$ in. big-end diameter, after which the piston rod itself can be reduced to $\frac{3}{16}$ in. Neither of these dimentions is very critical. In my case the chamfer at the top of the big end was formed naturally by a throw-away Tungsten Carbide tip.

Face off the end of the big-end, and the bottom of the piston neatly, and chamfer both slightly. The two grooves in the piston should be evenly spaced; semi-circular in form, and not more than $\frac{1}{16}$ in. wide.




*Piston*

Cut the whole workpiece from the bar so that the piston is just over $\frac{5}{8}$ in. long: reverse in chuck and face to this length. Chamfer the top.

Complete both piston and rod units in this way, and then, either running at high speed in the lathe, or with the big ends gripped in the chuck of an electric drill, lap the pistons individually to fit each cylinder. Use medium, or only fine emery cloth with paraffin. When each is a

smooth, sliding fit, mark the top of each piston, and cylinder head, with a number punch, a letter punch, or merely one and two-dots. Keep each pair together.

Now you can file away half of each big-end as shown, to form a neat "half square". Drilling for the nylon big-end bushes must wait until a later stage.

**The Frame**

The front of the frame is of 16g sheet steel; the baseplate and rear of 18g. This is so that the front part shall be flat and stiff for the cylinder port faces, and the remainder easily formed to shape.

Some people prefer scribers and centre-dots etc., but for this sort of work I usually mark the shape out on the sheet metal, as accurately as possible, with a "Rapid" marker or similar pen. The thick black line give something very definite to work to: One hacksaws round its outer edge, and finishes up by filing, checking measurements constantly with a steel rule. When making the front part, be sure to leave the tops of the two "horns" where the cylinders go, somewhat oversize. This is because the radiused ends of the cylinder bases will eventually be made to blend with them by filing the frame. Also, leave the "horns" a little wide, too.

Be careful to position the holes for the main bearing; cylinder pivots and frame joining bolts very accurately. All these could be drilled with B.S.I. centre drill bits. You will find, with thin sheet metal, that these usually give a rounder, more accurately sized hole than an ordinary drill.

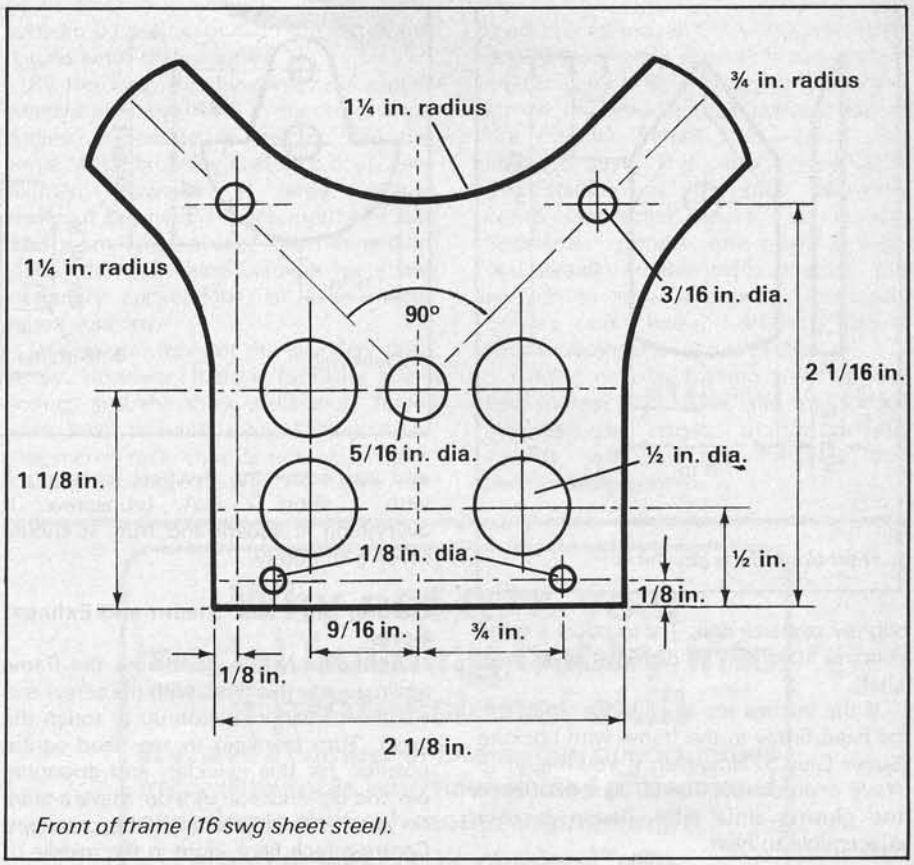
The "lightening" holes are really optional: of course they contribute virtually nothing to weight saving. However, they do greatly enhance the appearance of the Viper, especially when the recess of the flywheel, painted red or green, can be seen through them. They are all ½ in. diameter.

Now fix No. 1 cylinder to the left and front face of the frame by passing a short 2 B.A. screw through the pivot hole, with enough washers under its head to pull the cylinder tight against the frame. Arrange it to be at dead-centre by aligning with the main bearing hole, and scribe or "Rapid" mark round the top of the cylinder base. Remove cylinder and file surplus metal away until the frame just matches the shape of the cylinder base. Do the same with No. 2 cylinder.

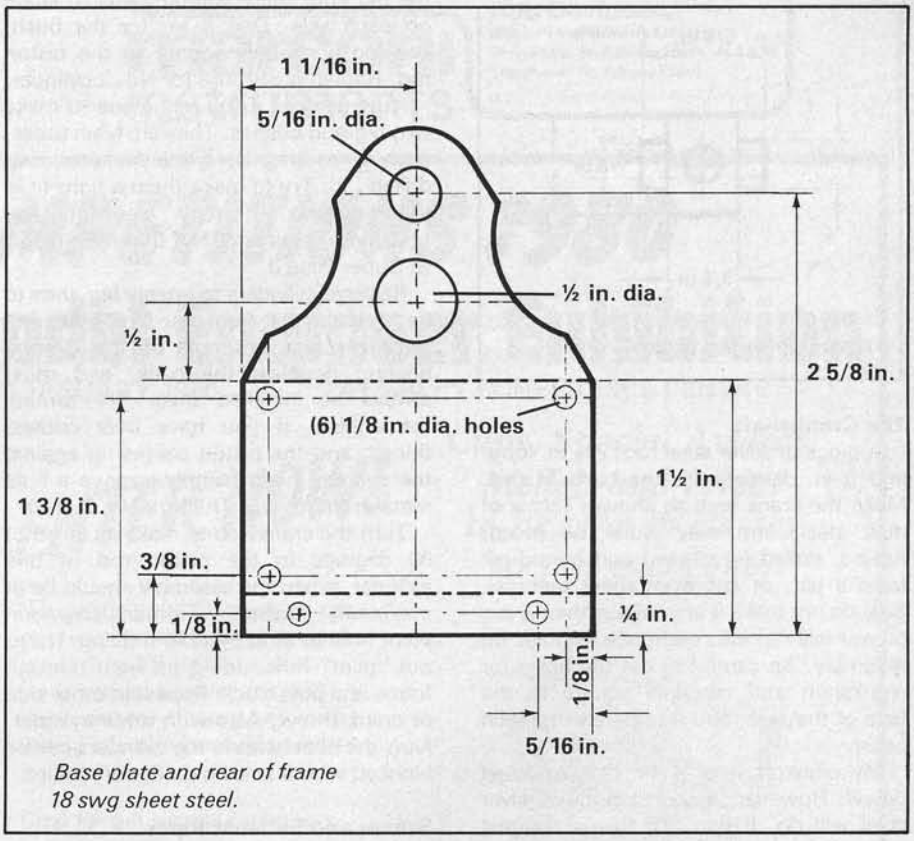
My own port blocks were made from the same brass strip, ¾ in. by $\frac{1}{8}$ in., as the cylinder bases. However, steel would also do. Shape the lower chamfered ends as shown: leave the top ends square; do NOT drill yet, and soft solder to the rear of the frame. If you have plenty of heat, you could try silver solder here, but beware of distorting the port faces. After this, round off the top ends to match the frame by filing, and drill the $\frac{3}{16}$ in. pivot holes.

The baseplate and rear part of the frame is cut out and drilled in just the same way. Bend along the fold lines to a right angle as shown, using a vice, perhaps a rectangular block of steel, and a hammer. Be very careful here, as inaccurate bending will lead to a misaligned crankshaft. Join the two halves of the frame together with any $\frac{1}{8}$ in. diameter screws and nuts.

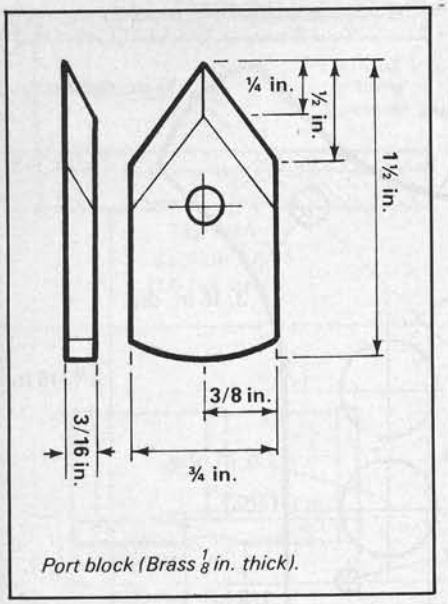
We need a piece of ½" diameter hard nylon bar for the two main bearing bushes. Make them to the dimensions shown, running the lathe at high speed, and using a sharp, pointed tool, with plenty of top rake. Aim at making the $\frac{5}{16}$ in. diameters a fairly tight fit in the frame holes. Nylon is rubbery, and tends to flex away from the tool. For this reason, you may find, when you drill (also at high speed) the bushes, that you need a very




*Front of frame (16 swg sheet steel).*



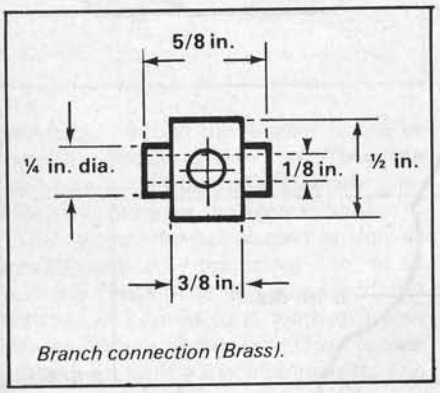

*Base plate and rear of frame 18 swg sheet steel.*



*Port block (Brass $\frac{1}{8}$ in. thick).*

slightly oversize drill. Try to make a good running fit for a $\frac{3}{16}$ in. diameter silver steel shaft.

If the bushes are at all loose, they can be fixed firmly in the frame with Locktite Super Glue 3. However, if you intend to stove enamel your frame, as I did, leave the glueing until later. Nylon is very susceptible to heat.



*Branch connection (Brass).*

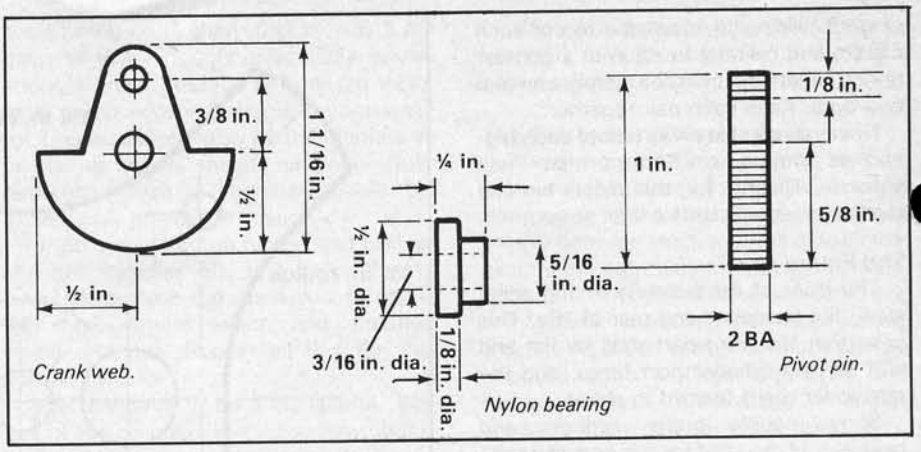
### The Crankshaft

A piece of silver steel rod, 2½ in. long, and $\frac{3}{16}$ in. diameter, is the basis of this. Make the crank web as shown: this is of mild steel, and may either be faced; turned; drilled (in centre) and parted off from a bar, or cut from sheet material. But, do not make it any thicker than $\frac{3}{16}$ in., or you will run into clearance troubles on assembly. Be careful to get the holes for crankshaft and crankpin square to the face of the web, and also parallel to each other.

My crankpin is a ½ in. by $\frac{1}{8}$ in. steel dowel. However, a short length of silver steel will do. If you use this, I suggest leaving it a little long, and cutting it to correct length after assembly of the engine. We do not know exactly how those big-ends are going to line up.

Silver solder the crankshaft together. But do not quench in water to remove scale. This would leave it as brittle as glass. Leave it to cool naturally.

Having cleaned the crankshaft up, try it in the bearings to check alignment etc., and also instal the flywheel, securing it with a short 2 B.A. grubscrew. If everything is square and true, it should revolve smoothly.




### Drilling Big-Ends, Steam and Exhaust Ports

Assemble No. 1 cylinder to the frame again, looser this time, with the screw and washers. Push its piston up to touch the head. Turn crankpin to top dead centre position for this cylinder, and arranging pin and big-end side by side, make a mark on the latter adjacent to the crankpin. Centre-punch here, right in the middle of the big end: there is little metal to spare on each side. Drill $\frac{3}{16}$ in. for the bush, keeping absolutely square to the piston rod. Repeat procedure for No. 2 cylinder.

Now use our nylon technique to make two big-end bushes. They are plain tubes, each $\frac{5}{32}$ in. long by $\frac{3}{16}$ in. diameter, and drilled $\frac{1}{8}$ in. Try to make them a tight fit in the big-ends. If they are not, use Locktight Retainer 601. If that fails, resort to Super Glue 3.

Remove cylinders to enable big-ends to be tried on the crankpin. No. 1 big-end goes on first: its half of the divided bearing goes at the back, and must always be installed thus. Try turning the engine. If you have over cooked things, and the piston comes up against the cylinder head, simply remove a little metal from its top. Then try No. 2.

Turn the crankweb to make an angle of 90 degrees to the piston rod of one cylinder, when the assembly should be at maximum "swing". Tighten screw in pivot hole to stop cylinder moving. Using our "pilot" hole, drill $\frac{5}{64}$ in. right through frame and port block. Repeat at other side of crank throw. Also with other cylinder. Now the pilot holes in the cylinders can be blocked with a small blob of soft solder.

### Steam and Exhaust Pipes

A piece of the brass bar used for making the cylinders, can be used for the branch connection. Turn to dimensions given, drill through $\frac{1}{8}$ in., and part off. Reverse in chuck to shape other side. Drill a $\frac{3}{16}$ in. hole at right angles to the central hole for the short stub, which can itself be connected to a steam or air supply by flexible tubing, once we get to running the engine.

If you engine is to be used almost exclusively on steam, you will not need the oil cap shown. Instead, a simple displacement lubricator will be required, giving a steady supply of oil. However, if you are going to run the engine much on compressed air, fit the oil cap. It is impossible to oil the cylinders adequately from underneath, and we do not want those aluminium pistons siezing in the bores. An occasional shot of oil will lubricate the cylinders; work its way down the port faces, and also take care of the cylinder pivots. By the way, the nylon bearings can run without oil, but they seem to retain it very well anyway.

The ¼ in. oil-cap is the type found on machine tools, etc. It has a small ball-valve and spring in it, and, properly fitted, should be steam-tight. Drill a ¼ in. hole at right angles to the $\frac{3}{16}$ in. one, and drive the oil-cap into it.

We only need 6 in. of $\frac{1}{8}$ in. external diameter copper tubing. Each of the steam and exhaust pipes is 1½ in. long. Anneal the tube by passing slowly through a flame to red heat. When cool, clean well with wire wool. For bending, use a quite thin, not too hard, piece of wood, with a hole, just a little larger than the tube, drilled in it. Study the drawing for bending the two steam pipes. One is kinked slightly downward, to avoid oiling bias. Each exhaust pipe is bent into a neat semi-circle.

The arrangement of pipes shown allows the engine to run in a clockwise direction, seen from in front: thus any threaded drive connections will be self-tightening. Countersink the four port holes in the port blocks $\frac{1}{8}$ in. diameter from the rear, not much more than $\frac{1}{8}$ in. deep, and definitely not right through. Have a trial assembly, and when everything fits, soft solder the steam pipes into the branch connection first, so that the hole for the steam stub faces forward, and the oil cap upward. If you soft soldered the port blocks in place, tighten a $\frac{3}{16}$ in. screw and nut in each of the cylinder pivot holes. This is to avoid trouble if the first soldering softens. Now solder the pipes into the port blocks. Follow with the exhaust pipes. Finally, solder about ½ in. length of $\frac{3}{16}$ in. external diameter copper tubing into the front hole of the branch connection as a steam stub.

**Cylinder Pivots and Springs**

The pivots can either be made from $\frac{3}{16}$ in. diameter steel rod, or adapted from 2 B.A. bolts. We need the short length of shank to act as a bearing surface in the port blocks. The really important thing is to make sure the short length of thread, which screws into each cylinder base, is absolutely square to the pivot. To prevent the pivots from unscrewing themselves when running, try Locktite Retainer again. If they come loose too easily, use Super Glue.

I made a pair of knurled finger-nuts from the same aluminium stock I used for the pistons. 2 B.A. wing nuts, if you can get them, would also do. In practice, it was found ordinary nuts, only finger-tight, had to be lock-nutted against these, as they tend to unscrew themselves when the engine is running.

Any convenient size light springs can be used. You can even make them yourself, by winding thin piano wire around the thread of a bolt, and then cutting to length, and tidying up the ends.

Now you can completely assemble the engine, and test run it with air pressure.

**Epilogue**

If you make the parts for the Viper in the order described, you wil find that, where one part has to be matched to another, the first is always ready for the second. I mentioned the flywheel first, so that, if you have to get it made for you, you can be getting on with the rest of the engine while this is done.

By the way, this flywheel may appear somewhat large for a model marine engine, increasing its height, and the angle of the propeller shaft in a boat, very slightly. However, a large, deeply undercut flywheel is much more efficient than a small, solid one, and this should make the Viper also suitable for some stationary applications, or even model steam vehicles.

One person thought the cylinders toop heavy. However, there is room for over-boring, and the thick walls must retain some heat, which is a good thing. Also, they merely rock: they do not reciprocate.

I did mention "tuning". I havev not tried this myself, but it is obvious, when one considers the operation sequence of an oscillator, that, following the power stroke, the piston actually starts to ascend the cylinder before the exhaust port starts to open. This cannot be efficient: the steam has to start becoming compressed again, before it can escape. Therefore, suppose one made a slight countersink in the exhaust port, just enough to allow it to start opening at bottom dead centre? I shall be glad to hear from anyone who tries this.

Finally, only by making year Viper as friction-free as possible, and by carefully adjusting the tension of the cylinder springs, will you get the very best performance from it.

# Scaling Plans

By Stephen Kent

One of the many problems a modeller is bound to meet during the persuance of his hobby is a lack of a suitable plan in the desired scale for his project. The purpose of this article is to give us outline of how this problem may be overcome.

Before outlining the various methods open for re-scaling, a cautionary note should be sounded.; The drafting of a scale plan in any form is a time-consuming and relatively skilled operation. Bearing this in mind, the modeller must be prepared for disappointments and the necessity of abandoning a half completed job that is not up to standard and simply starting again. Further, the modeller contemplating the re-drawing of plans must realise that the re-drafting process is bound to introduce errors to a greater or lesser degree. The above mentioned points should not, however, be taken in a negative light; they are simply a warning that such re-drafting is an exacting process. The satisfaction gained on completing the job is enormous and there is no better way to train oneself for the more difficult task of drawing plans from scratch.

In this author's opinion, there are three ways open to the average modeller to re-scale plans, namely the Pantograph, photography and the Grid method. Taking each in turn, we shall look at the Pantograph first.

A Pantograph is a draughtsman's instrument which comprises a tracing head and an inking head which are joined and can be fixed in an infiniate number of ratios to each other. The method of employment is to adjust the relationship between the two heads to give the required enlargement or reduction and then to trace off the original outline and detail which will be automatically re-drawn to the desired size by the inking head. The original needs to be covered with either tracing paper or drafting film on to which the new image may be reproduced. Pantographs are used commercially for such re-drafting and as such are very expensive. The modeller may be able to find a second hand instrument at a more reasonable price and must also be wary of some virtual toys which are sold as Pantographs and are liable to produce totally inaccurate reproductions. The individual must weigh-up for himself whether the expense involved is worthwhile in relationship to the number of times the instrument will be used. The writer would advise against the method on just such grounds.

Photography provides a more realistic 'quick' approach to re-scaling. Before going into method, a word or two about copyright will be in order. Strictly speaking, photographing anything bearing the © symbol is contravening the copyright laws in the UK. The problem is that once a piece of artwork is on negative it may be reproduced over and over again. The temptation to provide a friend with a print and then possibly to sell another to one of his friends is always present. Such duplication is the nub of the law, the dissemination or sale of such material without the copyright holder's permission is totally illegal. If the individual wishes to persue this method, he or she must always seek the copyright holders permission in writing first and if granted, only use the reproduction personally.

Assuming permission has been granted, the modeller will need the plan mounted flat on a base board, a reasonable 35mm camera with suitable lens, a tripod and a good overall (rather than point) light source. The art work being photographed should fill as much of the negative frame as possible. Once the negative has been developed, it is a simple matter to establish the required size of the re-scale and produce a suitable print. The above is deliberately sketchy because of this point of law. The author cannot stress too highly that it is totally illegal to re-scale in this way without prior permission from the copyright holder.

The final method, the Grid, is the most difficult in that it requires the development of draughting skills, but is far the most satisfying. Before even contemplating the execution of this method it is essential to have a basic kit of instruments comprising a pair of dividers, a plastic ruler bearing a mm scale, a pair of compasses, a set of French Curves, a Set Square, a pencil eraser and a selection of 2, 3 and 4H pencils. In addition, a pocket calculator will be of great value as the method involves a good deal of mathematical figuring. Money spent on good equipment will not be wasted as all the items mentioned are essential when it comes to drawing-up original plans. It will be noted that no mention is made of ink pens. The author feels that for the beginner, the use of such equipment is likely to provide more pitfalls than advantages. learning the correct use of a pencil will be of far more value at this stage and will provide a perfectly adequate working drawing.

Before looking at the ins and outs of the Grid method, a few words on the equipment listed are necessary. The compass and dividers will be familiar to most people. A Bow compass would be a good investment as well as a larger pair. The Bow enables very small circles to be drawn accurately. Both types should have interchangeable ink and pencil heads. The pencil head should be sharpened by filing with an emery board to a 45 degree angle thus providing a very fine drawing edge. The ruler should not be the normal school type, but one which is a solid moulding with bevelled edges for ink work. French Curves are plastic mouldings providing a number of curved templates against which to draw, providing an infinite number of smooth curves to overcome the roughness of free hand work. The Set Square is a triangular template providing accurate 45 and 90 degree edges against which to draw. Again, it and the French Curves should have bevelled edges for future ink work. The quoted pencils have 'hard' leads which produce a fine sharp line. They should never be sharpened with a pencil sharpener but rather trimmed with a craft knife. Cut away the wood until a reasonable length of lead is visible and then make scraping strokes from wood to point whilst rotating the pencil between the fingers to provide a needle sharp drawing edge.

Having gathered together the necessary equipment and, most importantly, practiced with it, the Grid may be begun. Firstly, mount the original plan on a flat moveable surface such as a thick piece of cardboard. This is to allow one to move the artwork into the best position to work from and is best done with Masking or Drafting Tape. This is a form of Sellotape but with less powers of adhesion so that it may be removed without damage to the surface of the original. Next, lay a suitably sized piece of architect's quality tracing paper over the flattened plan and tape this down.

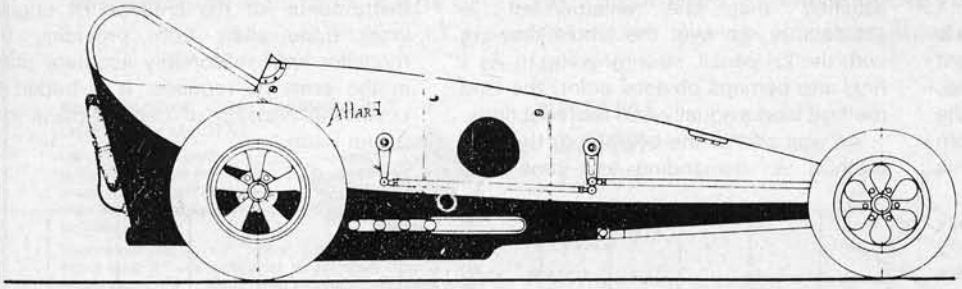
Draw a base line horizontally just below the required elevation, ending it just ahead of and just behind the extremities of the elevation. For the sake of this example, let us suppose that it is wished to convert a 1/72nd original to 1/48th scale. This being the case, mark the base line out into 4mm divisions. These correspond to one foot divisions on the full sized prototype. Use a 3 or 4H pencil for this job. Lay the ruler along the base line so that the marked divisions are visible and using the 90 degree angle on the Set Square, draw verticals from each division. Taking the outer most verticals, mark these off into 4mm divisions and join with horizontals. Ensure that the finished grid covers the whole of the elevation with a small margin all round.

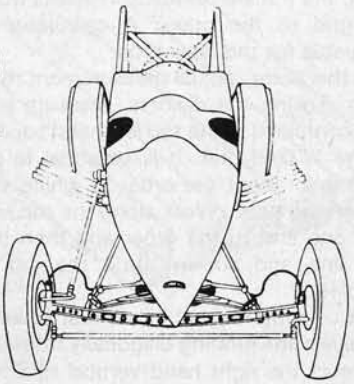
Mount a further piece of tracing paper and draw a further grid. This second grid should have the same number of scale one foot squares as the first and each division should correspond to the one

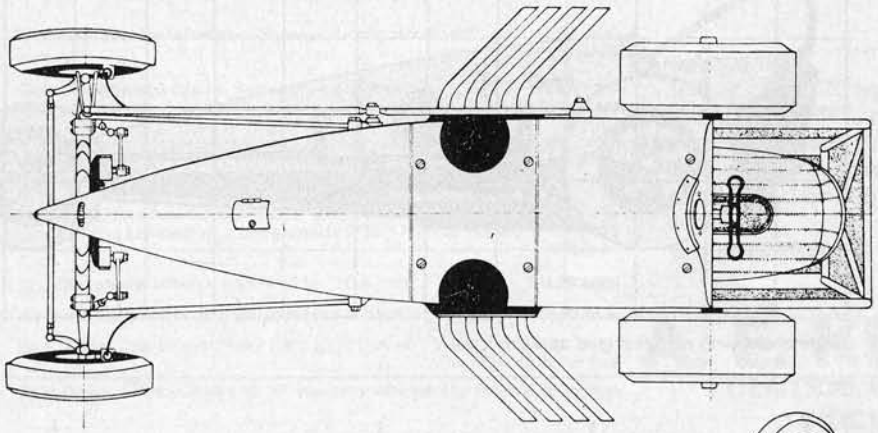
## 1961 ALLARD DRAGSTER

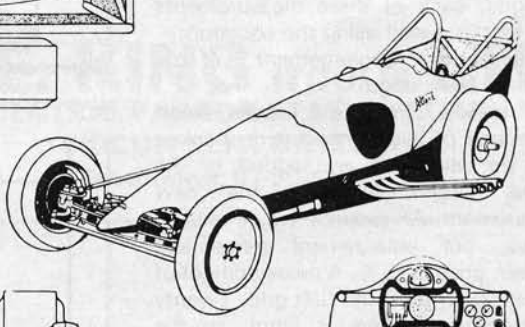
1/32 CARS MM 843

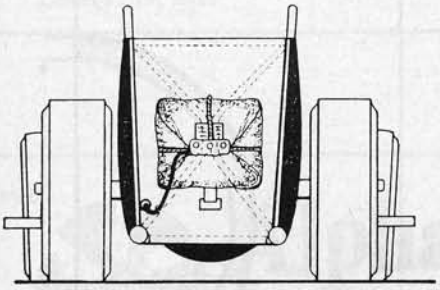
13 - 35 Bridge Street, Hemel Hempstead, Herts.

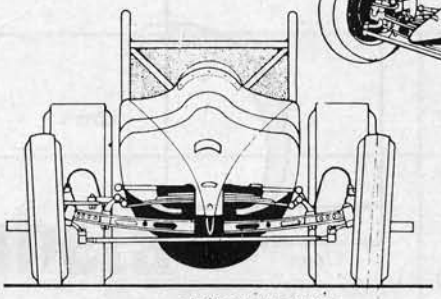






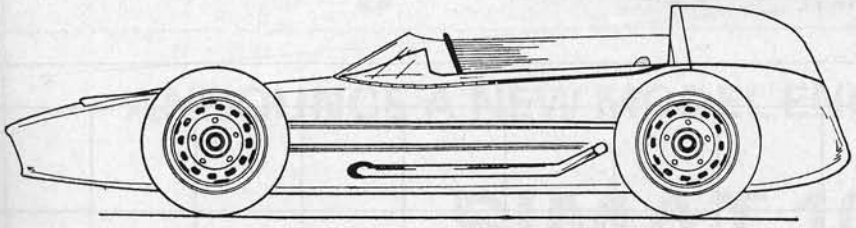


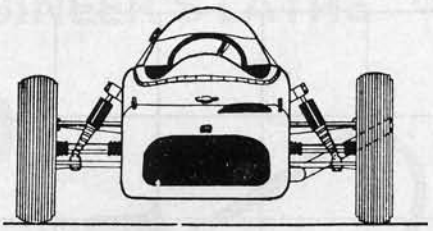


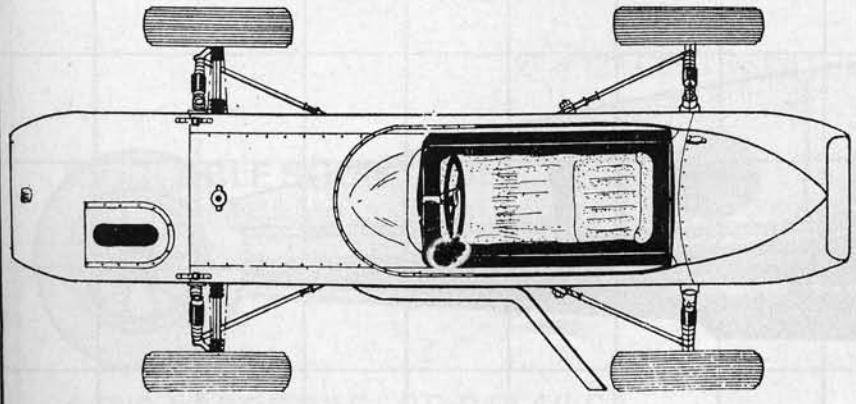


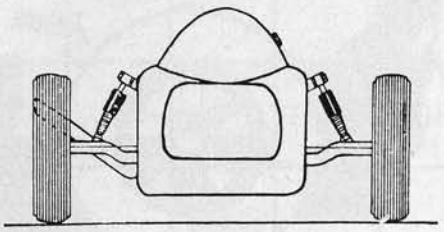
2 1/2° POSITIVE CAMBER

## 1963 SAAB F.J.







*Some examples for you to try.*

foot module in the new scale. In the case of our example, the squares on this second grid should have sides of ¼in. (one foot in 1/48th scale).

Having drawn the grids, the next step is to work out the percentage enlargement the 1/48th grid has over the 1/72nd one. This figure is most important, as it is the key to the transfer of measurements from one grid to the other. A calculator is invaluable for this operation.

At this point, actual measurement may begin. Taking the dividers, measure any lines contained in the top left hand square on the 1/72nd grid. It is essential to be systematic about the order in which the squares are used. Work along the top line from one end to the other and then the next line and so on, until the job is complete.

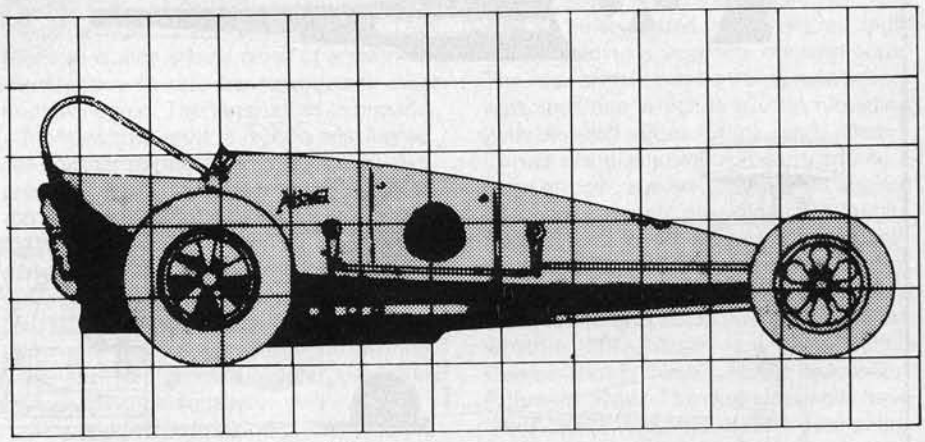
Let us suppose that in our first square, we have a line running diagonally from the centre of the right hand vertical to 3mm up from the base of the square on the left hand vertical. To transfer these to the new grid, each of these measurements must be processed using the equation:— Original length + Englargement % of that length = New length.

This means that the enlargement percentage of every measurement taken must be calculated and added to the original length to give the new measurement. An example would read as follows; our enlargement percentage between grids is 25%. A measurement of 8mm is taken from the first grid. Twenty five percent of 8mm is 2mm, so the transferred measurement is 10mm.

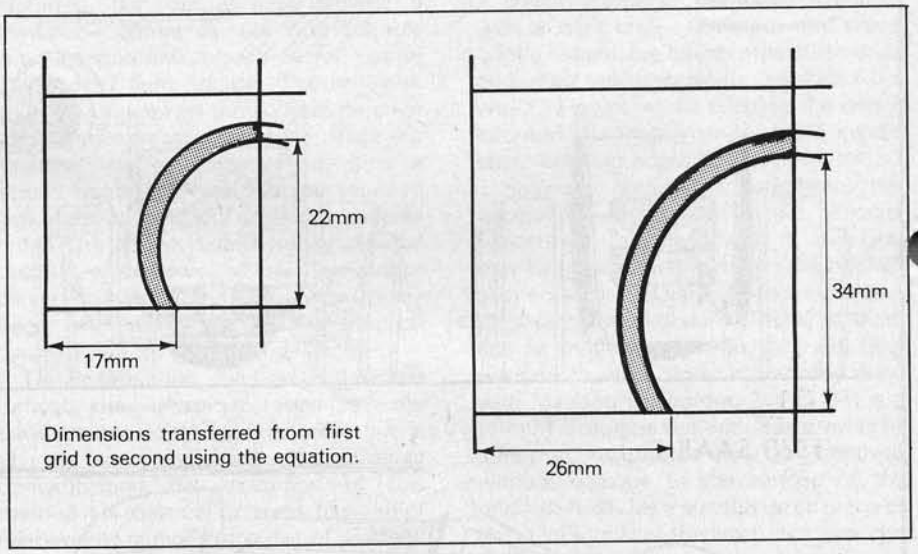
As each measurement is taken and processed, it should be plotted lightly (using a 2H pencil) on to the second grid square by square and the points joined. This joining should again be done lightly so that if it is incorrect it can be erased without destroying the grid. Curved lines should be plotted and then joined using the French Curves. Circles are drawn with the compasses.

When the whole is complete, compare it with the original and make any necessary adjustments. When completely satisfied that the enlargement is satisfactory, go over the whole drawing with the 2H pencil, strengthening it. As a final and perhaps obvious point, the Grid method works equally well for reductions.

As was said at the beginning, the Grid method is demanding on time and application, but it is enormously rewarding in that it provides vital experience in handling drawing instruments for the creation of original work quite apart from providing the modeller with reasonably accurate plans in the scale he requires. It is hoped to cover the drawing of original plans in a future issue.

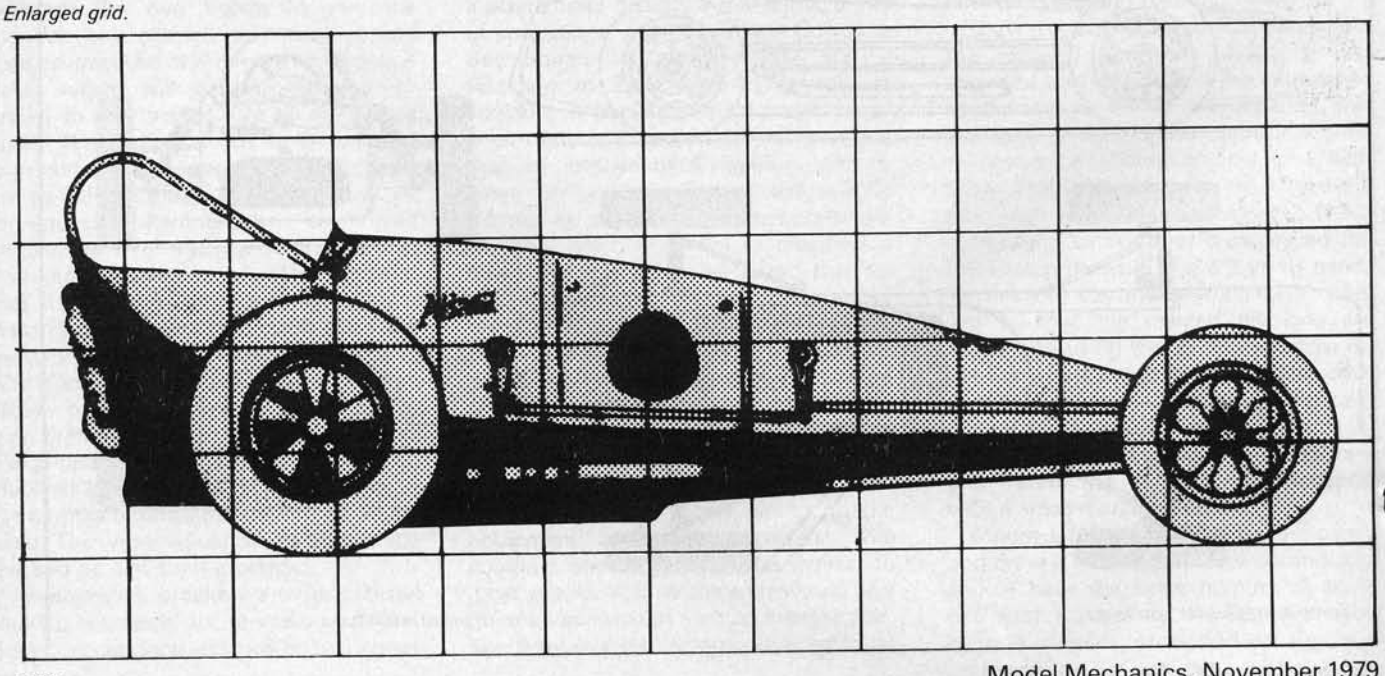


*Original drawing with first grid applied.*



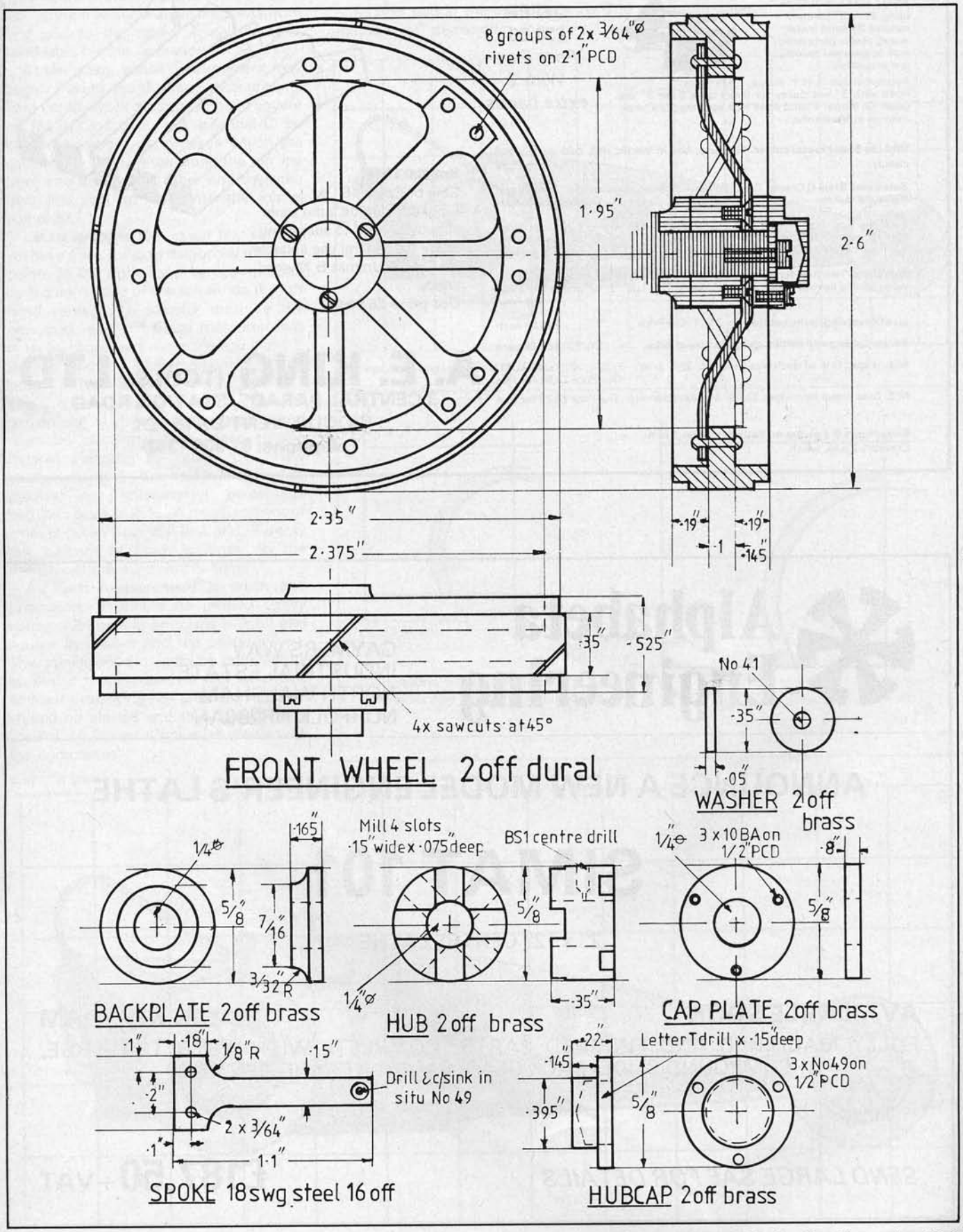

Dimensions transferred from first grid to second using the equation.

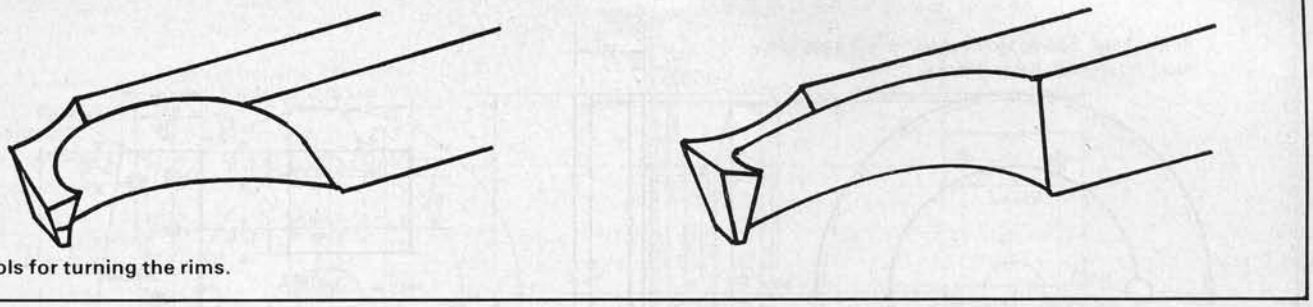
*Enlarged grid.*



# Sweet Sixteen

By Rex Tingey. Part 5 completes the series of articles on the construction of a Traction Engine to build on a small lathe.





Tools for turning the rims.

### Steering

The steering is by means of chain on a drum turned by a worm and pinion made as described in the gear cutting section. The chain should have links $\frac{5}{32}$ in. to $\frac{3}{16}$ in. long, and can be obtained from most handicraft shops. When the gears are cut make the pinion shaft and turn the chain drum, drilling the end for the pinion shaft. Turn and bore phosphor bronze for the drum bushes. Make the steering shaft, threading the end in the lathe. Make the bush and the shaft bearings, securing the worm-wheel with Loctite 641: if you have made the worm-wheel with a ¼ in. bore a brass insert will be required for the wheel to fit the shaft, again secured with Loctite 641.

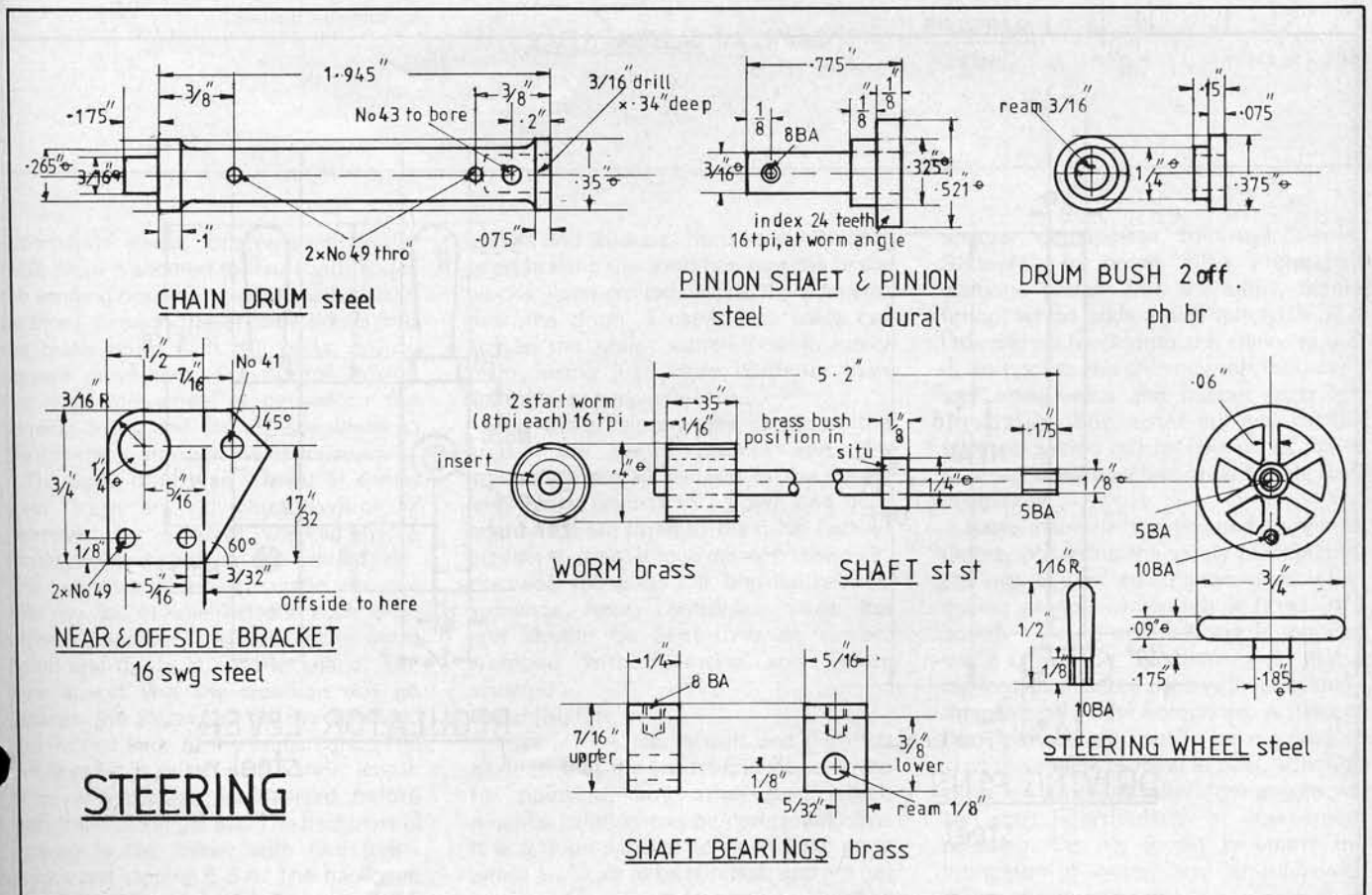
Make the near and off-side brackets, first as a pair, marking out and drilling the No. 41 hole on each before cutting out approximately to shape and securing the pair together with an 8 BA screw, nut and washer. File carefully to outline and clamp on the cross-slide to drill the larger hole ¼ in. dia. and the securing holes No. 49. Separate, clean off the burrs and scribe one bracket for the part to be cut off with a fine hacksaw blade. Loctite the bushes in and secure the lower shaft bearing, complete with the shaft and worm onto the nearside bracket, pinion shaft in place. Assemble the brackets, chain-drum and upper shaft bearing, adjusting the lower shaft bearing if necessary. Mark the top position of the upper shaft bearing for the brass bush to be Loctited on after loosening the lower bearing, and pulling the shaft up a little, so that the adhesive does not lock the bearing. Turn the steering wheel blank and the handle, and index around the wheel to drill and file to shape the spokes. Fit the handle to the wheel and the wheel to the shaft. Secure the chain with S hooks, to the drum and the axle, as shown in the photographs. The chain winding onto the top of the drum should be above the chain winding underneath.

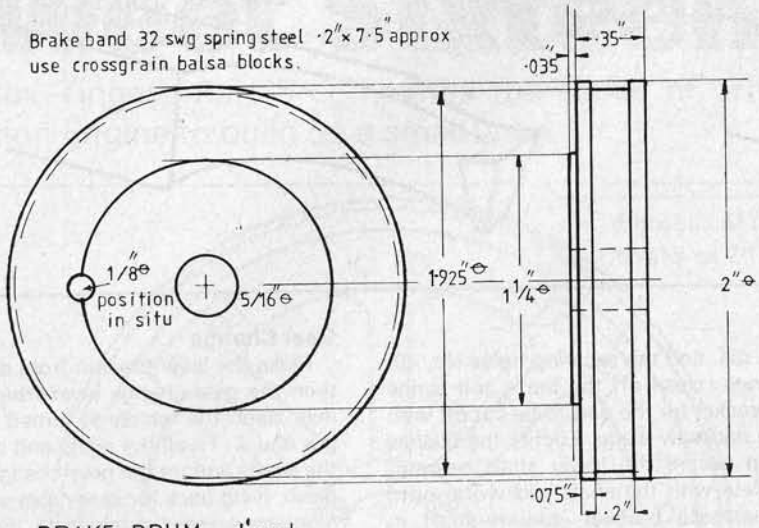
### Gear Change

Make the lever bracket from dural, and then the gear-change lever from $\frac{3}{16}$ in. in mild steel: the handle is turned in the 4-jaw chuck. Fit all the gears and collars on the shafts and try the gear-change lever in place, filing back for lower clearance. The regulator lever is screwed to the side of the lever bracket, using a tight spring washer. There is no location fitted to the gear change as it seems quite positive without, but there is room to fit a $\frac{1}{8}$ in. spring-loaded ball into the gear lever, if required, to give a low, high and neutral gear lever position on the bracket.

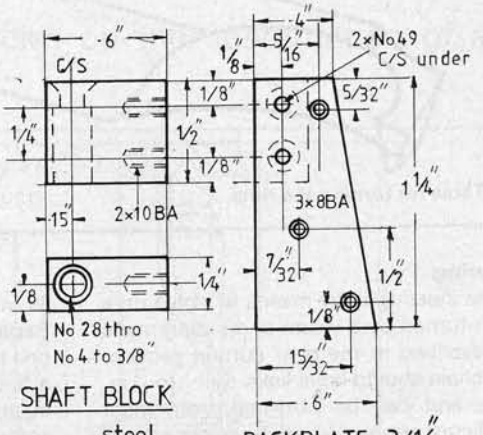
### Completing the Engine

The brake and cable drums are turned from 2 $\frac{1}{8}$ in. dia. dural in the three-jaw chuck, jaws reversed, first finishing a face, reversing and finishing to width, drilling through ¼ in., bringing up the live centre to turn the outer diameter grooves, and raised face, before drilling through $\frac{5}{16}$ in. Note that the driving gears drive the



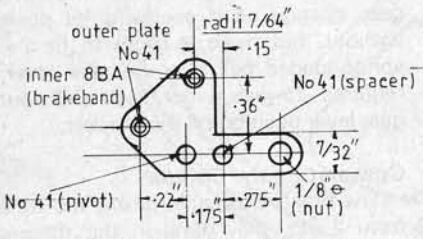



BRAKE DRUM dural

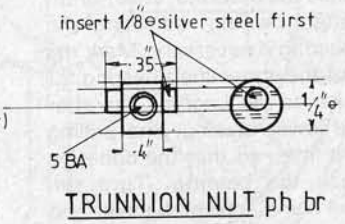



SHAFT BLOCK steel

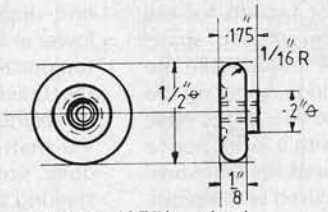
BACKPLATE 3/16" steel



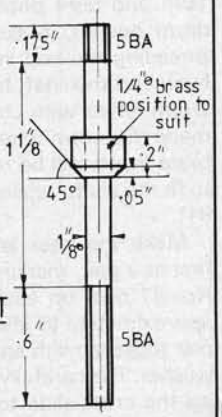

LEVER PLATE 2off 18swg steel



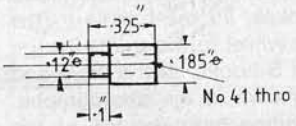

TRUNNION NUT ph br



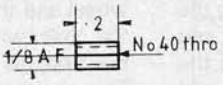

HANDWHEEL steel




SHAFT st st

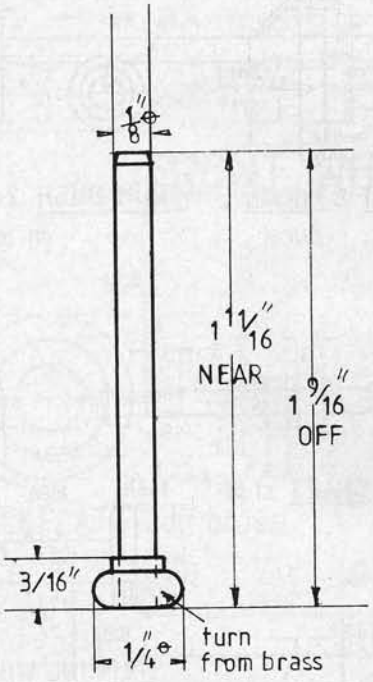



PIVOT SPACER steel

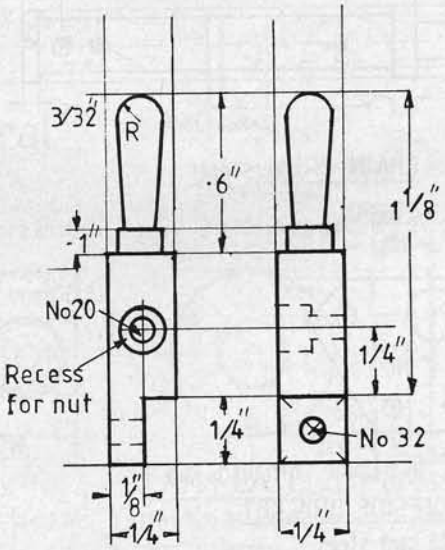



LEVER SPACER brass

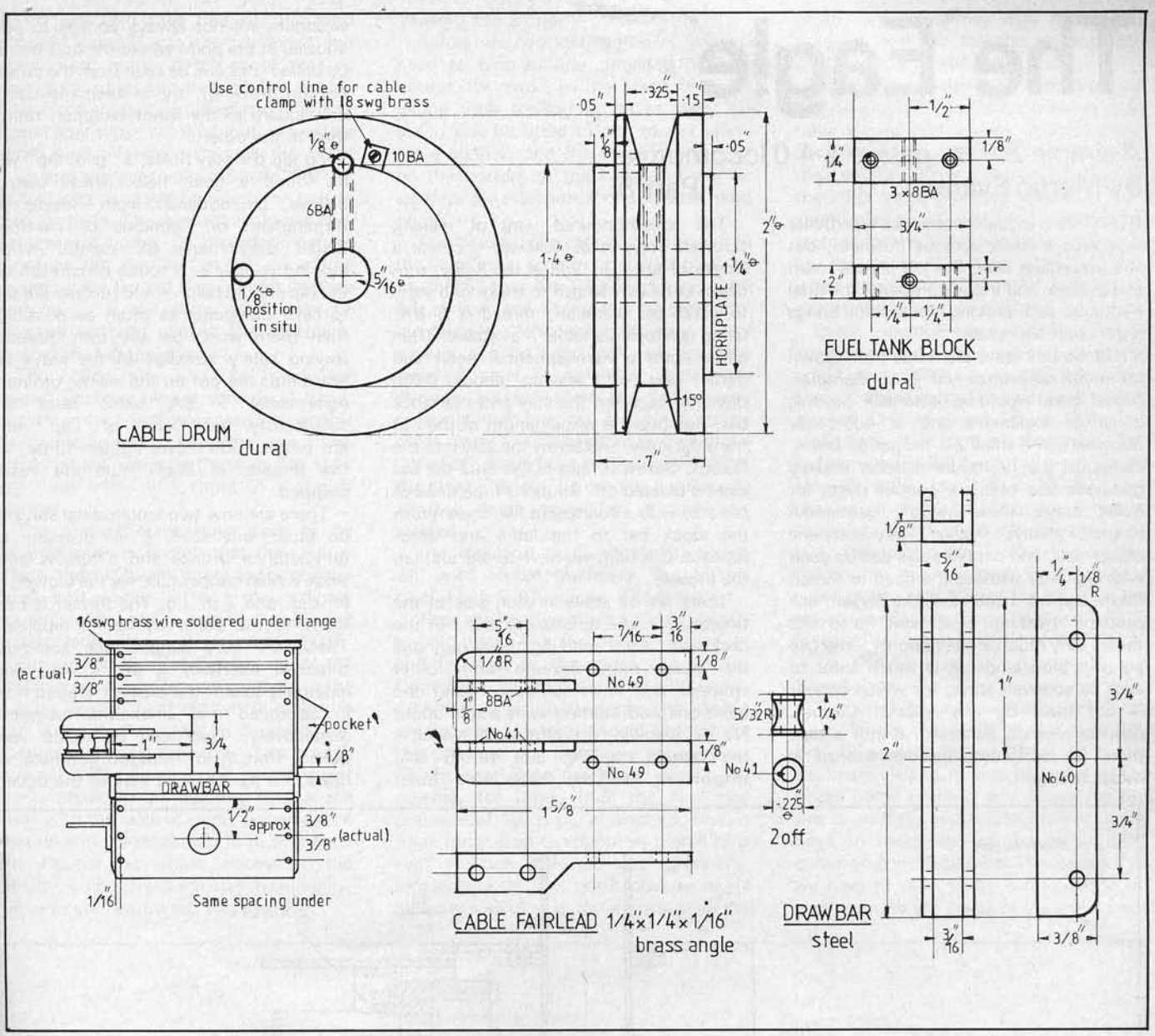
# BRAKE




DRIVING PINS steel




REGULATOR LEVER steel




main shaft direct, otherwise only the cable drum is secured to that shaft, so for the winding operations a short pin should be fitted through the off-side wheel into the brake drum with the brake on, to prevent movement. For normal driving the near-side wheel is pinned to the winding drum, and the off-side wheel to the drive gear, through the brake drum.

The brake drum has a band of spring steel (from an old clock) which is tightened by a lever worked by a handwheel and shaft on the tender side. The two lever plates are made oversize with one No. 41 hole drilled in each to be secured together and the other holes drilled and the lever filed to shape. The lever spacer and the trunnion nut go between the plates, as do the annealed and rivetted ends of the brake band. The trunnion nut is drilled and a short length of silver steel axis is inserted before drilling and tapping 5 BA. The backplate is secured to the tender with two 8 BA screws and tapping 5 BA. The backplate is secured to the tender with two 8 BA screws and washers, from inside. To give good braking the band has wooden brake blocks glued around, inside the diameter over the drum. I used $\frac{3}{16}$ in. balsa cut across the grain, adhered with epoxy resin, using just more hardener than adhesive, to keep it flexible.

The cable fairlead, the drawbar, the steps, the water pocket and the drawstraps are all secured to the tender with epoxy resin (1 to 1 now), and false hex. heads are fitted to the cable fairlead bracket to make it look correct. However, the cable rollers do roll, and the cable is authentic, being control-line cable: the end should be bent over an eyelet, whipped with fusewire and lightly soldered.

**Finishing Off**

Take off the rear wheels and the third shaft so that the tender can be removed for painting; any other part which requires painting can be completed now. It is a good scheme to paint steel parts which are likely to be handled, and are not lubricated, to prevent rusting. I etched special nameplates for my "Sweet Sixteen", in brass, also etching a diamond pattern into the steps, before fitting, which adds a nice touch. Wipe a little diluted black onto the chain, to dull it, and polish the chimney top, hub-caps and other brass and copper parts left unpainted. The outer surface of the flywheel should not be painted as this is normally used as a belt drive for ancillary equipment.

Raise steam in the finished engine as before, observing the safety precautions. Do not expect to change gear while driving as no syncromesh is fitted. If a speedy heat-up of the boiler is required use a blower on the chimney so that a higher flame can be used without burning the paint off of the hornplates. A twist of the flywheel will usually be required to start the engine running in gear, although there are positions where the engine will self-start, particularly at top steam pressure. Do not forget to empty the lubricator of water, and to refill with steam oil between runs.

# The 'Eagle'

## A simple 2½ in. gauge 4-4-0 locomotive

By Martin Evans

Part 8

STAYING a model locomotive type boiler is always a rather tedious business, but like everything else, the job comes to an end in time, and if done properly, the final hydraulic test proving successful brings the builder his reward.

The firebox stays are made from drawn gunmetal or bronze rod $\frac{3}{16}$ in. diameter. Monel metal would be better still, but this is rather expensive and is not really necessary in a small 2½ in. gauge boiler. Although the professional boiler makers generally use ordinary copper rivets for boiler stays, these worthy gentlemen nearly always have oxy-acetylene equipment, and copper stays can be dealt with this way without the need to thread them. But for those who, like myself, use propane heating equipment (also for those, very much in the minority, who use paraffin blowlamps) it is much safer to stick to screwed stays, for which copper is not ideal by any means. Copper, especially when annealed, is not a nice metal to screwcut; besides bronze is much stronger!

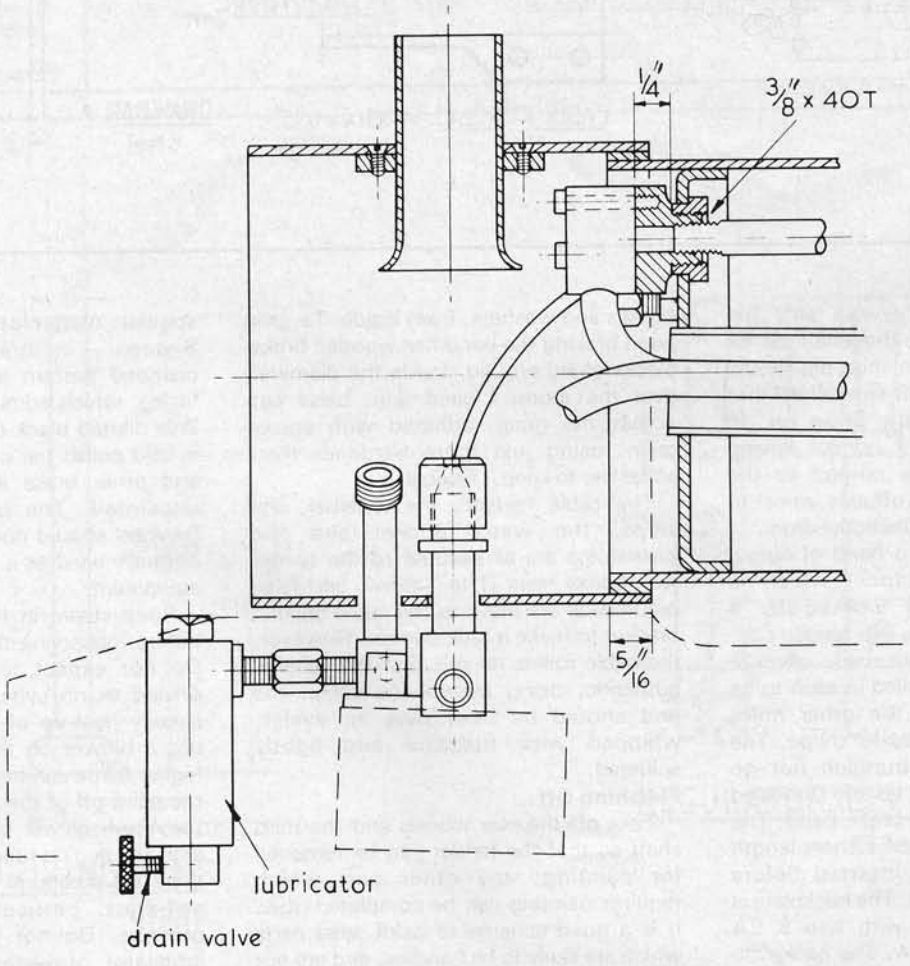
The time-honoured way of making screwed stays is as follows:— chuck a length of the $\frac{3}{16}$ in. rod in the 3-jaw, turn down sufficient length to make one stay, to 0.126 in. diameter, thread it 5 BA, using tailstock dieholder if available. Then partly form a hemi-spherical head and partly part off, leaving about 0.050 diameter between the stay and the stock bar. Remove the whole length of the rod from the lathe, and screw the stay into the firebox. Screw it right home until the bar can be twisted off. Round off the head of the stay with a coarse-cut file, then return the stock bar to the lathe and ditto-repeato. But first, we have to drill and tap the firebox.

There are 19 stays in each side of the firebox, 2 in the throatplate and 1 in the backhead. After marking these out, drill the holes right through both outer wrapper and inner wrapper, using the hand-drill and starting with a drill about No. 42, following up with No. 39, which is the correct tapping size for 5 BA. **Important,** as the inner and outer wrappers are not always parallel to one another at the point where the hole has to be drilled (this can be seen from the cross-section drawing), try to keep the hand-drill square to the **inner** wrapper, rather than to the outer.

To tap the stay holes, a "pilot tap" will be found a great help. These can, I believe, be obtained from Reeves of Birmingham or Kennions of Hertford (usual disclaimer). Be careful when tapping copper — a touch of paraffin on the tap should help — and reverse the tap to clear chippings as often as possible, then there won't be any torn threads. Having safely screwed all the stays in, brass nuts are put on the inside; ordinary commercial 5 BA brass nuts are satisfactory, but "blind" or "cap" nuts are better. Don't over-tighten these, as the threads of brass nuts are easily stripped.

There are now two longitudinal stays to be fitted, one solid, $\frac{5}{32}$ in. diameter of gunmetal or bronze and a hollow one, thick-walled copper tube for the blower, $\frac{3}{16}$ in. o.d. and $\frac{1}{16}$ in. i.d. The former is best fitted to the boiler by "blind nipples". These are very simple little turnings, threaded internally $\frac{5}{32}$ in. × 40t, and externally to suit the bush or tapped hole in backhead and smokebox tubeplate respectively. They can be made very quickly from $\frac{5}{16}$ in. hexagon gunmetal or brass. To fix the solid stay in the boiler,

*Smokebox details*



screw one end into one of the blind nipples, insert it into the backhead and screw right home at the same time as easing the other end through the tapped hole in the smokebox tubeplate. This may sound a bit tricky but if a bit of wire with a short loop is lowered through the dome bush and slipped round the stay, this will enable it to be guided through the hole in the tubeplate. The second nipple can now be screwed home, its threads engaging those on the stay and at the same time engaging the tapped hole in the tubeplate and being of the same pitch, can be screwed up hard against the tubeplate, locking the whole job solid.

The hollow stay can't be fitted "for keeps" until the blower valve is to hand, but it can be fitted temporarily to enable the hydraulic test to be carried out if two blind nipples, same as those on the solid stay, are made and fitted in a similar manner.

The firebox stays now have to be sweated over to ensure that they are all steam tight. Obtain some high-melting-point soft solder — not the ordinary tinman's or plumber's solder — and some soft-soldering flux such as Baker's Fluid.

Put a good dose of the flux inside the firebox with the boiler upside down in the brazing hearth, heat the whole boiler up until it melts the solder to be used, hot enough to make it run easily. Touch each stay nut inside with a (small, cheap) paint brush dipped in the flux and then touch same with the stick of solder, when a nice neat fillet of solder should form over each nut. Repeat the whole process on the outside, going over each stay individually. Allow to cool and wash thoroughly.

**Testing the Boiler**

Before we can test the boiler, we will have to plug all the threaded bushes, except for two — the large pressure gauge (one reading up to at least 250 p.s.i.) can be fitted to one of the safety valve bushes, and the check valve bush on the bottom of the backhand can be used for the attachment of a suitable hand pump.

The dome bush cannot be plugged in the usual way, so turn up a steel blank to fit, drilling four No. 34 holes in this for 6 BA screws and fitting this to the bush. Incidentally, although ordinary steel screws can be used just for the test, stainless steel or gunmetal screws are strongly advised when the dome cover proper is fitted later on. This blank can be made water and steam tight by inserting a "washer" made from Hallite or Walkerite; the blank can later be used as a drilling jig for the dome cover, so it won't be wasted.

The regulator bush on the backhead will need similar treatment, but in this case, fit six 8 BA screws (see drawing).

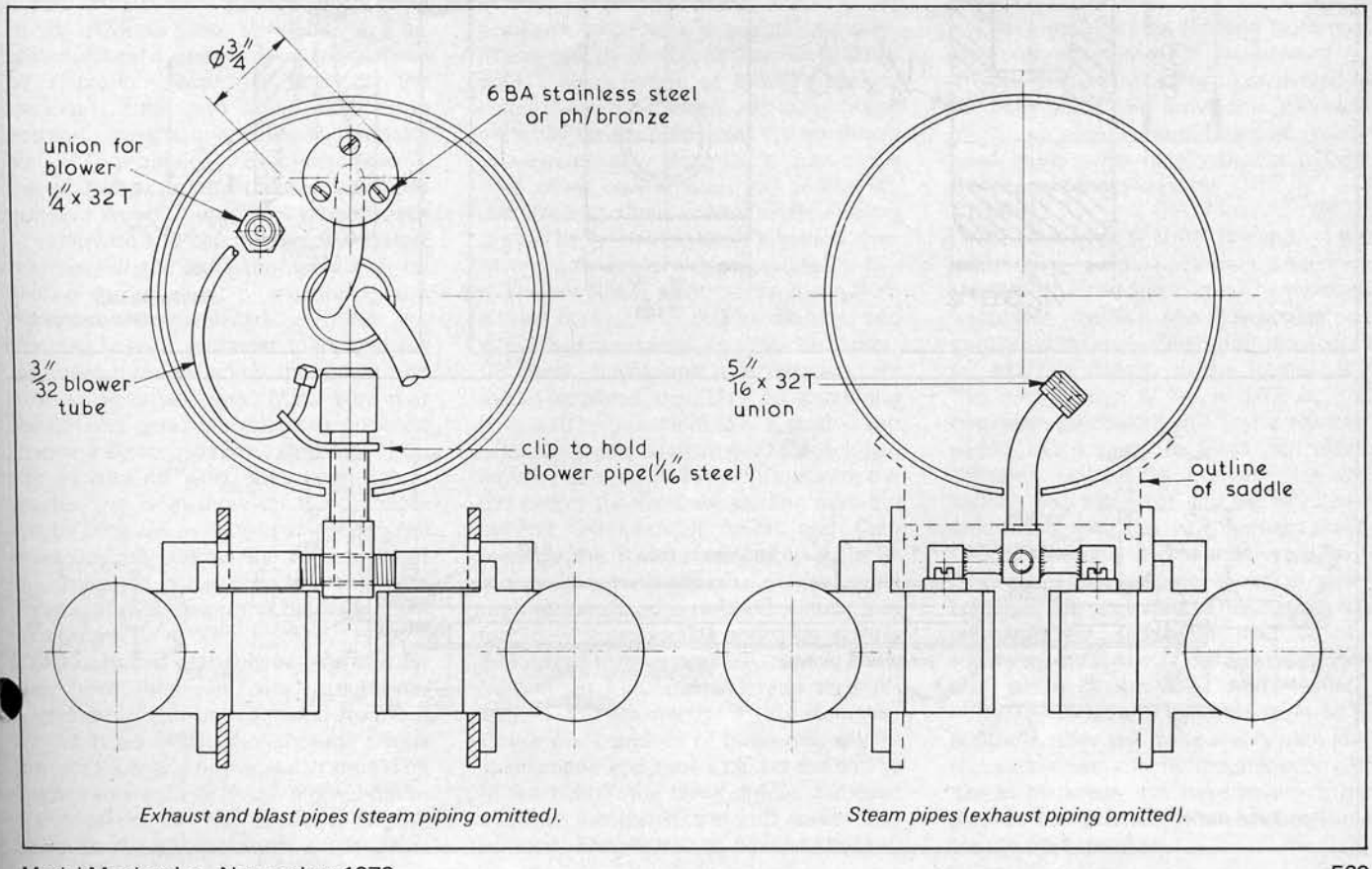
Place the hand pump in anything handy to hold water — a shallow tray does fine, and fit it up to the check valve bush. Completely fill the boiler with cold water, excluding all air, then apply a few strokes on the pump, which should soon shoot the pressure up. Bring the pressure up slowly, examining the boiler, inside and outside, for leaks, until the final test pressure of 160 p.s.i. is reached. Hold it there for at least ten minutes, then if all is well, release the pressure gradually. Incidentally, it is a good plan to apply plumber's jointing to the threads of all the plugs, otherwise they may leak under pressure and the leakage be confused with a leak from the boiler itself.

At this point, perhaps I should remind beginners that all model engineering clubs now require that owners of locomotives should produce a boiler test certificate for their engine before it can be steamed on the club track. For this reason, it is a sound plan to ask one's club secretary to arrange for the boiler test to be carried out by the society's official boiler testers, when there should be no difficulty in obtaining the vital certificate.

Even experienced boiler makers sometimes find a small leak or two on final boiler test. With a simple boiler like Eagle's, there should be no trouble. Often a small pinhole shows up, or there is a slight leak from one of the stays. The former can usually be cured by drilling a No. 55 hole, tapping it 10 BA, and screwing in a tiny bit of copper, threaded to match. Leaky stays can be dealt with by cleaning the offending spot thoroughly, then heating to the melting point of the solder used for caulking the stays, and applying Baker's fluid, followed by a touch of the solder.

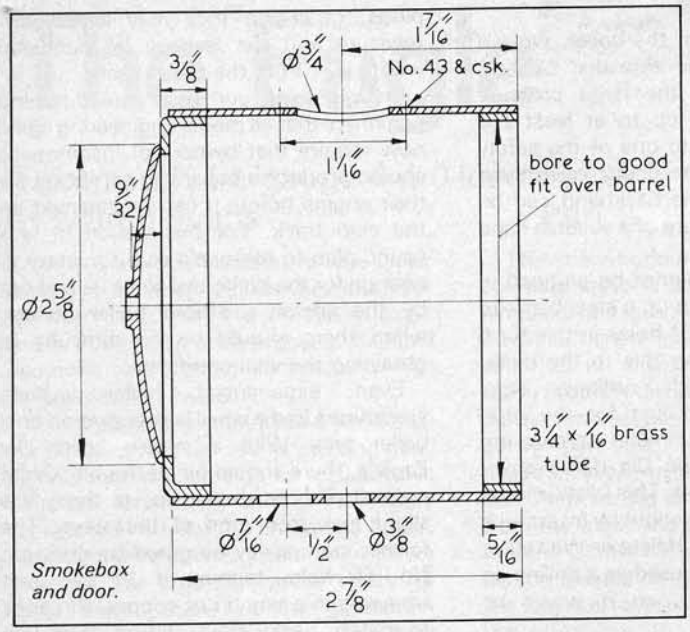
**Smokebox**

The smokebox can be made next. It is a $2\frac{7}{8}$ in. length of brass tube, $3\frac{1}{4}$ in. o.d. If the tube can be obtained in $\frac{1}{8}$ in. thickness, it will fit over the end of the boiler barrel without any alteration; but this is unlikely, and builders will probably have to make use of the much more common $\frac{1}{16}$ in. thick tube. This means that we have to silver-solder a ring, say $\frac{5}{16}$ in. wide, around the inside of the smokebox,

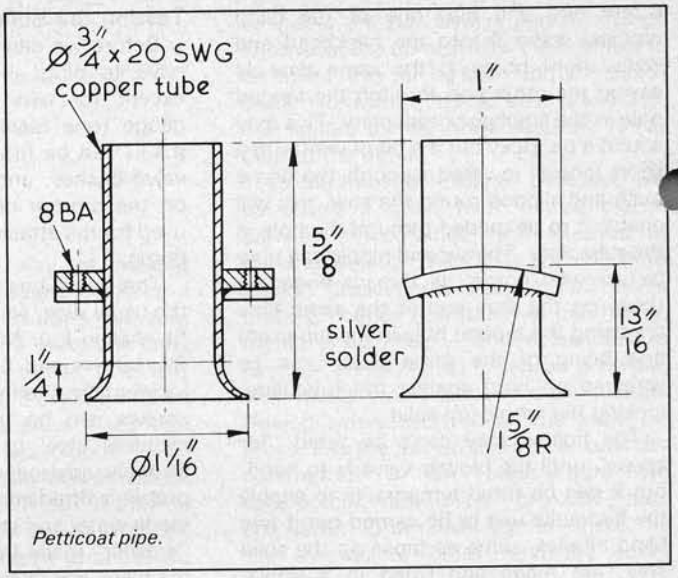



*Exhaust and blast pipes (steam piping omitted).*

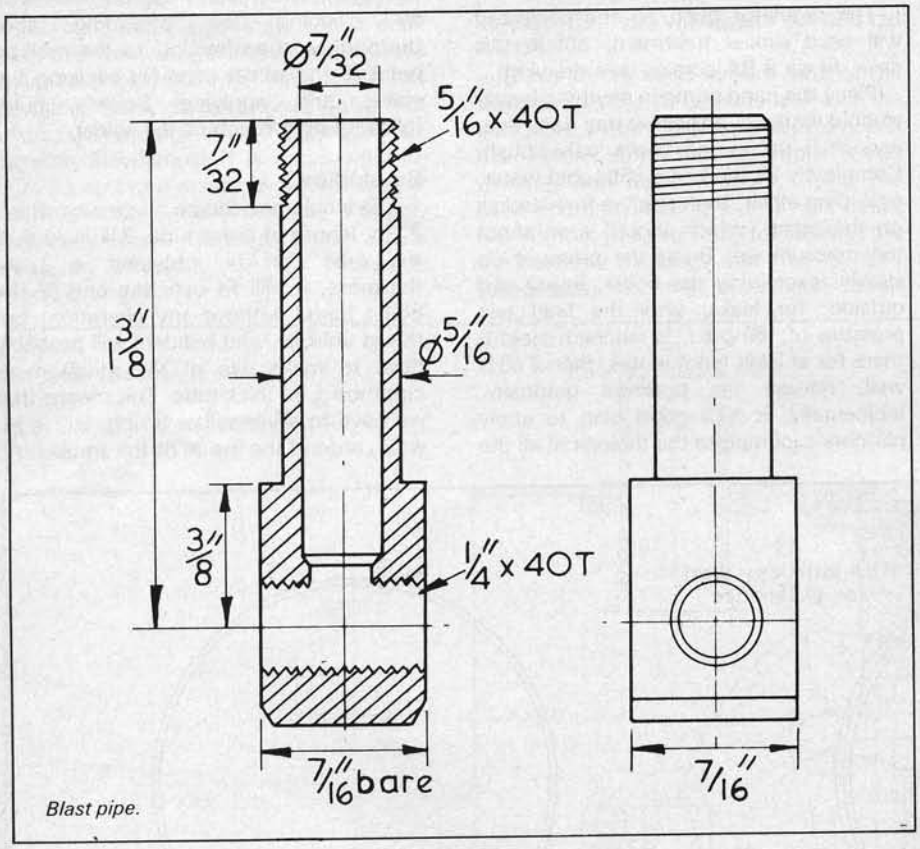
*Steam pipes (exhaust piping omitted).*



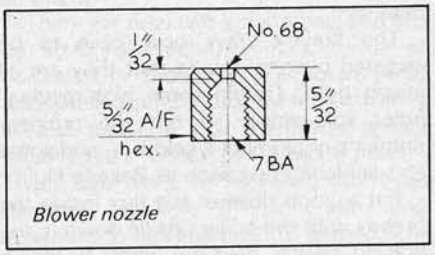

Smokebox and door.



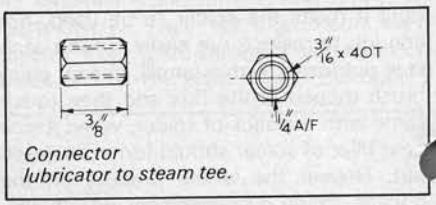

Petticoat pipe.



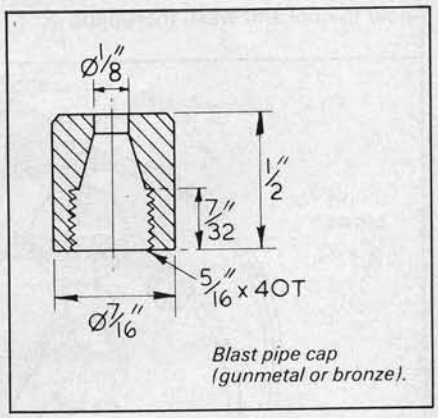

Blast pipe.



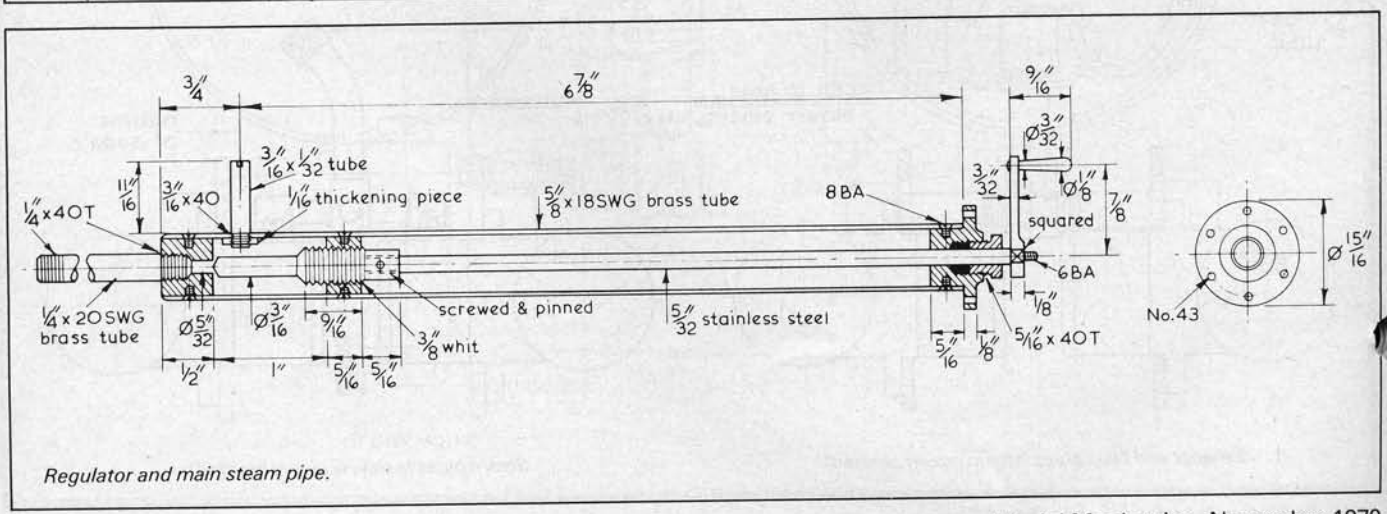

Blower nozzle



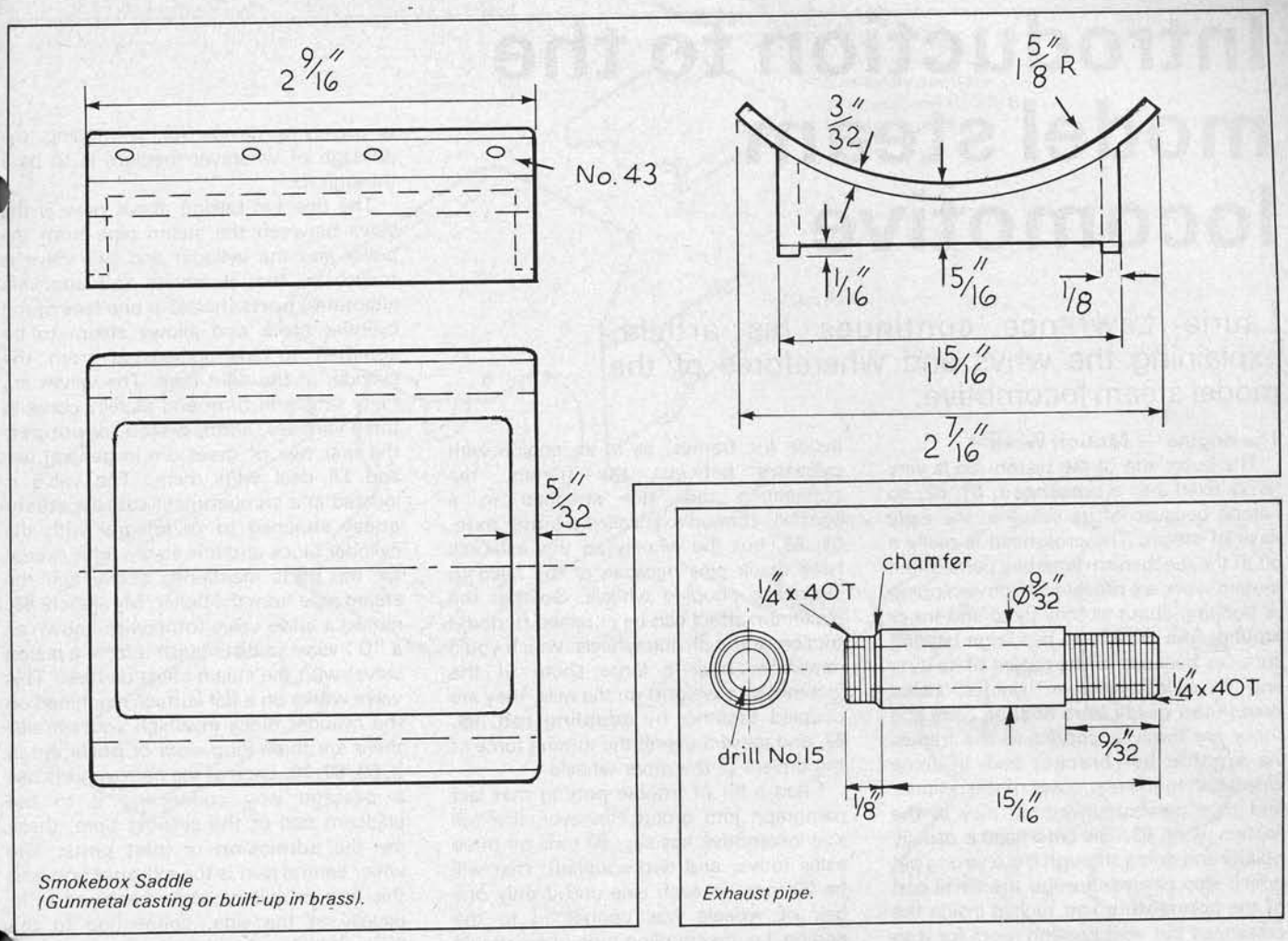

Connector lubricator to steam tee.




Blast pipe cap (gunmetal or bronze).




Regulator and main steam pipe.




*Smokebox Saddle*
*(Gunmetal casting or built-up in brass).*

*Exhaust pipe.*

and machine this down until the smokebox is a nice tight fit over the end of the barrel. One way of doing this, which is not as difficult as it sounds, is to get a length of brass strip, say $\frac{5}{16}$ in. × $\frac{1}{8}$ in. section. Bend it into a ring such that it can be "sprung" into the end of the smokebox tube and silver-solder it in position. Then bore it in the lathe until a perfect fit is obtained. Be careful here — the smokebox tube must be supported inside, a wood "bung" will be sufficient — otherwise the chuck jaws will distort the tube, or the lathe tool will catch up and rip the tube out of the chuck with disastrous results! Mark out for the chimney liner or petticoat tube, and for the holes through which the steam and exhaust pipes will pass. Make sure that the exhaust pipe hole is exactly opposite that for the petticoat pipe. Drill about $\frac{1}{8}$ in. dia. to start off with, then open out in stages. The ¾ in. hole for the petticoat can be achieved by drilling a row of small holes inside a scribed line, breaking out the unwanted piece, and finishing with half-round files, using the petticoat itself as a gauge.

A casting will probably be available for the front ring of the smokebox; alternately, it can be machined from a 3 in. dia. brass blank, though such things are very expensive nowadays. It should be made a very tight fit in the smokebox, in which case it will not need any further fixing. On the inside of the front ring, two little clips or brackets will be required, to support the crossbar. These are bent up from $\frac{1}{16}$ in. mild steel and are riveted on as shown. On the outside of the ring, we need two hinge-lugs, to support the door. These can be turned up from mild steel, with a short length of 8 BA thread to screw them into the ring, and cross-drilled vertically for the hinge pin. If they should prove at all slack, silver-solder them to the ring, using only a tiny bead of Easyflo, and keeping them vertical while heating the job by inserting a short length of $\frac{1}{16}$ in. silver-steel wire through the holes.

The smokebox door can be made from a brass blank 2¾ in. or 3 in. diameter and $\frac{3}{32}$ in. thick (commercial size). To "dish" the blank, first anneal it as described for the boiler plates, then lay it on something fairly soft — a block of lead is ideal — but even hardwood such as oak or beech can be used at a pinch. Hit the blank with the ball end of the hammer, starting from the outside, working all round and then towards the middle, annealing again as soon as the metal starts to go hard, until the desired shape is reached. Chuck it in the 3-jaw, concave side outwards, setting it to run as truly as possible, centre, drill a hole about $\frac{1}{8}$ in. diameter and face off around this to about ¾ in. diameter. Chuck a short piece of brass rod, say ½ in. diameter and turn a pip on the end to fit the hole in the blank tightly. Squeeze this into the blank, and soft solder it in position. The whole can now be chucked for finishing the door to size, making sure that the contact edge is true so that the door will seat air-tight on the front ring of the smokebox.

The hinges can be filed up from mild steel (or nickel-silver if available) $\frac{1}{8}$ in. square, that part which is to be riveted to the door being filed down to a thickness of $\frac{1}{32}$ in. or slightly more. Use $\frac{3}{64}$ in. round-head brass rivets here, obtainable from Reeves or Kennions I think.

**Saddle**

The full-size G.N.R. (Ireland) 4-4-0 locomotives did not have separate smokebox saddles, the smokebox wrappers being splayed out and continued downwards so that they could be attached directly to the frames. But this construction is rather difficult, and beginners particularly will find a separate saddle much easier to make and erect. Castings should be available for the saddle, but this item can be fabricated quite easily from $\frac{1}{16}$ in. or $\frac{3}{32}$ in. brass sheet, the corners being angled and riveted (with $\frac{1}{16}$ in. countersunk copper rivets) or silver-soldered, as preferred. The curved top plate of the saddle is held to the smokebox by a row of 8 BA screws each side. If these are the "small-headed" hexagon type, now available from M.E. suppliers, they will make a very neat job. But before we can fit the smokebox or saddle for keeps, we have several other parts to make which I shall have to leave for the next instalment.

# Introduction to the model steam locomotive

Laurie Lawrence continues his article, explaining the whys and wherefores of the model steam locomotive.

**The engine — Motion Work**

The outer end of the piston rod is very firmly fixed into a **crosshead, 61, 62,** so named because of its shape in the early days of steam. The crosshead is really a bit of the mechanism whereby parts of the motion work are prevented from whipping or flopping about as they fly to and fro or around. The crosshead has large bearing surfaces because of the nature of its duty and it slides between guides called **crosshead guide bars** or **slide bars** and these are firmly anchored to the frames via a **guide bar bracket** and, in some cases also to the rear cover of the cylinder and thus prevent unwanted play in the motion work, **63.** The crosshead is usually hollow and going through it is a strong pin which also passes through the small end of the **connecting rod** tucked inside the crosshead but with enough room for it to swing a little. The connecting rod is only a rod which connects crosshead and wheel and is the means whereby the push of the piston is transmitted to the wheel. The rod has two ends, of course, at the crosshead end it is called the **little end** and at the wheel end it is the **big end;** only a difference in size! Because each end has to fit over a pin, there are holes bored in them and each hole is fitted with a bush, a sort of liner, made of hard or long wearing metal.

**The Engine — Cranks**

The big end is a sliding fit over a very strong pin called a **crank pin** which is firmly secured in the wheel some distance away from its centre. This distance is half the full stroke of the piston. Incidentally, cylinders are measured by the bore, i.e. inside diameter, and stroke and to the knowledgable this gives some indication of the power potential of the locomotive. The wheel, with its crank pin, is a sort of lever arrangement. I had better put in a little explanation here about wheels. The large wheels which are driven by the engine are classified as **Drivers** because they are directly driven by the connecting rods. If they are connected to the drivers by rods, they are called **Coupled** wheels. We'll sort this out in a minute. The axle of the drivers is the **driving axle** and this is the only distinction between it and other axles where all the motion work is outside the frames. Where the motion work is inside the frames, as in an engine with cylinders between the frames, the connecting rods are attached to a specially formed axle called a **crank axle, 64, 65,** but the wheels on this axle still have crank pins because of the need to couple to coupled wheels. So that the maximum effect can be obtained from the friction of the driving wheels (which you'll remember bear a large share of the locomotive's weight) on the rails, they are coupled together by **coupling rod, 66, 67,** and these transmit the turning force of the drivers to the other wheels.

I had a bit of trouble putting that last paragraph into order! However, if a full size locomotive has say, 60 tons on three axles (driver and two coupled), that will be 20 tons on each axle and if only one pair of wheels was connected to the engine, i.e. no coupling rods, there would only be 20 tons of weight for adhesion on the rails to drive the locomotive along. This is the reason for the coupling rods, to get the maximum power available to be delivered at the wheel rims; this "coupled" weight is called the **adhesive weight.** Sometimes it is not always enough, I might add, as many drivers of small locomotives find out when they are heavy handed with the regulator.

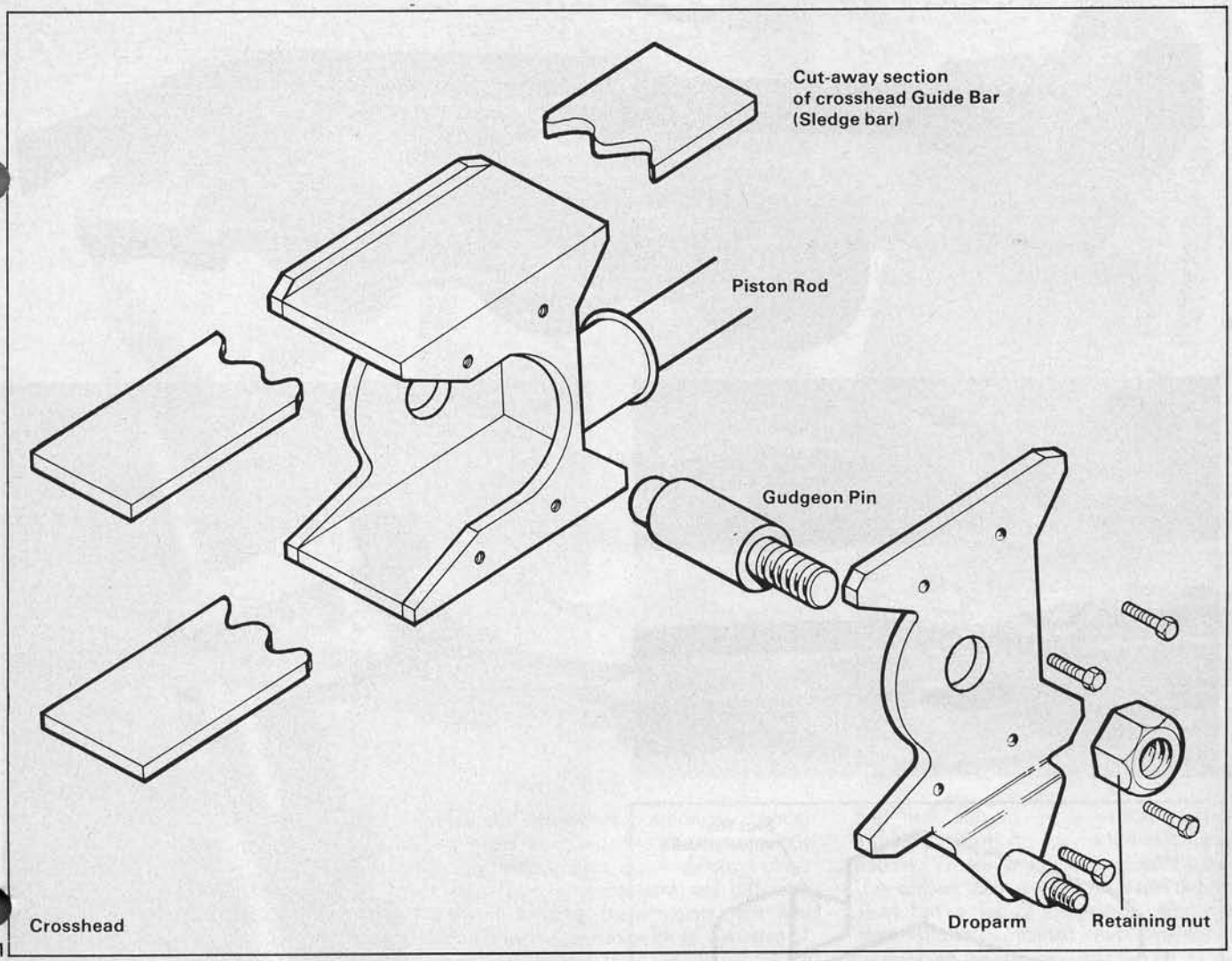
**The Engine — Slide and Piston Valves**

And that brings me to another bitter bit — the means of controlling the admission of steam to the cylinders. You will readily appreciate that if steam is admitted to one end of a cylinder the piston will be driven back along the cylinder by the steam pressing on it; if the supply of steam was not cut off, the piston would stay at one end of the cylinder which is no help! So what is needed is some means of cutting off the supply of steam at the right time and in the right place, after it has done its work on one stroke. You'll remember I told you the engine is double acting, so what has to happen is that steam must escape from the cylinder after having pushed the piston one way, so that steam can be admitted to the other end of the cylinder and push the piston back. The mechanism that does all this is called a **valve** and **valve gear.** (We keep meeting **valves** and these come in all sorts of sizes and shapes for different purposes. A valve is merely a device for controlling the passage of whatever medium is to pass through it).

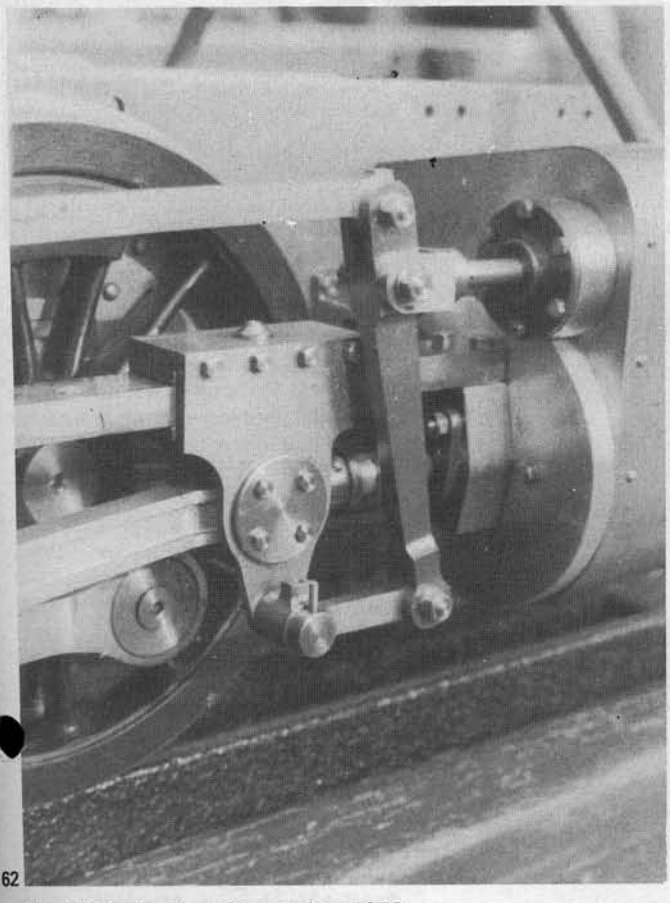
The one I'm talking about now is the valve between the steam pipe from the boiler and the cylinder and this valve is moved so that it covers and uncovers alternately **ports** (holes) in one face of the cylinder block and allows steam to be admitted to and exhausted from the cylinder at the right time. The valves are fairly simple in form and usually come in three varieties, **slide, piston,** or **poppet;** the first two of these are in general use and I'll deal with them. The valve is located in a compartment called a **steam chest** attached to or integral with the cylinder block and it is steam tight except for the ports mentioned above and the steam pipe from the boiler. My sketch, **68,** shows a **slide** valve (otherwise known as a "D" valve to distinguish it from a piston valve) with the steam chest omitted. This valve works on a flat surface machined on the cylinder block in which you can see there are three long slots or **ports** cut in it, **59, 69, 70.** Each of the narrow ports has a passage way connecting it to the adjacent end of the cylinder bore; these are the **admission** or **inlet** ports. The wider central port is the **exhaust** port and this has an exit passage machined in it, usually at the side, connecting to the pipes which take the used or exhaust steam out to the chimney.

A **piston valve 71, 72,** has the same function as a slide valve but it is shaped like a long piston or bobbin with a head at each end of a diameter about half the bore of the cylinder or a little larger and it slides back and forth in a cylindrical steam chest integral with the cylinder block, **60.** It is a close sliding fit in the steam chest otherwise it would leak steam past it badly. Instead of three ports as in a slide valve, each end of the piston valve steam chest has two ports, one narrow for admission and one wide for exhaust. For both types of valves, only one passage is machined at each end to connect inlet and cylinder. What happens is this; the "D" valve has a recess cast or machined in its body, **68,** the flat machined surround of the face of the valve is in contact with the machined face, called the **port face,** of the cylinder block. The valve is moved so that it uncovers a narrow inlet port which allows steam to enter the adjacent end of the cylinder and the piston is pushed back. At a pre-determined percentage of the stroke of the piston the movement of the "D" valve is reversed and it goes back across the port until it is closed and keeps it closed and no further steam is admitted to the cylinder.

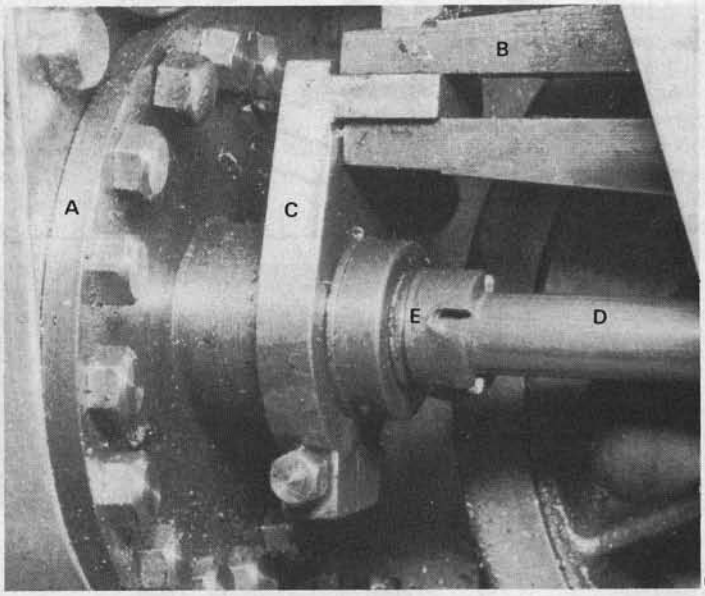
Now the steam has heat and pressure and it will continue to work against the piston even when the supply is cut off from the cylinder. This is known as expansion and things are so arranged that




61



62




63

**61** *Crosshead.*

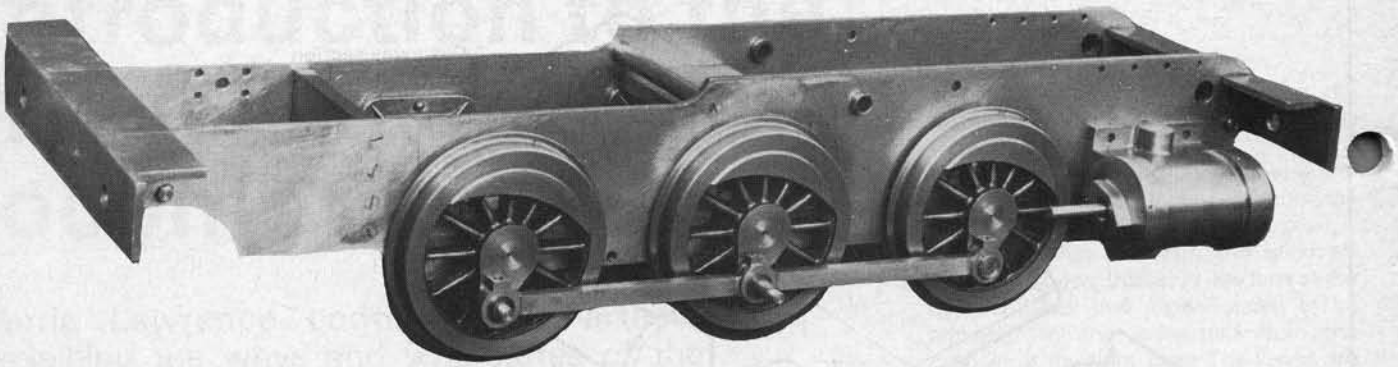
**62** *Another type of crosshead using one guide bar only.*

**63** *Crosshead guide bars fixed to cylinder cover.*

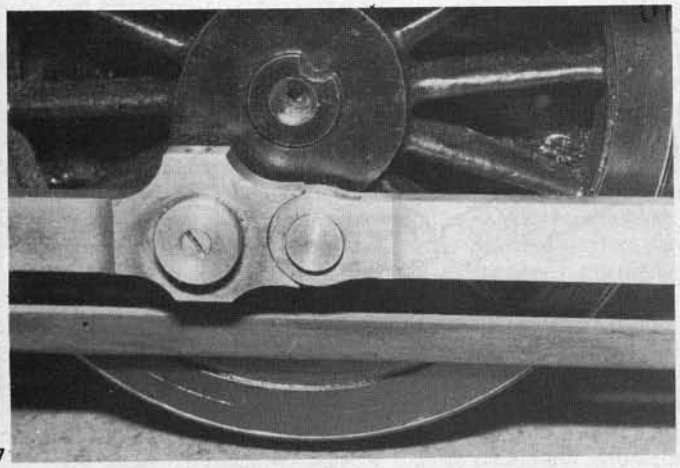
**A** *Cylinder rear cover.* **D** *Piston rod.*

**B** *Crosshead guide bars.* **E** *Gland.*

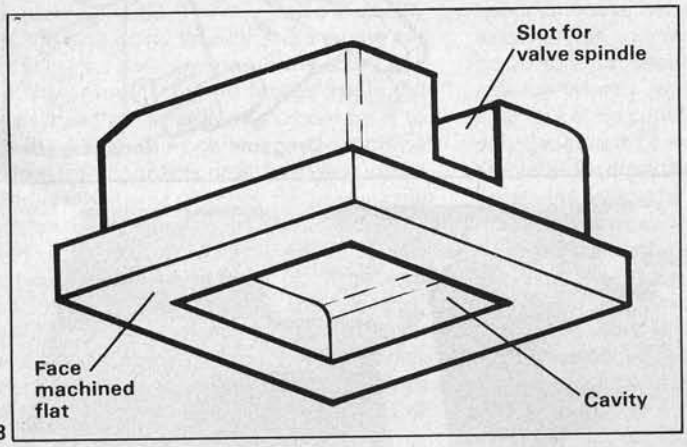
**C** *Guide bar bracket.*



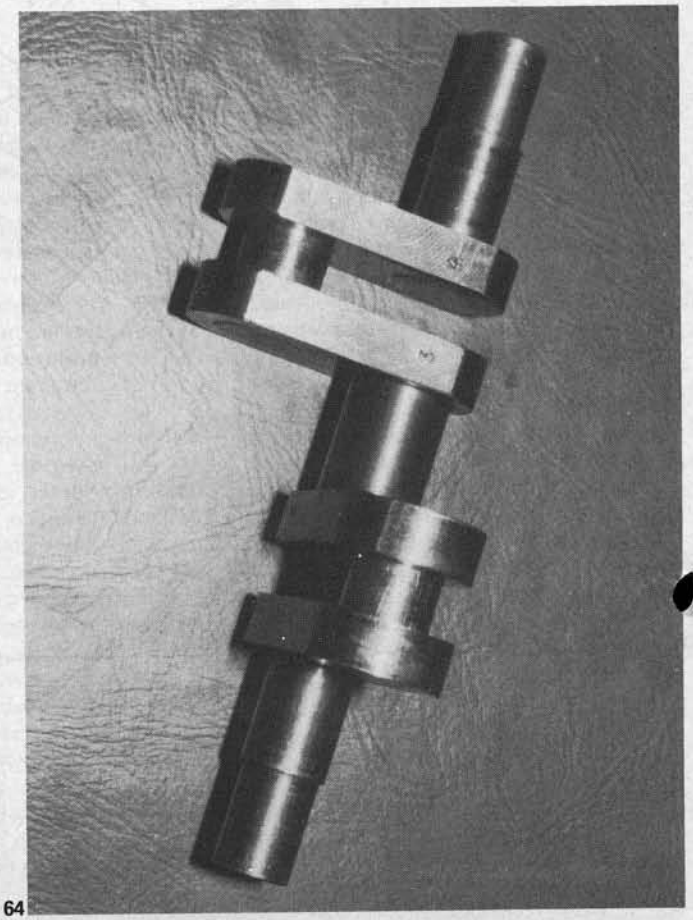
66



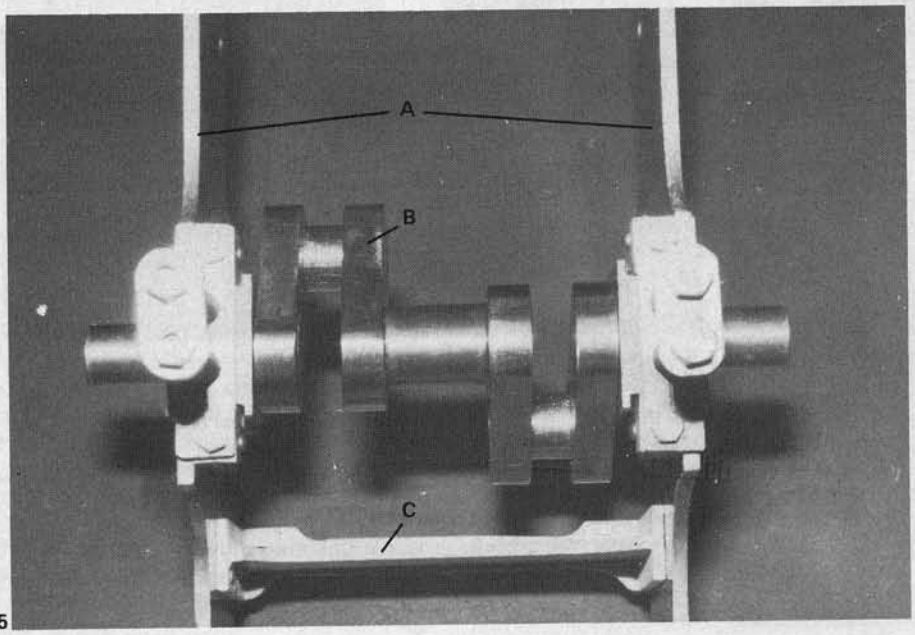
67




68



64




65

**64** *Crank axle for inside cylinder loco.*

**65** *Crank axle mounted in frames.*

**A** *Engine frames.*

**B** *Crank axle.*

**C** *Frame stretcher or stay.*

**66** *Coupling rods mounted on crank pins on the wheels.*

**67** *Knuckle joint in coupling rods allows flexibility of movement.*

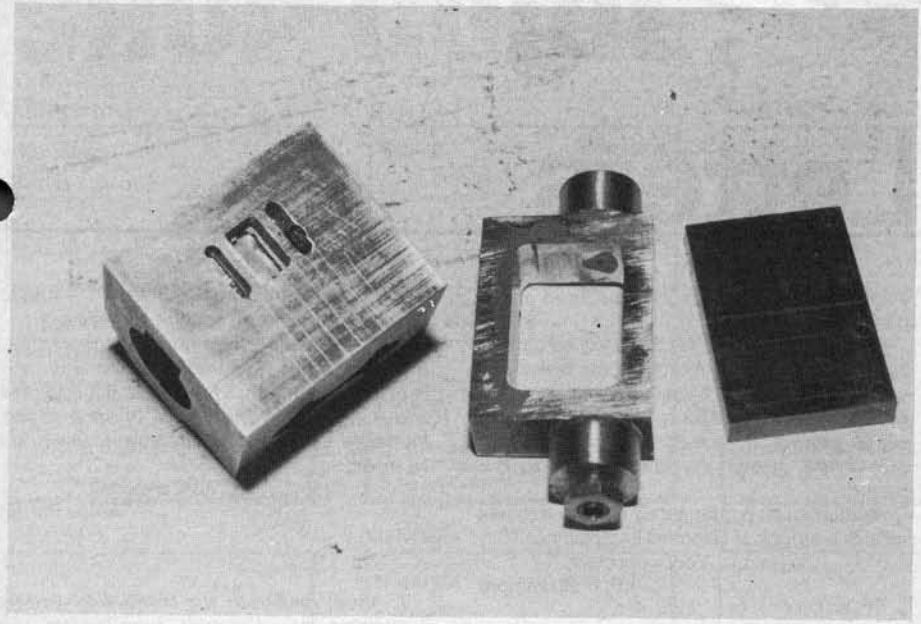
**68** *Slide ("D") valve. Underside view.*

**69** *Parts for a slide valve cylinder.*

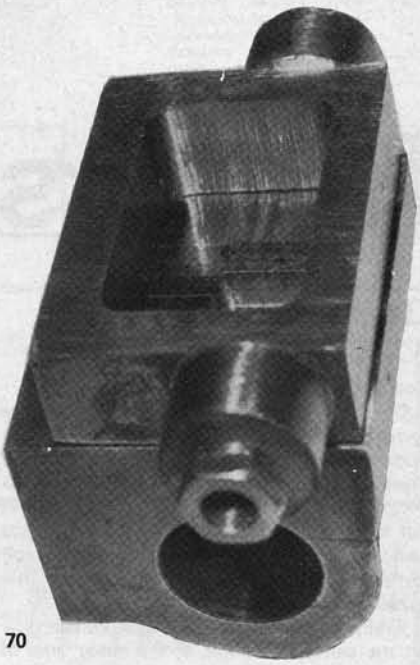
**A** *Cylinder block with ports cut in.*

**B** *Steam chest.*

**C** *Steam chest cover.*



69



70

72

**70** *The steam chest fits on top of the cylinder block.*

**71** *Piston valve.*

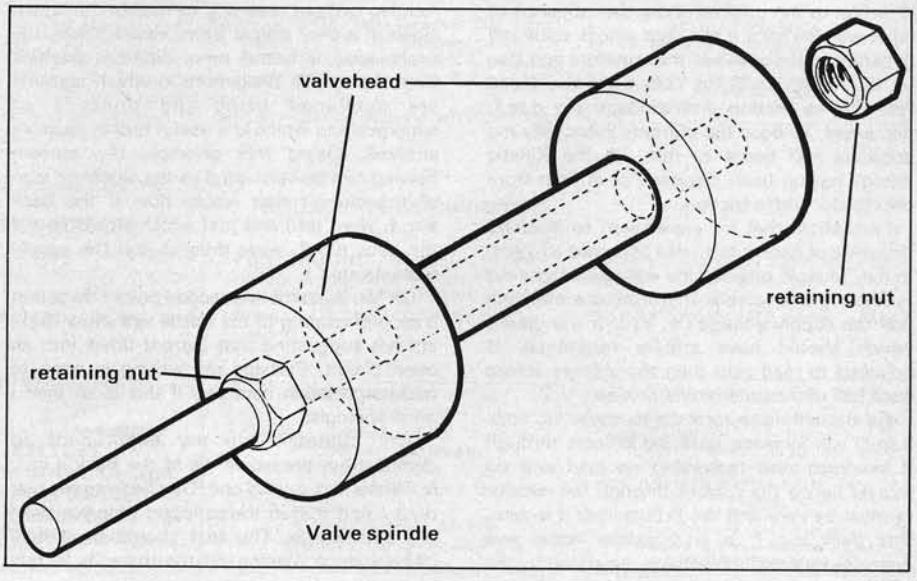
**72** *Piston valve with spindle and clevis fitted.*

the percentage of cut off (of the stroke) can be anywhere from about 80% downwards. We'll come to that when valve gear is explained. The slide valve, which is now travelling the opposite way and has cut off the steam, continues to travel across the port until the port is open again with the piston near the end of its stroke at the far end of the cylinder. Steam can expand still further but it has an exit path now available and it rushes out through the passage in the cylinder block, the same one by which it entered, and thence through the narrow port, then under the hollow centre of the "D" valve and out through the wide exhaust port. While all this is happening, the valve uncovers the other narrow port, allows steam into the back end of the cylinder so driving the piston forward and, again at some pre-determined percentage of the stroke, the valve cuts off the supply of steam and so on as before, repeating the cycle over and over again, several hundred times a minute if need be.

The piston valve performs in the same way. I will have to come back to slide and piston valves when we reach the mechanism which drives them because there is a variation in the way they admit steam. A slide valve has the pressure of steam on its relatively large back and therefore has a fairly high resistance to being moved and for this reason is alleged to have a high rate of wear. A piston valve has no such pressure acting on it and is therefore much easier to move, but it is alleged to be more difficult to keep steam tight in the piston valve steam chest and more difficult to make to the close limits required. However, amongst model engineers, each type has its adherents but in my view, given good workmanship, neither type presents any real difficulty because keeping them steam tight and wear down to a minimum is a matter of good lubrication.

### The Engine — Valve Gear

Now for the matter of moving the valve at the right time and in the right place. As I mentioned earlier, the mechanism which does this is called **valve gear.** There are upwards of 80 known (some barely known and some thankfully forgotten) designs of valve gear, but I shall only deal with two popular designs here. A great deal has been written about valve gears and the subject is a veritable Tom Tiddler's ground for argument and debate. Wherever model engineers meet the subject can always be expected to spark off a lot of discussion. For the mathematically inclined there are some recent handbooks available which allow the really keen enthusiast to get the best possible arrangement for his locomotive, but the average enthusiast usually sticks to the published design to which he is building and this course is recommended for beginners and less experienced model engineers. I will try to keep my description of valve gear as simple as possible and, if it catches the eye of some knowledgable reader, I hope he won't shudder too much!




71

# Readers Letters

## Question

Dear Sir,

Catching up on some reading I recently came across the article in your June issue by Roger Barrett headed Electronics in which he gives his version of the operation of a permanent magnet motor. I am afraid I could not let it go unchallenged because he makes two quite erroneous statements, which unfortunately make nonsense of his explanation.

Firstly, he states that two currents can flow on the same conductor at the same time in opposite directions. This is impossible. The back e.m.f. generated by the motion of the conductor in the magnetic field opposes the applied e.m.f. and the difference causes the current to flow through the circuit resistance. As the speed of the armature increases from zero to a maximum so the back e.m.f. increases from zero to, assuming no load, a fraction less than the applied e.m.f., the effective e.m.f. falls to nearly zero and so does the current. The power supplied falls from a maximum to just sufficient to overcome friction and windage. The energy supplied by the power source during the acceleration period is absorbed by the armature as Kinetic Energy.

When a load is applied the speed of the armature falls, the back e.m.f. is reduced, the effective e.m.f. increases so the current increases until the power source supplies sufficient for the load, as well as friction and windage.

The second erroneous statement was that when the power source was removed, with the armature continuing to rotate under its own inertia, "power will be fed back into the supply". The fact is that if the power source is disconnected the system becomes an open circuit in which no current can possibly flow. But, if a resistor is substituted for the power source a current will flow in the opposite direction to the original under the influence of what was the back e.m.f. and whose value still depends on the speed of the armature and also on the resistance in the circuit. As the speed falls due to friction and windage the e.m.f. decreases, as does the current. Eventually the armature will come to rest, all the Kinetic Energy having been disposed of in heat from the resistor and in friction.

I am afraid that his experiment to illustrate the value of back e.m.f. also becomes suspect. In the "at rest" position the voltages across the resistor $r_a$ and across the armature are both half the supply voltage i.e. V/2. If the meter, which should have infinite resistance, is adjusted to read zero then the voltage across each half of the potentiometer is also V/2.

As the armature runs up to speed its back e.m.f. will increase until the current through it becomes zero (assuming no load and no losses) hence the current through the resistor $r_a$ must be zero and the P.D. across it is zero. The back e.m.f. e is therefore equal and opposite to V and the voltage registered by the voltmeter will be V/2 just half the value of the back e.m.f.

If losses are allowed for there will be a small current drawn by the motor via the resistor $r_a$ which will then have a small P.D. If a variable resistor is substituted for $r_a$ a small measure of speed control is possible. This control is greater the greater the load applied to the motor.

All this can be confirmed by reference to any reliable textbook of Electrical Engineerings.

Yours sincerely,
E. F. Blakemore

## Answer

Thank you for forwarding Mr. Blackmore's letter concerning my article in your magazine.

I can sympathise with Mr. Blackmore's objections to my explanation of the operation of the permanent magnet motor, but I feel nevertheless that he is rather too critical. In an article of this kind, which is aimed at readers unfamiliar with for example the concepts of electro-magnetic induction and Kirchoff's rules, it is inevitable that accuracy must to some extent be sacrificed for the sake of clarity and impact. I think that the degree of sacrifice in this case has been too great for Mr. Blakemore.

My explanation is, admittedly, not the conventional one but was intended to be rather more graphic. Nevertheless I believe that the concepts are sound as long as they are not misconstrued.

For example, I have not stated that "two currents can flow in the same conductor at the same time in opposite directions". In fact I have been at pains to point out the slightly paradoxical situation.

What I have attempted to do is to show why the current is reduced when the motor is running without resorting to network analysis, albeit in a very simple form. (Incidentally, my explanation is based on a different analysis from that of Mr Blakemore in which currents are combined using the principle of superposition which is a useful tool in network analysis. Using this principle the current flowing can be calculated as the algebraic sum of the current that would flow if the back e.m.f. were zero and that which would flow if the back e.m.f. were present and the supply were shorted.)

On Mr. Blakemore's second point I think that a second reading of my article will show that I am not suggesting that current flows into an open circuit. Perhaps my writing is open to misinterpretation here and if this is so then I must apologise.

The comment on my experiment to demonstrate the existence of the back e.m.f. is, I am afraid, a valid one. On checking my first draft I find that in transcription I have missed out two words. The text should have read "The voltage reading on the meter is in fact *proportional to* the back e.m.f. . . .". I must thank Mr. Blakemore for pointing this out.

May I, finally, through you, thank Mr. Blakemore for his erudite comments and express the hope that he will continue to read and enjoy Model Mechanics in spite of the inevitable errors and compromises which will be made.

Yours sincerely,
Roger Barrett

*I have received the following letters containing various queries, from readers who would appreciate any information which may be of help. We will forward any replies.*

Mr. G. Sewell of Kent would like some information about hand shapes. He has a Polygon 202 with swivelling head and ram, and would be interested to know the manufacturer and whether the firm is still existing. The cross traverse casting has a semi-circular cross section with the ways machined on the top. On each side of the centre spigot there is a tapped hole in the bottom of the trough in the castings, obviously to hold some fitment—but which fitment?

Mr. Brian Hope of Gloucestershire has been offered a 5 in. "Invicta" lathe—pre-war for £100 on its stand. He would like any information on these lathes. The one he has been offered has three speeds and a ¾ h.p. motor single phase.

Master Alex Staton (ages 12 years) of Staffordshire would like to know if any readers have ideas on how to make an efficient vapourising lamo for his chemistry set that does not use too much meths. He is after something like a Bunsen Burner that uses meths vapour instead of North Sea gas. He has access to a workshop and would appreciate any help.

Mr. Gerry Pakes of St. Albans was wondering whether we could publish any articles on how to complete plastic models as regards painting and airbrushing. We are in the process of completing an article on this which should be a great help to all plastic kit enthusiasts. However, any tips from readers would come in handy.

Mr. Benjamin Rolt of Chorleywood would like any information from readers on where to obtain details and plans on the construction of a working Zeppelin Airship.

Mr. D. Sullivan of Lancashire is in the process of converting an "Action Man" Toy Tank and wishes to construct a gear box to drive the rear axle, but does not know what size gears to use and can go no further with his construction until he has this information. Fortunately, Mr. Bill Burkinshaw, Editor of R.C.M.&E. is in the process of completing an article on this very subject and should be published very shortly.

# SHOP GUIDE

★ Mail Order Welcome

**READERS PLEASE NOTE: Due to soaring postal charges many retailers are unable to answer postal enquiries unless accompanied by a stamped addressed envelope.**

### BERKSHIRE

**READING** Tel: 51558

READING MODELS
5 Chatham Street

Mon-Sat:
9.00 a.m. - 5.30 p.m.

### CUMBRIA

**PENRITH** Tel: 65378

MODELMAKER
11 Poet's Walk
CA11 7HJ

Mon-Sat: 9.00 a.m.-5.30 p.m.
Wed: Half Day
Fri: 9.00 a.m.-6.00 p.m.

### DEVON

**TORBAY** Tel: 521767

MANSEL'S MODELS
Palace Avenue
Paignton

Mon-Sat incl:
9.15 a.m.-5.30 p.m.
Wed: Half Day
Friday: 9.15 a.m.-7.00 p.m.

### HAMPSHIRE

**FAREHAM** Tel: 234136

G M H BUNCE & CO. LTD
206 West Street

Open 9.00 a.m.-5.30 p.m.
Closed Wed.

**FARNBOROUGH** Tel: 44600

DONS MODELS
24A Queens Road,
North Camp

Open: Mon-Sat:
9.00 a.m.-6.00 p.m.
Closed all day Tuesday

### HERTFORDSHIRE

**WATFORD** Tel: 46966

RAILMAIL OF WATFORD
65-67 Vicarage Road

Mon-Sat:
9.00 a.m.-5.30 p.m.

### KENT

**BROMLEY** Tel: 01-460 0818

AVICRAFT LIMITED
15 Chatterton Road

Open: 10.00 a.m.-6.00 p.m.
(Not closed for lunch)
Wed: 10.00 a.m.-1.00 p.m.

### LINCOLNSHIRE

**LINCOLN** Tel: 25907

THE MODEL CENTRE
24 Newland, LN1 1XG

Open: Mon-Sat:
9.00 a.m.-6.00 p.m.
Early closing Wed:
9.00 a.m.-1.00 p.m.

### LONDON EAST

**PLAISTOW** Tel: 01-472 2471

A G HERMITE
633 Barking Road, E13

Mon-Sat: 9.00 a.m.-6.00 p.m.
Closed all day Thurs.

**WANSTEAD** Tel: 01-530 4405/4660

AKRON TOOL SUPPLY CO
69 Nightingale Lane
E11 2EY

Mon.-Fri: 9.00 a.m.-5.30 p.m.
Sat: 9.30 a.m.-12.30 p.m.

### LONDON NORTH

**LONDON** Tel: 01-607 4272

HENRY J NICHOLLS
& SON LTD
308 Holloway Road, N7

Open Mon-Sat:
9.00 a.m.-5.30 p.m.

### NORTHUMBERLAND

**NEWCASTLE UPON TYNE** Tel: 22016

THE MODEL SHOP
18 Blenheim Street

Mon-Fri: 9.00 a.m.-5.30 p.m.
Saturday: 9.00 a.m.-6.00 p.m.

### NOTTINGHAMSHIRE

**NOTTINGHAM** Tel: 50273

GEE DEE MODELS LTD
19-21 Heathcote Street
Off Goosegate

Mon-Sat: 9.30 a.m.-5.30 a.m.
Thurs: early closing

**NOTTINGHAM** Tel: 060 744 3094

MILLHOLME MODELS
The Old School
Woodborough

Open: Tues-Sat 10.00-1730
Sun 10.30-12.45

### OXFORDSHIRE

**OXFORD** Tel: 42407

HOWES MODEL SHOP
9-10 Broad Street

Open: 8.45 a.m.-5.30 p.m.
6 day week

### SCOTLAND

**GLASGOW** Tel: 041-221 3111

RAILMAIL OF SCOTLAND
165a St Vincent Street

Mon-Sat: 9.00 a.m.-5.30 p.m.

### SURREY

**ADDLESTONE** Tel: Weybridge 45440

ADDLESTONE MODELS LTD
63 Station Road

Mon-Sat: 9.00 a.m.-6.00 p.m.
Wed: Closed all day
Fri: 9.00 a.m.-6.30 p.m.

### SUSSEX

**EAST GRINDSTEAD** Tel: 21750

SOUTH EASTERN MODELS
5 The Parade,
London Road,
Felbridge

Open: Mon-Sat: 9.30 a.m.-5.30 p.m.
Closed Wednesdays

### WALES

**CARDIFF** Tel: 29065

BUD MORGAN
22 Castle Arcade
South Glamorgan
CF1 2BW

9.00 a.m.-5.30 p.m.
Wed: 9.00 a.m.-1.00 p.m.

**CARDIFF** Tel: 31367

RYALL & WALTERS RADIO MODELS
34 Llandaff Road

Open: 9.00 a.m.-12.30 p.m.;
1.30-5.30 p.m.
Monday till 8.00 p.m.; Closed Wed.

### YORKSHIRE

**KEIGHLEY** Tel: 65662

AIREDALE MODELS
5 Royal Arcade
Low Street

Mon, Wed, Fri: 10.00 a.m.-6.30 p.m.
Thurs: 10.00 a.m.-7.30 p.m.
Sat: 9.00 a.m.-6.00 p.m.
Tues: Closed all day

# classified advertisements

All classified Advertisements must be pre-paid.
Private and trade rate 12p per word (minimum £2.00). Box Numbers 50p extra. Display box rate £6.25 per column inch (maximum 2"). All advertisements are inserted in the first available issue. Box replies to be sent care of Advertising Department, P.O. Box 35, Bridge Street, Hemel Hempstead, Herts, England HP1 1EE. There are no reimbursements for cancellations.
The Advertising Manager reserves the right to refuse or suspend advertisements without giving any reason.

# mini make tracks for märklin

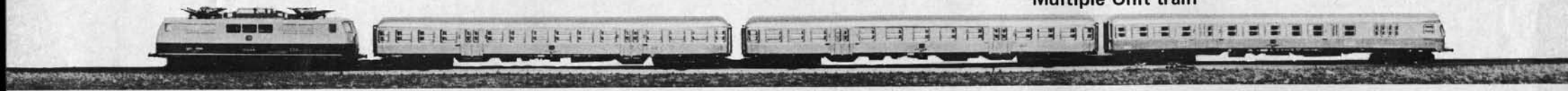
**Express train**

Express train set of the former German State Railways
(without track or transformer)
Length: 372 mm (1 ft $2\frac{5}{8}$")

märklin
a great leisure activity

Multiple Unit train set with automatic reversing red & white lights (without track or transformer)
Length: 499 mm (1 ft $5\frac{3}{4}$")

**Multiple Unit train**



Main MÄRKLIN Stockists

Anglia Scale Models, Colchester
Beatties Model Shops: London - High Holborn, Lewisham, Southgate; Birmingham, Manchester, Leeds, Liverpool, Sheffield, Nottingham, Bristol, Southampton
Blackwells, Hawkwell, Essex
Bobs Models Ltd., Birmingham
A. Booth, Bury, Lancs
Cowplain Models, Cowplain, Hants
E.C.O.S. Poole, Dorset
E.M.A. Model Supplies, Feltham, Middlesex
Fratton Bargain Shop, Portsmouth
Guilloud Sports, Slough, Bucks
Hadley Hobbies, London, E.1.
Hamleys Model Shops, London and Bristol (in Debenhams)
Harbour Models & Crafts, Folkestone, Kent
Hobbies & Models, Kenton, Harrow, Middlesex
Hobby Specialists of Shrewsbury
High Level Models, Middlesbrough
Kings Lynn Model Centre, Norfolk
Langdons Model Railways, Gloucester
Lawsons, Plymouth
R & M Lowe & Sons, Lytham, Lancs.
Mega Models, London, W.1.
Mackay Models, Paisley, Scotland
Model & Tool Supplies, Raynes Park, London S.W.20.
Model Shop, Canterbury
Model Shop, Harrow, Middx.
J. Morris, North Lancing, Sussex
Platform 3, Blackpool
Railtronics Ltd., Mevagissey, Cornwall.
R & D Models, Cambridge
L.A. Richards, Wimbledon, S.W.19
Scale Model Railways (Scotland) Ltd., Glasgow
Scoonie Hobbies, Kirkaldy & Dundee, Scotland
Taylor & McKenna (Hemel) Ltd., Hemel Hempstead, Aylesbury, Bletchley, Kettering, Northampton, Luton, Banbury
Thames Trains, Thames Ditton, Surrey
Totnes Model Railway Centre, Devon
Toys Galore, Watford, Herts
Trents Ltd., Swindon & Reading

**UK. Distributors: A.M. Richards, 6 Richmond Way, Fetcham, Leatherhead, Surrey KT 22 9NZ**