7-20 DECEMBER 1973 First and Third Friday Volume 139 Number 3478 20p
(USA & CANADA—$1)
MAP HOBBY MAGAZINE

Model Engineer

MODEL ENGINEER EXHIBITION 1974

Model Engineer

Founded 1898

Incorporating Mechanics and English Mechanics and Ships and Ship Models

Volume 139 Number 3478
December 7th, 1973

CONTENTS

Second-class postage rates paid at New York, U.S.A. Registered at the G.P.O. for transmission by Canadian Post. American enquiries regarding news stand sales and advertising should be sent to MODEL ENGINEER, Eastern News Distributors Inc., 155 West 15th Street, N.Y. 10011.

MODEL & ALLIED PUBLICATIONS LTD.

ABC
MEMBER OF THE AUDIT BUREAU OF CIRCULATIONS

Also published by MAP:– Aeromodeller; Model Boats; Radio Control Models & Electronics; Model Railways; Scale Models; Military Modelling; Woodworker.

COVER PICTURE

Foden steam wagons nos. 1742 and 848 of 1904 seen at the Warwickshire Steam Engine Society's Annual Rally at Earlswood, July 1971.

Colour photograph by Mike Wood.

NEXT ISSUE

A West Riding Jubilee.

Editorial Director	D. J. LAIDLAW-DICKSON
Managing Editor	V. E. SMEED
Editor	**MARTIN EVANS** M.I.G.T.E.
Technical Consultants	D. H. CHADDOCK C.B.E., M.Sc., C.Eng., F.I.Mech.E.
	CLAUDE B. REEVE
	G. W. WILDY C.Eng., M.I.Mech.E., F.I.G.T.E
Advertisement Manager	D. E. KELLY

Subscription department:
Remittances to **Model & Allied Publications Ltd.,** P.O. Box 35, Hemel Hempstead, Herts. HP1 1EE. (Subscription Queries Tel: **Kings Langley** 62692/3.) Subscription Rate £6.00 (U.S.A. and Canada $15.00) post free, index included.

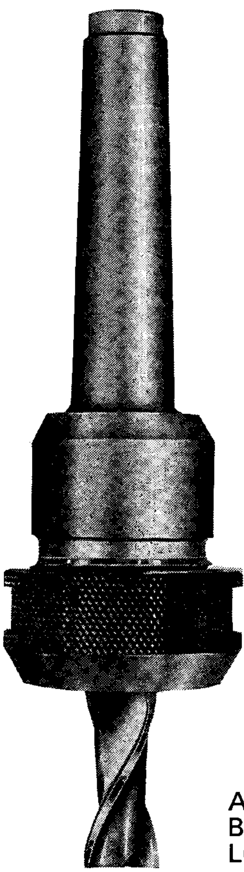
Editorial and Advertisement Offices:
P.O. Box 35,
Hemel Hempstead, Herts. HP1 1EE.
Hemel Hempstead 2501-2-3

Clare

MILLING CHUCKS AND CUTTERS

For **DORE WESTBURY**

AND SIMILAR MILLING MACHINES



- ★ **ACCURATE RELIABLE VERSATILE** (our standard of concentricity .00075" T.I.R. 2" from chuck)
- ★ **NON SLIP OR CREEP DOWN OF CUTTERS**
- ★ **ONE CHUCK TAKING ALL CUTTERS FROM 1/16th to 3/4 in. diameter facemills to $1\frac{1}{2}$ in. diameter**

■

No. 1 M.T. Collet available for drilling

■

CAN EASILY BE USED ON LATHE SPINDLES

■

ASK FOR OUR SIMPLE BUT EFFECTIVE CENTRE LOCATORS

Foolscap S.A.E. for information and all orders to

Model Engineering Services

6 KENNET VALE BROCKWELL
CHESTERFIELD DERBYSHIRE

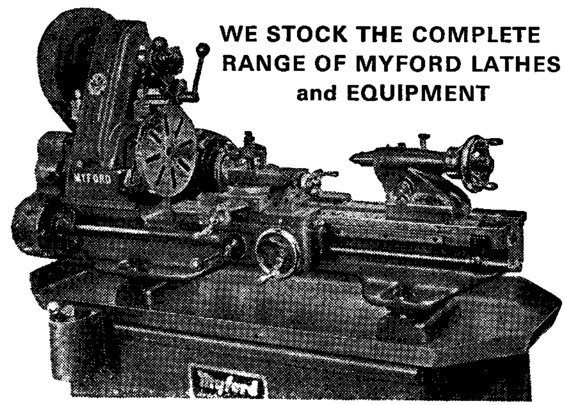
Manufactured by:

CLARE COLLETS LIMITED

ALTRINCHAM CHESHIRE.

BUCK & RYAN LTD.

TOOLS AND MACHINERY



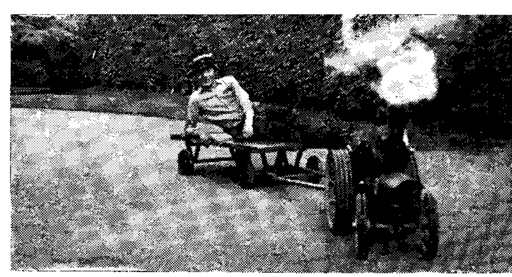
WE STOCK THE COMPLETE RANGE OF MYFORD LATHES and EQUIPMENT

MYFORD ML7 BENCH LATHE £151 VAT Extra
(Clutch, Motor and Stand Extra)

MYFORD ML SUPER 7 BENCH LATHE £209 VAT Extra
(Stand and Motor Extra)

101 TOTTENHAM COURT RD., LONDON, W.1
Telephone: 01-636 7475 (4 lines)
55/57 HARROW RD., LONDON, W.2 Tel: 01-723 6534

Flying Dutchman



A $2\frac{1}{2}$" scale compound traction engine at work at Oakhill

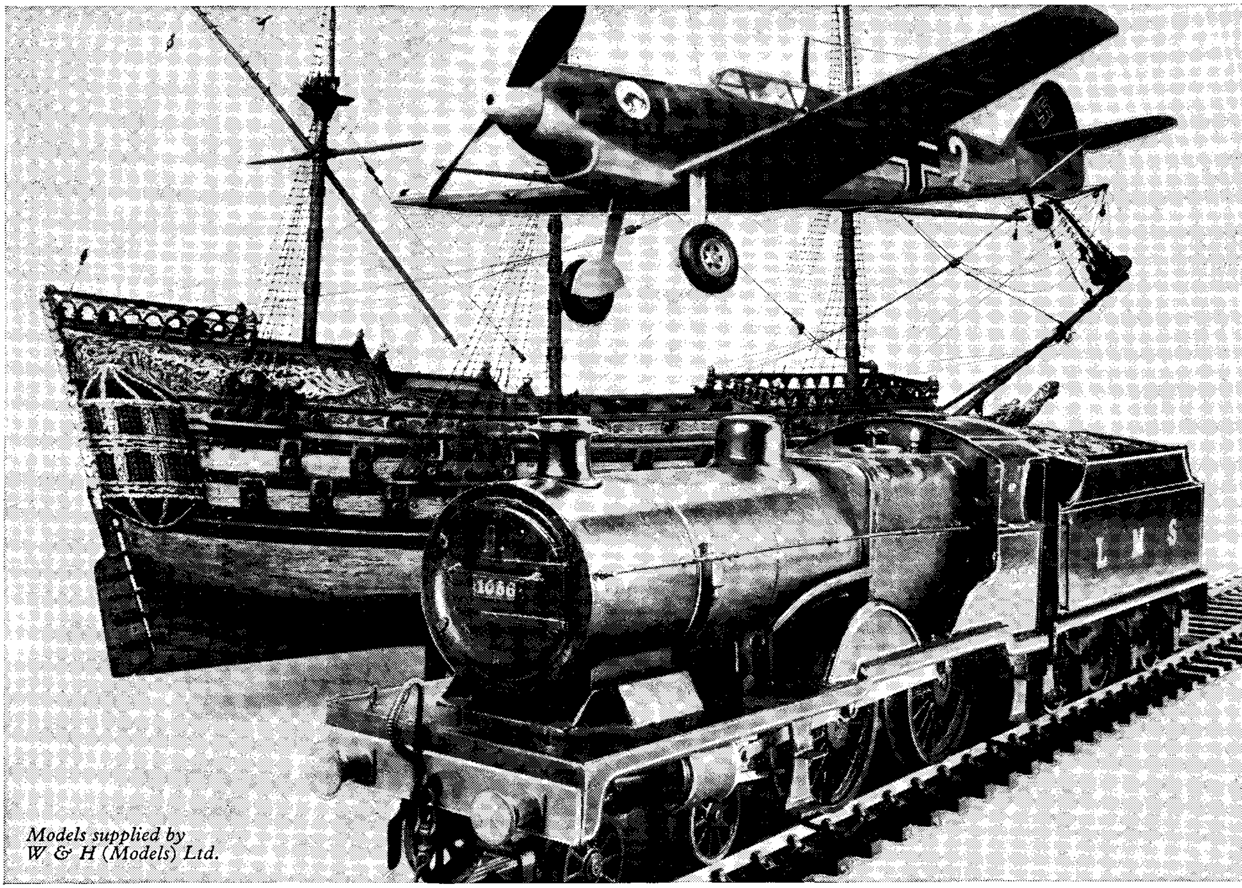
FLYING DUTCHMAN MODELS: offer for sale a selection of passenger carrying working steam models, locomotives in all gauges, traction engines, etc.

FLYING DUTCHMAN MODEL COLLECTION: several showcase models are now available due to reorganisation of the collection.

U.K. inquiries—please telephone

OAKHILL MANOR, OAKHILL, Nr. BATH, SOMERSET. Tel: Oakhill 210

Please telephone for appointment
May be viewed in London area
MODELS OF ALL TYPES URGENTLY WANTED

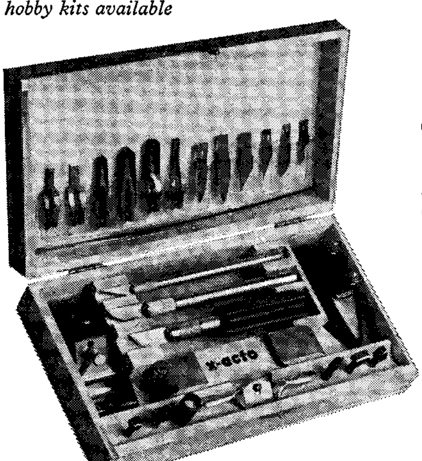


Models supplied by W & H (Models) Ltd.

Whatever your modelling interest...

You have only to glance at our illustration to see that with X-acto fine tools in your hands there's a new modelling dimension waiting to be explored. X-acto tools will help you create the model of your choice with precise perfection.

No. 86 X-acto and Tool Set (£7.50) Just one of many hobby kits available



x-acto precision tools for modelmakers

Everything from a single knife to a complete Hobby Chest (From 17p -£19.25)

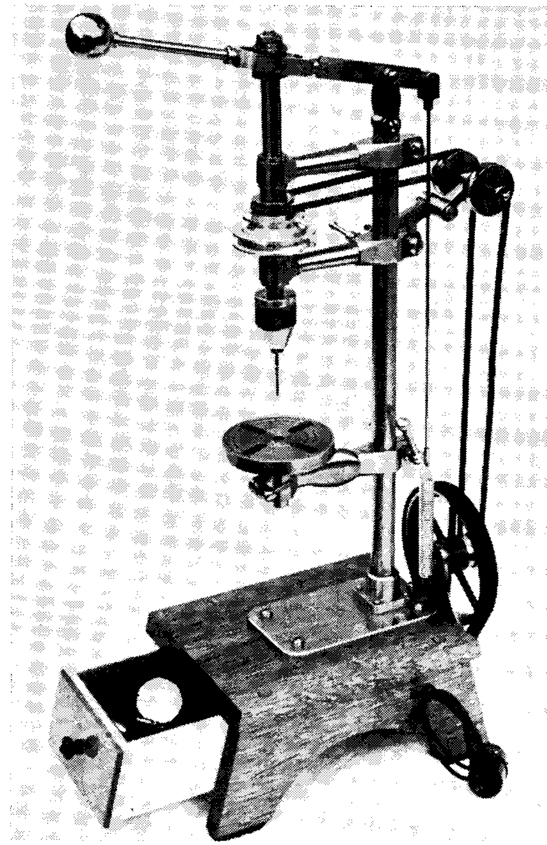
x-acto®

KNIVES · PLIERS · FILES · RAZOR SAWS · CLAMPS · DRILLS · SCREWDRIVERS · SOLDERING IRON/ HOT KNIFE.

AVAILABLE FROM ALL GOOD MODEL SHOPS

SMOKE RINGS

A Commentary by the Editor



One of the entries for the M. E. Exhibition — a sensitive drilling machine by John Stevens.

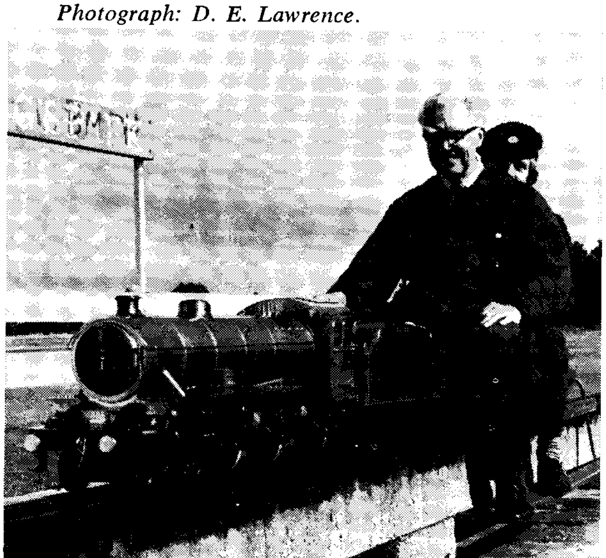
M. E. Exhibition

Intending visitors to the Model Engineer Exhibition will be pleased to hear that we have a record entry in many of the classes this time. This applies particularly to the model boat sections, with 11 entries in Class D, 40 entries in Class E, 28 in Class F, nine in Class G, and ten in Class I (miniatures).

Class J (general engineering models) is quite strong with 14 entries, but the biggest surprise is the enormous entry in Class S (The Juniors) which has no less than 93! It is true that many of these entries are of miniature figures and other military items which are not strictly model engineering, but there are several stationary engines among them, and some model boats.

I am very glad to say that my appeal for entries for the LBSC Memorial Competition has not fallen on deaf ears; on the contrary, the entry is the splendid one of 18 locomotives, ranging from a 5 in. gauge *Pansy* and a 3½ in. gauge *Britannia,* to a small-boiler *Tich.* The entry includes such well known designs as *Maisie, Mona, Molly, Juliet,* and *Doris.*

Another "Springbok" completed. Bertie Green tries out his 4-6-0 for the first time and is very pleased with the engine's performance.
Photograph: D. E. Lawrence.



7¼ in. gauge Society

At a meeting held at West House School, Birmingham, on Saturday, 20 October, the 7¼ in. gauge Society was formally inaugurated. There were over 50 7¼ in. gauge enthusiasts present, and apologies were received from 22 others. Representatives from the Trade were also present.

It is intended that two Summer Rallies should be held on a suitable track in various areas of the country in turn. Members will be able to maintain contact by means of a Newsletter published quarterly. The General Secretary is Mr. W. Shepherd, of 20, Hartington Cresent, Coventry, and the Membership Secretary is Mr. K. Woodham, Mannering, High Street, Carlton-le-Moorland, Lincoln.

Mr. Heseltine at Stuarts

Mr. Michael Heseltine M.P., Minister for Aerospace & Shipping, recently visited the works of Stuart Turner. Ltd., at Henley-on-Thames. Mr. Heseltine expressed particular interest in a large export order received by Stuarts just before his visit; this was for 2000 of the Company's No. 12 electric pump units for Qatar, in the Middle-East.

Mr. Heseltine will be the guest speaker at the Annual General Meeting of the Stuart International Model Engineer's Club at the White Hart, Nettlebed, Oxon, on 14 December.

MASTIFF PETROL ENGINE

Part XX **By L. C. Mason** *Continued from page 1099*

WITH THE CAMSHAFT finished, we could move on to considerations of driving it. The drive is by plain 2 : 1 spur gears of 40 D.P., the pinion on the crankshaft having 35 teeth and the wheel on the camshaft 70. The gears as supplied by Muffetts or John Whelan require slight modification, but this is quite straightforward.

To start with the smaller gear for the crankshaft, this has a face width of ¼ in. This needs narrowing down to 3/16 in., so chuck the wheel by its boss in the three-jaw and face back the wheel thickness to 3/16 in. Check that the bore of the wheel is running quite true in the chuck; if it is not, then either get it to do so by paper packing under one or more jaws, or transfer the gear to the four-jaw. When it runs true, open up the ¼ in., bore of the wheel to 5/16 in., for a snug fit on the 5/16 in., dia. end of the crankshaft. It is better to bore this with a small boring tool, rather than just drill it out. Leaving the wheel in the chuck, plane a 3/32 in., wide keyway through the bore, 3/64 in., deep, to match that on the crankshaft nose. Reverse the wheel in the chuck, holding it with soft protective pads over the teeth, and face back the boss to 3/16 in., deep — which finishes that ready for use.

The crankshaft gearwheel is held in place by the skew gear driving the oil pump and contact breaker shaft, and shares the same long crankshaft key. The skew gear also requires slight modification, but this could be left until we come to the contact breaker drive.

The big wheel on the camshaft is also keyed in place, but here the fixing is slightly more elaborate.

It will probably have been noticed that while each wheel is keyed in place for a positive drive, there has been no mention so far of considerations of exact timing. If the wheels are keyed in position on their shafts just as their keyways happen to come in relation to the teeth, it will be obvious that the nearest one can get to the exact valve timing desired could be anything up to nearly one tooth out. Now, one tooth on the 35 t. crankshaft pinion is over 10 deg. of crankshaft rotation, and this is not really good enough for anything like reasonably exact timing. If we could reduce the timing inaccuracy to something of the order of a quarter of a tooth, then the maximum possible timing error comes down to around 2½ deg., which is much more like it.

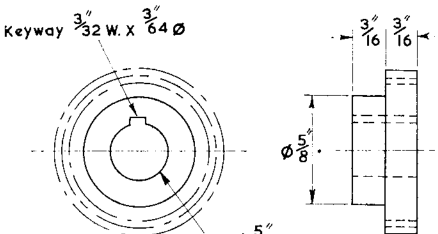
This is done in the fixing for the camshaft gearwheel, by providing it with a separate centre which is keyed to the camshaft, and then locking the wheel itself to its centre in one of several available positions, each of which varies from the others by much less than one tooth. In this way, the pinion and the wheel centre can be keyed in position straight away, the timing approximated by the meshing of the gears, and then a more exact position found by the "vernier" selection of the most appropriate locking position. When once established, the wheel can remain locked to its centre, then the right timing is restored after removal of either gearwheel by merely re-engaging them with their keys.

To tackle the wheel centre first, this is a plain turning and boring job from a stub of mild steel. Start with a piece full thick, turn the boss and bore it, and plane in the keyway. Index it round accurately in four positions 90 deg. apart. Reverse in the chuck, holding it by the boss and face back the main disc to the 3/32 in. thickness shown.

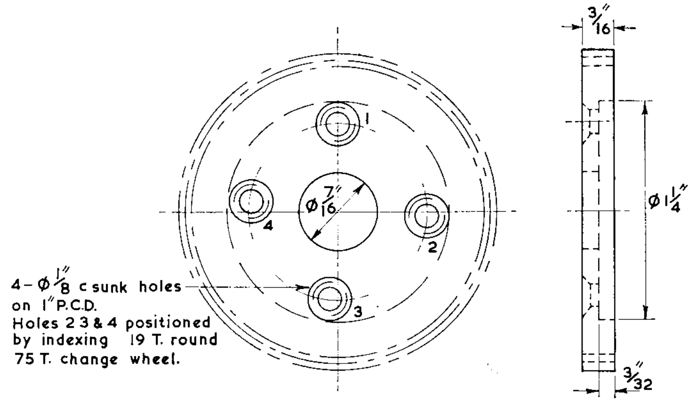
For the gearwheel, grip it in the three-jaw by the boss (or the four-jaw if necessary to get it to run quite true) and face back the outer side to give the 3/16 in. wide tooth width. Bore out the ¼ in. centre hole a snug fit for the 7/16 in. dia. centre boss. Then with a sharp cornered tool, turn in the 1¼ in. dia. recess 3/32 in. deep to accept the centre a shakeless fit, so that the centre settles in the recess flush with the surface of the wheel. Reverse in the chuck getting this face running really true and using soft packing where it is gripped over the teeth, and turn the boss right off, so that you finish up with a flat toothed disc 3/16 in. thick, recessed on the side in the chuck.

Now we come to the crafty bit, in locating vernier locking positions for its attachment to the centre.

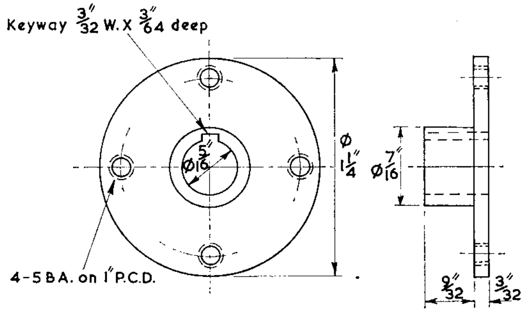
The wheel has 70 teeth, and the centre was indexed round to 90 deg. positions. If we now set up a 75 t. wheel on the mandrel dividing attachment, but divide round the wheel in the same four 90 deg. positions, the angular positions between stations would be equivalent to 18¾ t. on the 75 t. indexing wheel, as 4 x 18¾ = 75. So, if we use the 75 wheel for indexing round, but index round every 19 teeth, we shall finish up with four positions, the first of which could coincide with a centre hole, the second would be ¼ tooth out, the third ½ tooth, and the last ¾ tooth displaced in relation to the holes in the centre. Simple arithmetic shows that ¼ of a tooth on a 75 t. wheel is



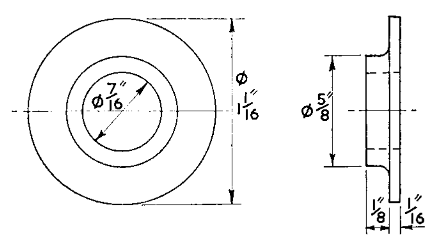
CRANKSHAFT TIMING PISTON B.M.S. 1 off
35 T. 40 D.P.



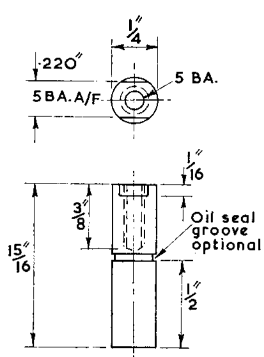
CAMSHAFT TIMING WHEEL B.M.S. 1 off
70 T. 40 D.P.

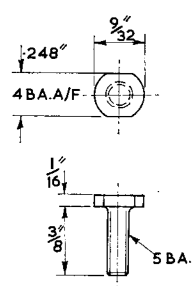


CAMSHAFT TIMING WHEEL CENTRE
B.M.S. 1 off

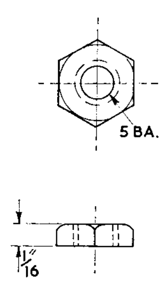


CAMSHAFT TIMING WHEEL WASHER
B.M.S. 1 off

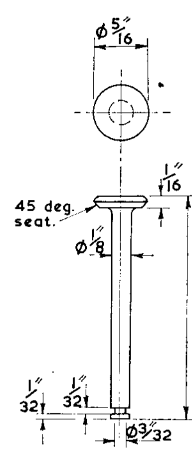




TAPPET HEAD
Silver st. head hdnd.
8 off.



TAPPET LOCK NUT
Standard BMS nut thinned
to 1/16" thick.
8 off

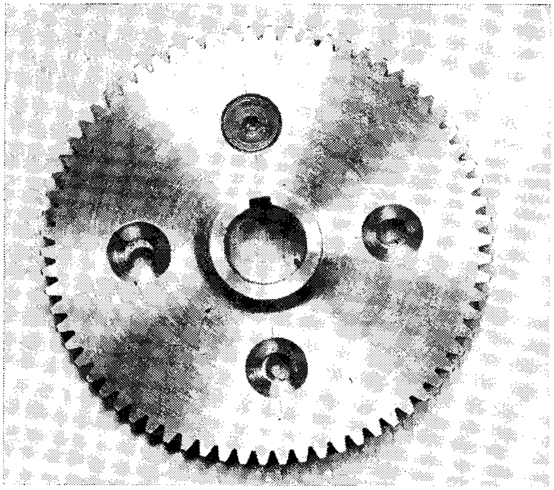


TAPPET
Silver steel hdnd. 8 off.

VALVE
Stainless st. 8 off.

1.2 deg; as this is on the camshaft, this represents 2.4 deg. of crankshaft rotation, which is much more acceptable than the 10 deg. plus given by one tooth of the crankshaft pinion. Taking into account that plain meshing of the gears to as near as possible could well give an error of less than a whole tooth, the final error is likely to be less than the maximum possible 2.4 deg. out.

So the next step is obvious. Divide round the wheel with the 75 t. wheel, indexing by 19 t. each



The camshaft gear-wheel attached to its centre. The tapped holes can be seen progressively further displaced in relation to the holes in the gear wheel, providing vernier timing adjustment.

time. This will give a set of four stations, the distance between the fourth and first being slightly less than the rest, as 4 x 19 = 76. Mark cross lines cutting the index marks to give drilling points on a 1 in. dia. circle, centre dot these, remove from the chuck and drill the four spots No. 40. Fit the centre into its recess in the wheel, and mark through one of the holes in the wheel to show the drilling point on the centre on each of its divided lines. Drill the marked points in the centre No. 40 and tap 5BA. Open up the four holes in the wheel to $\frac{1}{8}$ in. or No. 30 and countersink on the flat outer side. A 5 BA countersunk socket head screw provides the lock, filed off flush on the back surface of the centre.

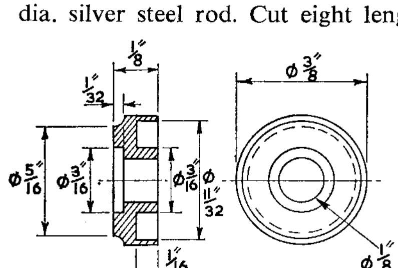
The wheel is held in place on the camshaft nose by a $\frac{1}{4}$ in. x 40 t. nut and washer, bearing on a substantial clamping disc. This is big enough to partly cover the gear wheel lock screw, thus acting as a safety check in case the screw should work loose. It is a plain turning job as shown in the drawing.

Tappets are plain turning and drilling from $\frac{3}{4}$ in. dia. silver steel rod. Cut eight lengths for a start and face both ends, just rounding the sharp edge on the cam end. Drill and tap the outer end 5 BA x $\frac{3}{8}$ in. deep. If you have a filing rest, use this to file a couple of flats about $\frac{1}{16}$ in. wide on the tapped end for a 5 BA spanner for use in tappet clearance adjustment. Harden them right out and polish up, getting a nice polish on the ends that will bear on the cams. I turned a shallow oil retaining groove on mine about halfway along the length inside the tappet guide, but this can be omitted without any ill effects if you are all for simplicity.

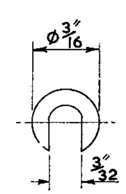
Tappet heads are in effect 5 BA bolts, having a thin flat head with a couple of spanner flats, and again turned from silver steel. Harden these right out like the tappets. I polished up the heads of mine and let down the temper along the screwed stems to spring blue on the under side of the heads, just so that they were not quite so brittle as in the glass hard state, and so might be less liable to fracture under the head in view of the hammering they get. I have had this happen in the past, but admittedly with heads rather more poorly proportioned than these.

The valves themselves are plain turning jobs again, but the turning needs to be accurate and to a good finish. If you have any preference as to fancy steel for this purpose, by all means use that; I have had every satisfaction in a number of engines from ordinary free-cutting stainless steel, and the valves in this engine are of this material. The valves are turned complete on the end of the bar, stem outwards, and then parted off at the head. For turning the stem you will need tailstock support, and here you can either turn a short length to slightly oversize on diameter, providing a point on the end for use with a female centre, or make the stem extra long and drill it with the smallest centre drill for use with a half-centre. I personally favour the latter way, as the half-centre seems to give you more room for tool manoeuvring than the female centre.

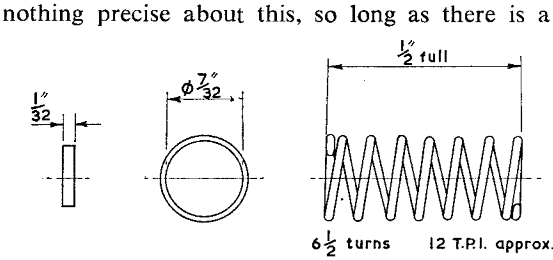
For turning the stem, use a R. H. knife tool with the point ground to a radius that automatically shapes the curve under the valve head. There is nothing precise about this, so long as there is a



VALVE SPRING COLLAR
B.M.S. 8 off



VALVE SPRING COTTER
Silver st. 8 off



VALVE SPRING
22 S.W.G. spr. st. wire 8 off

definite radius and not a sharp corner. It is worth while keeping the radius small enough to show a small amount of "flat" under the edge of the head, not only so that you can turn the seating surface to a definite shape, but so that you can measure stem length under the head somewhat more easily.

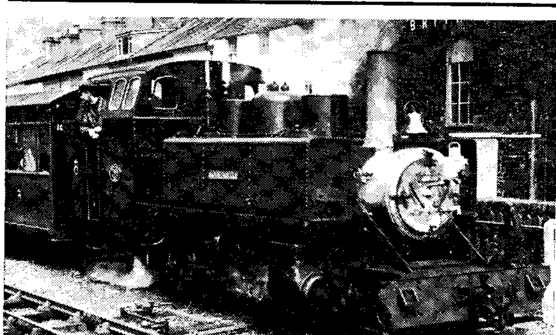
The order of turning then, is best carried out as follows: face the bar end, centre drill, and extend sufficient for one valve from the chuck. Engage the half-centre and turn the stem parallel, forming the radius under the head at the same time. Make the stem about $\frac{3}{16}$ in. longer than the finished length. Get the stem absolutely parallel and to a close shakeless fit in the valve guide. Slew the top-slide round 45 deg. and turn in the seat with light cuts. With the tool used for turning the piston ring grooves, turn in the groove round the stem for the spring retaining cotter. Withdraw the tail centre and part off to leave the head a few thou thicker than the finished size. Saw off the drilled end of the stem, leaving it a trifle long, and grip by the stem in the chuck, with the head of the valve inside the chuck and the groove in the stem just showing. Gently face back the end of the stem to length and file a tiny chamfer on the end. Re-chuck by the stem head outwards, as close to the chuck jaws as you can grip, and very gingerly face off the head with minute cuts. Break the sharp edge round the top of the head.

It is unnecessary to provide a screwdriver slot in the head for grinding in. I have done this sometimes in the past, but the finished valve is not an easy piece to hold for cutting the slot without damage, and any grinding in can be carried out just as well by the use of a pin-chuck on the bottom of the stem.

Spring collars are turned from mild steel rod, with the square-bottomed recesses formed by an end-mill or slot drill. The retaining cotters are from silver steel, and these are best produced by drilling into the end of a length of rod with the $\frac{1}{8}$ in. drill, and parting off the required number of washers $\frac{1}{32}$ in. thick, subsequently sawing and filing the slots by hand. They need not be hardened. Make a few spares while you are at it!

Winding springs in the lathe has been described often enough, and the valve springs are produced in this way from 22 S.W.G. spring steel wire, either setting up a screwcutting train to space the turns uniformly, or developing the knack of spacing them freehand, running the lathe in backgear. Wind up only enough for two or three springs at a time, and when these have been cut slightly long, flatten the ends back to free length by a touch on the grindstone.

Incidentally, never cut spring steel wire with wire-cutters. By far the best way is to touch the wire on the edge of the grindstone; in a second or two it will glow red hot and be ground nearly through. A slight bend at the thin point will then snap it, when the sharp ends can be squared off to a safe bluntness on the stone.



MOUNTAINEER

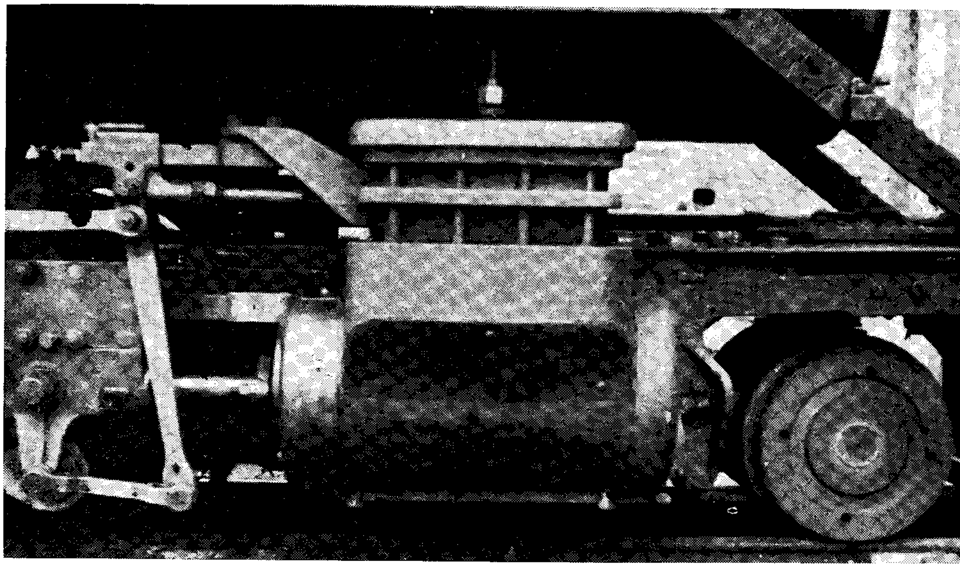
A narrow-gauge 2-6-2 tank locomotive for $3\frac{1}{2}$in gauge

by Don Young

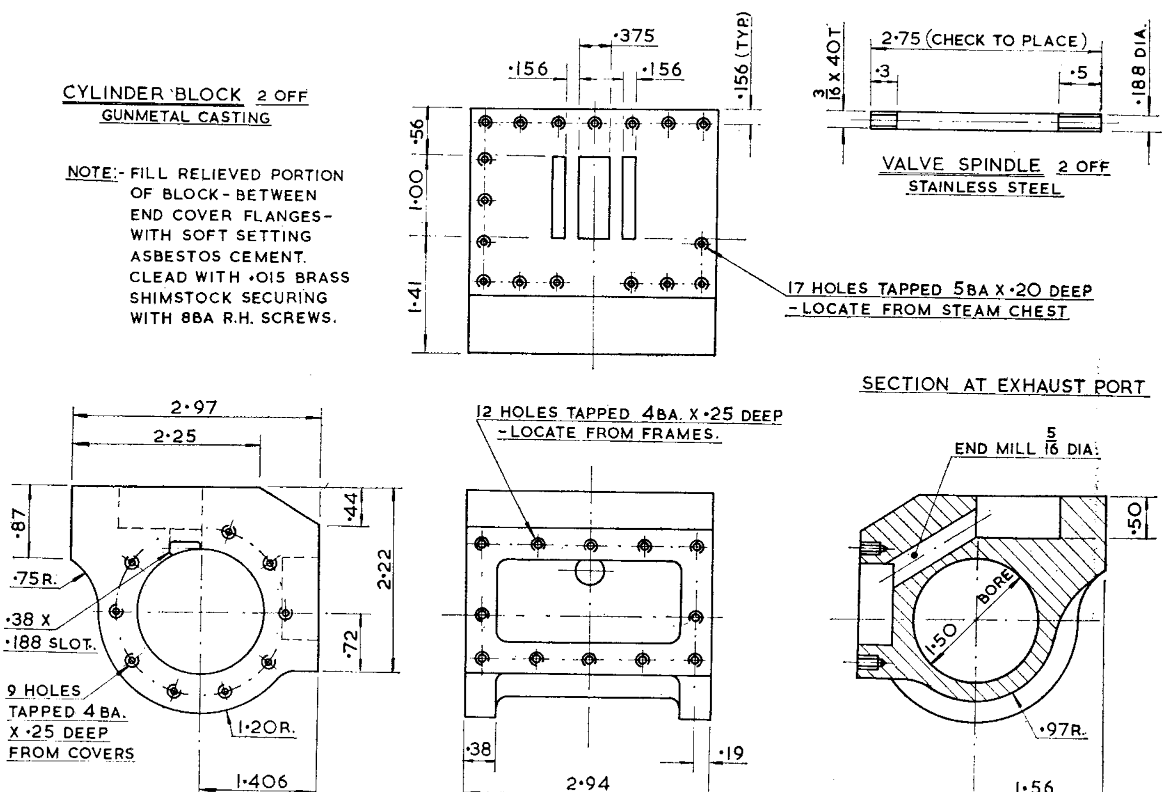
Continued from page 1108

OVER THE PAST three years, yours truly has frequently said quite jokingly to Allan Garraway that *Mountaineer's* cylinders should be bored out to 11 in. The standard reply, until 1972, was that she could not make enough steam to look after the 9 in. or so present cylinders. Oil firing has changed all that, so I put the question more seriously this year, when the chance presented itself, with the answer already stated that the casting would not allow it. Why the preamble? Well the cylinders shown hereabouts are $1\frac{1}{2}$ in. bore, a scale 11 in., which our boiler will be more than capable of satisfying.

Actually, this set of cylinder castings is going to be a very useful asset in the future, for other $3\frac{1}{2}$ in. narrow gauge locomotives and for 5 in. standard gauge ones. I did suggest to Messrs. Reeves' patternmaker that the chamfer at the inner edge of the top of the cylinder block be omitted, to assist in this respect. Then all we have to do is machine away a portion of the 'lump' at the outside of the block, to reposition the steam-chest. Quite a few American designs, like the myriad 4-4-0's, had this 'lump' feature to some degree and removing the lump altogether adds many more possibilities to the list.

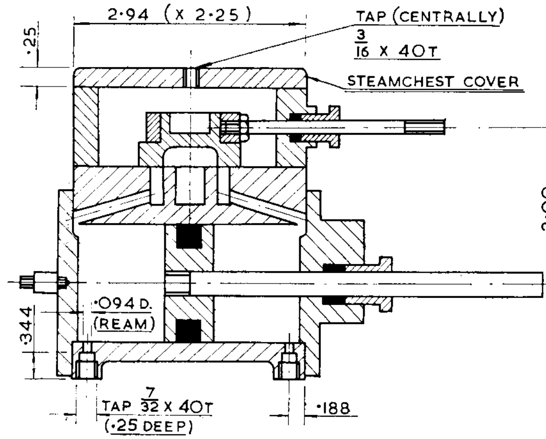


The right-hand cylinder of "Mountaineer." Note the oil feed connection to the top of the steamchest.



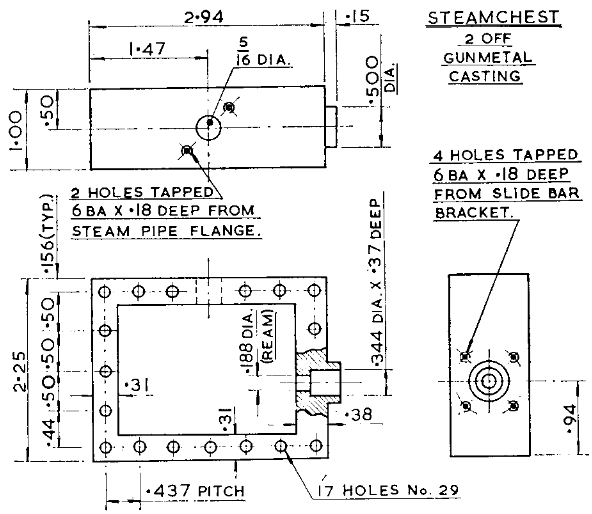
During a recent visit to the Reeves emporium I was able to inspect virtually all of the castings and patterns produced for *Mountaineer*. It must be recorded that they are of the usual uniform high standard, with the accent on sheer size, for this is a $1\frac{3}{4}$ in. scale locomotive for $3\frac{1}{2}$ in. gauge, which means that the components are much larger than for a standard gauge 5 in. gauge miniature. This is the main reason for the growing popularity of narrow gauge locomotives, everything is so much more robust.

It was noted that the cylinder blocks inspected

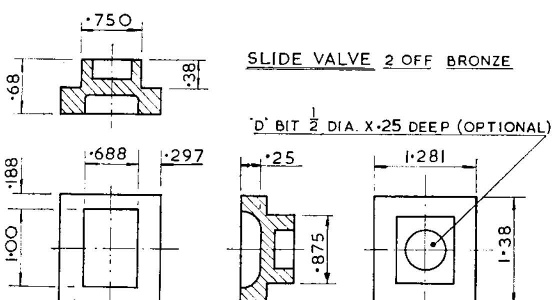


SECTIONAL ASSEMBLY OF CYLINDERS

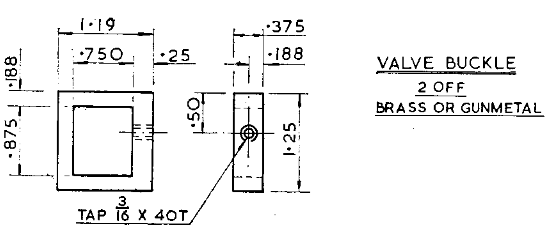
NOTE:- RELIEVE CYLINDER COVER SPIGOTS LOCALLY IN WAY OF STEAM PASSAGES.



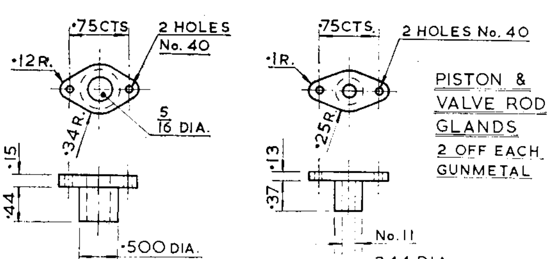
STEAMCHEST 2 OFF GUNMETAL CASTING



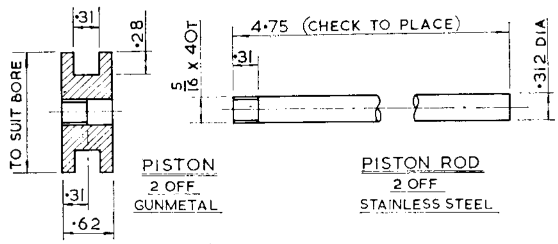
SLIDE VALVE 2 OFF BRONZE



VALVE BUCKLE 2 OFF BRASS OR GUNMETAL

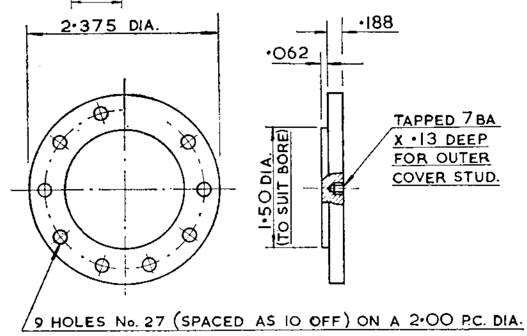


PISTON & VALVE ROD GLANDS 2 OFF EACH GUNMETAL

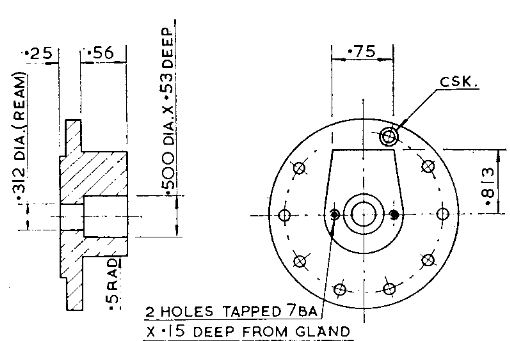


PISTON 2 OFF GUNMETAL

PISTON ROD 2 OFF STAINLESS STEEL



FRONT CYLINDER COVER 2 OFF GUNMETAL



REAR CYLINDER COVER 2 OFF GUNMETAL

NOTE:- UNSTATED DIMENSIONS AS FRONT CYLINDER COVER

included the chamfer mentioned above. The reasoning for this is purely economic; to maintain a realistic price, despite the present exorbitant cost of gunmetal, required that the weight of the cylinder block casting be kept to a minimum. However, it will be a simple matter to amend the pattern for our future needs.

One more point whilst we are digressing; many readers' letters enquire why it cannot be categorically stated just how many passengers a particular design will haul. The answer is in one word, impossible. Why? Let me try to explain.

The 'fly in the ointment' is always the track on which the locomotive is to run. For instance, on an aluminium track, the limitation will almost certainly be lack of adhesion, especially on a hot day such as my misfortune to experience at Beech Hurst this year. Again, on a 2nd class steel track within which category our local track falls, terrific frictional resistance will occur. The track gauge can also cause additional friction, especially on curves. Anyone who is fortunate, maybe I should say unfortunate enough to 'run in' a new steel track will tell you of the extra effort needed by the locomotive. With reasonable conditions, I shall be disappointed if *Mountaineer* does not handle up to 20 passengers; there, I've said it!

Let us commence construction, starting with the cylinder block. Check all the major dimensions on the casting, to assess the machining allowances provided. Next chuck in the 4-jaw and machine the bolting face to size. The joint with the frames has to be "exhaust steam tight"; as yours truly does not favour a gasket at this joint, merely an application of liquid jointing compound, a reasonable finish must be obtained on this face of the casting. This is good practice anyhow, to check the tool ready for the important port face.

Change from 4-jaw chuck to faceplate and bolt an angle plate to it. Sit the bolting face of the cylinder block on the angle plate, put a piece of, say, $\frac{3}{4}$ in. x $\frac{3}{8}$ in. b.m.s. bar through the rough bore and bolt down to the angle plate. Take a cut across the port face, check the dimensions relative to the bore, and adjust the casting if necessary before finish machining. There is no need to tell builders that the finish of the port face is important!

---

for your BOOKSHELF

The Grinding Machine
by Ian Bradley, 135pp. Price £2.

The Drilling Machine
by Ian Bradley, 157pp. Price £2.50.

The Shaping Machine
by Ian Bradley, 98pp. Price £2.

(Model and Allied Publications Ltd.)

The subjects of this trilogy are all of interest to the amateur, and it is to the amateur that these books are primarily addressed. A great deal of the subject matter has already appeared in "Model Engineer" in years past, but it is a great convenience to have the material collated and properly indexed, and for the newcomer to the hobby, without ready access to earlier volumes of "Model Engineer", these books will be both welcome and useful.

It was somewhat disappointing, however, to notice that some lines of discussion were not more fully covered. For example, the manual on the grinding machine does not fully explain the approved British Standards Specification (B.S.4481/69) nomenclature for the designation of grinding wheels. Neither are the safety aspects of operating and maintaining grinding wheels explained in any great detail. These topics, and more information about silicon-carbide ('green grit') wheels would have been, in your reviewer's opinion, welcome additions to the workshop amateur's literature.

It is always difficult to draw lines of demarcation when subjects overlap — as for example, the grinding of cutting tools — but it would have been preferable, even at the expense of some duplication, to have re-printed certain material rather than referring to other M.A.P. technical publications. For instance, page 50 of "The Drilling Machine" requires reference to "Sharpening Small Tools" when the subject of dressing grinding wheels is discussed — a rather disillusioning discovery in a book costing £2.50.

Apart from these criticisms, these books should be of value and use to the amateur, covering as they do those machines which are found in many home workshops, and for which hitherto there have been no readily available manuals. As might be expected from a member of the 'Duplex' team, the illustrations are both good and plentiful.

G.W.W.

"World Locomotive Models".
by George Dow
Published by Adams & Dart, 1a Queen Square, Bath, Somerset.
168 pages, price £5.95.

Scale models of locomotives are almost as old as the full-size prototype, and although British models predominate (as might be expected) many fine locomotive models have been built in countries such as Austria, Belgium, Finland, France, Germany, Holland, Hungary, Sweden, U.S.S.R., and of course North America.

This book contains photographs of some 268 locomotive models, representing 40 countries, their prototypes dating from 1804, and many of them have never before been published.

The models depicted include some built by the finest amateur craftsmen, such as the late Dr. Bradbury Winter, W. A. Carter, F. Cottam, C. R. Amsbury, P. Dupen, C. R. H. Simpson, G. S. & N. D. Willoughby, etc, and also many of those built by the trade. The latter include such well-known names as Bassett-Lowke, Twining Models, Severn-Lamb, H. Clarkson, Bonds, and many others. Museum models have not been forgotten, both at home and abroad. There are long captions describing each model illustrated, and in addition the work includes 14 fine colour plates.

This is a splendid production and should be in the library or on the bookshelf of every lover of the locomotive, whether model or full size.

R.M.E.

"The Sentinel".

by W. J. Hughes & Joseph L. Thomas.

Published by David & Charles Ltd., Newton Abbot. 320 pages, price £5.95.

The well-known and highly successful series of Sentinel steam wagons was introduced by a firm of engineers called Alley & MacLellan at Polmadie, Glasgow, a company which started business as early as 1875, though the steam wagons did not appear until 1905. From 1875 until 1905, the company were noted for such things as steam and water valves, and they were probably the first firm in the world to undertake the prefabrication of ships—mainly small shallow-draught steamers—and Alley & MacLellan build the engines for them too.

With congestion at Polmadie, the company decided to move the steam wagon side of the business to Shrewsbury; this was in 1914, and by July 1915 the first Shropshire-built wagon left the new works.

This book, which covers most of the Sentinels including the Sentinel-Cammell steam rail coaches, ends rather indeterminately at the 1929-30 period, but a second volume is to be published which will cover the famous D.G. series of wagons, often regarded as the "Rolls-Royces" of commercial vehicles.

The authors have covered the products of the "Sentinel" well, there being full descriptions of the various "standard" wagons, the "Super-Sentinels", the tractors, portables and shunting locomotives, and the railcars mentioned previously. Dimensions of the various Sentinel productions are given in a series of appendices, power outputs and prices are also listed, and details of the various bodies built and the materials used.

This book. which is well produced and adequately illustrated, should appeal both to the student of engineering history and to lovers of steam transport.

R.M.E.

"The Arthurs, Nelsons and Schools of the Southern"

by S. C. Townroe.

Published by Ian Allan Ltd., Terminal House, Shepperton, Middlesex.
103 pages, price £2.

Within seven years of the inception of the Southern Railway, a fine trio of express passenger locomotives had been produced, the "King Arthur" and "Lord Nelson" 4-6-0's and the "Schools" 4-4-0's.

The "Arthurs", based on a Urie design, were simple, straightforward and strongly-built engines, and on the whole, they were highly successful. The "Nelsons" never quite came up to expectations, though they were somewhat improved during the Bulleid regime. The "Schools" however were most successful at the outset, and apart from the fitting of a multiple-jet blastpipe, remained much as originally designed.

The author helped to build some of the "Schools" class locomotives, later he worked in the running department, making many footplate trips on the three classes described; he also had much to do with their maintenance.

The book includes some interesting reminiscences of the Southern Railway both in peace and wartime, and it is well illustrated. R.M.E.

CLASSIFIED ADVERTISEMENTS

SIR,—I suppose that many readers will have experienced the frustrations of applying to "Classified" advertisers who give only their telephone number; the wait whilst little Alfie fetches Mum; the even longer wait whilst Mum shouts Jack from the shed in the garden; and the subsequent unsatisfactory 15 minutes on a noisy line trying to ascertain whether the Gogglemeyer Miller is complete with thrupple-nuts or not.

It is unfortunate that this practice seems to be on the increase; in the current (19 Oct.) issue there are 37 small advertisements for Equipment, Models and Materials, some, of course, from our trade friends. Of these, no less than 13 give neither address nor box number. One assumes that the advertisers either wish to save cost, or desire to avoid endless visitors knocking at the door. It is worth while looking at these two points. The second is easily avoided by using a Box Number, which would have cost no more than 5p more than the average length of the telephone numbers quoted.

The first, however, should be looked at in a different light. Why should the respondent to an advertisement be expected to spend anything up to 50p to save the advertiser? The figures are enlightening. The average (estimated in some cases) value of the goods was £314, the lowest being £4.50 and the highest £1,850 "O.N.O." The average cost of the advertisements themselves was £1.05 — lowest 65p, highest £2.15; the latter for quite a moderately priced sale. The avarage cost of the "Phone address" was 21½p, and, oddly enough, the chap with the highest priced goods on offer spent no less than 40p on his telephone details! Compare these with the cost to those who gave their *full* addresses, which averaged 36½p, or to the price of a Box Number at 25p.

Within reason, the use of a phone address is clearly advantageous — one has every sympathy with someone offering a slide-rule for a couple of pounds or an odd length of hard-to-come-by boiler tube. But I for one am not prepared to rely on telephone details of complicated engineering plant, still less do business with a man who tries to save 10p on an advertisement for gear worth several hundred pounds.

There is a final point. Model engineering is a very "co-operative" hobby (few of us have not had valued help from fellow workers from time to time) and many readers depend on second-hand machines to keep going at all — three quarters of my own equipment was obtained in this way. I wonder how many modellers are without telephones? And how many of those who do have them can afford long-distance phone calls? It is just not fair to these chaps to retire behind a telephone number when advertising. If there *are* good reasons for not revealing name and address to all and sundry — and I more than most people find it difficult to accept casual visitors — then the Box Number provides a cheap and most efficient alternative.

Kendal T. D. WALSHAW

BUILDING THE ALLCHIN

Part XIII

by W. J. Hughes

Continued from page 1054

IT WILL BE RECALLED that in order to lock the compensating gear, as for example in thick mud where one hind wheel might spin and the other stay still, it is necessary to insert a longer-than-usual driving-pin through one of the holes in the left hand hub and into a corresponding hole in the compensating centre. This effectively locks the gear and prevents any differential action, so that both wheels drive together.

Of course, once normal road conditions are reached, the long pin had to be removed and the shorter one replaced. Otherwise a great strain was placed on the hind axle when cornering, and it was not un-known for a steam roller (which often did not have compensating gear) to fracture a hind axle for this reason.

There are these holes for this pin in the boss of the compensating centre, equi-spaced between the bevel pinions. They must all be exactly at the same radius as the holes in the left-hand driving-boss and the left-hand hind wheel, and a jig will ensure this (Fig. 1A and B). The jig has a spigot which fits the bore of the left-hand driving-boss (i.e., which has the same diameter as the hind axle), and a bush is made to fit over this spigot, but with an external diameter to fit the bore of the compensating centre.

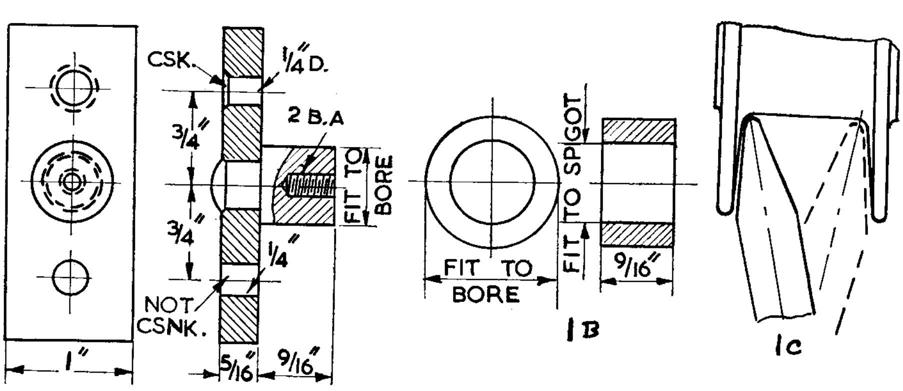
My jig was from 1 in. by 5/16 in. black mild steel (any suitable size would do, but not less than ¼ in. thick), about 2½ in. long. Scribe the centre line, centre pop the exact centre, and with dividers mark off the other two centres at ¾ in. Centre pop these, checking all three most carefully with a glass. Scribe a ⅜ in. circle at the centre, and ¼ in. circle at the other two, to act as drilling-guides. Drill the holes carefully and accurately, again using the glass: slightly countersink the ⅜ in. hole and **one** of the ¼ in. ones. If the holes are not exactly in line, scrap the job and start again.

Turn the spigot from ¾ in. b.m.s. rod, to fit the bore of the driving-boss, and with the end reduced to a press-fit in the ⅜ in. hole. Part off, reverse in the chuck, and round off the sharp corner with a smooth file. Centre the end, drill No. 21, and tap 2 BA. Press the spigot into the ⅜ in. hole in the bar, and rivet over lightly.

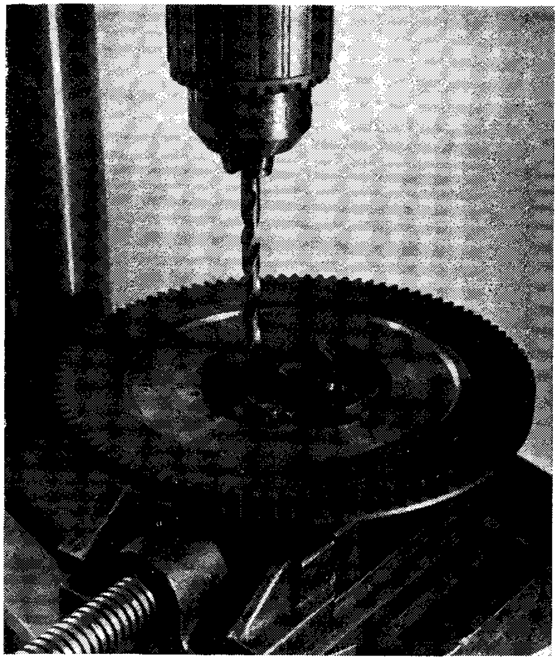
The bush or collar is an easy turning exercise from 1⅛ in. or 1¼ in. rod. Turn its end for about ¾ in. to a good fit in the bore of the compensating centre, and bore it out to a good fit on the spigot last made. Part off, and remove all sharp arrises.

To use the jig, fit the bush over the spigot, and insert it into the bore of the centre, on the spur-wheel side. In the bore at the other side fit the clamping-piece (part B of the drilling-jig for the pins) and clamp the two together with a 2 BA screw and washer, not too tight at first.

Turn the jig until the countersunk hole is over one of the bosses to be drilled, with the centre-lines of both coinciding. Tighten the clamping-screw, and check to see that the jig has not moved. Place parallel packing beneath the centre to clear the clamping-screw from the machine table — I used the jaws of my big machine-vice — and drill the hole through, with a keen drill and no forcing. Repeat the operation for the other two holes, remove the jig, and pass a 17/64 in. drill through all of them.



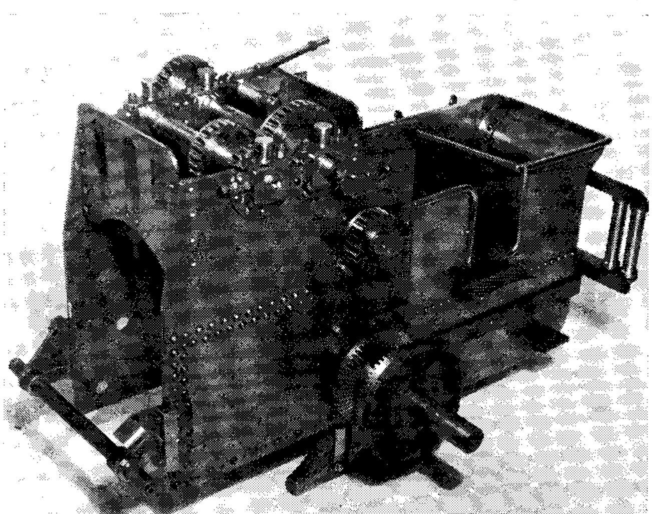
1A 1B 1C



Above: Fig. 2. *Below: Fig. 3.*

In order to clear the teeth of the bevel wheels, it is necessary to turn away part of the bosses of the lugs through which these three holes are drilled. The approximate amount is indicated by the broken lines in the sectional side elevation of the centre on Sheet Four of the prints.

First grip the workpiece by the winding drum flange in the three-jaw, and turn off the outsides of the bosses to a depth of 3/16 in., as shown there. Press the right hand bevel on to the outside spigot of its wheel-centre (as with previous gear wheels),



and try it in place to see if the teeth actually do clear. If not, turn a little more off, and try again. It may be necessary too to turn a shade off the three tiny bosses which hold the grub-screws securing the bevel-pins.

To turn away the surplus on the other side, the component may be clipped, gear-side inwards, to the face-plate, and set to run true. This time part of the lugs must be turned away to a depth of 5/16 in., also as on Sheet Four. Mount the left hand bevel wheel on its centre, and with this check to see if you have sufficient clearance on this side.

Securing the Gear-Wheels

Strictly speaking, if the force-fit of the large spur-wheel on to the flange of the centre is all it should be, that should be that. But because this unit has to transmit all the power of the engine, multiplied considerably by the gearing, then it is a wise precaution to use screws for additional security.

We drilled six holes for these in the flange, and these may now be "spotted" through to the wheel No. 30 drill, and finished through with No. 40. Tap 5 BA or $\frac{1}{8}$ in., and countersink on the flange side. The best screws for the job are countersunk socket head (Allen) screws, which are of high-tensile steel and which Reeves can supply in case of difficulty. The bevel wheels are secured similarly to their bosses, the left-hand one having four No. 31 holes countersunk inside, and the right-hand one with six No. 31 holes countersunk outside. Spot these through to the flanges with No. 31 drill, and for tapping with No. 43. The "left-hand" ones are $\frac{3}{8}$ in. deep: those on the right-hand centre go right through. Tap the holes 6 BA, and again use countersunk Allen screws. A particular precaution on the left-hand wheel is to make sure when pressing it home that the screws will not coincide with the bosses in the centre for the driving-pin holes.

After putting in the screws, these four holes may be drilled, using the jig made for those in the compensating centre. When one has been drilled, using the countersunk hole in the jig to guide the drill, swing the jig through 180 deg., and put a $\frac{1}{4}$ in. pin through the other hole into the one just drilled, to locate the jig for the second hole directly opposite it. The third and fourth holes are drilled similarly, and should then be opened out to 17/64 in., with the jig removed, of course.

The winding-drum, also on Sheet Four, is an iron casting. Grip it on the outside jaws of the three-jaw, and use slow back-gear in rough turning the outside face and edge of the casting. Take a good cut so as to get well under the skin, and with a good hefty boring tool take a roughing cut through the bore. Hone up (or regrind if need be) the boring tool, set the inside calipers to a few thou., less than 3 in., and bore out to fit, which should be slightly less than the winding-drum flange of the compensating centre.

Go carefully now, taking very light cuts until the flange will just enter and rotate in the bore, without shake. Use a little oil on the flange. Next machine the relief on the inside of the bore, 1/32 in. deep by 5/8 in. wide: Its distance from the outer face should be slightly more than 1/8 in., so as to finish 1/8 in. when the face is finish-turned. The diameter of the spigot is 3¼ in. Turn the outer edge to 4¼ in. dia., and round off the outer corner.

Change the chuck jaws and reverse the work, with the bore sitting on the outside steps of the inside jaws. If these are reasonably accurate this should be near enough, for a slight eccentricity on the rope groove will not matter. Otherwise it will be necessary to pack one or two jaws, or to use the four-jaw chuck.

Rough-turn the outer face and then the rope-groove, of which the slightly bevelled sides may be "stepped" at this stage. In finish-turning, I used a stout parting-tool for the bottom of the groove, and then a round-nosed tool, set at an appropriate angle as in Fig. 1C, for one side. Here some nice manipulation of cross-slide and top-slide handles is necessary, to run out the curve into the flat part at the bottom. If the radius of the nose of the tool is about 1/16 in., this will give the right shape here. If the tool is now moved to the position as indicated by the broken lines, the other side of the rope-groove may be machined. Finally face off the outside of the drum, the spigot now being 3⅛ in. dia., and turn off the flange to 4¼ in. dia. Round off both flanges as drawn.

Driving the Drum

The drive for the winding-drum was described and illustrated on page 950, 5 October issue, and now Fig. 4 gives a close-up of the pawl in the "off" position, and the clamp for the winding-rope end. The cheesehead screws here are temporary only, to be replaced by hexagon-heads in final assembly. Individual components are on Sheet Four of the drawings.

In making the latch (from ½ in. by 3/16 in. b.m.s. bar) drill the ¼ in. hole before cutting the piece off the bar. The spring block similarly may be filed or milled to 7/32 in. thick, drilled for the dowel-holes, and drilled and tapped for the 10 BA screws, before cutting it off the end of a piece of ¼ in. square mild steel. My spring was made from a piece of old clock-spring, annealed by heating to red in a gas flame, and allowing to cool slowly. It was too wide, so the surplus was sheared off and the edge trimmed with a file to 3/16 in. wide.

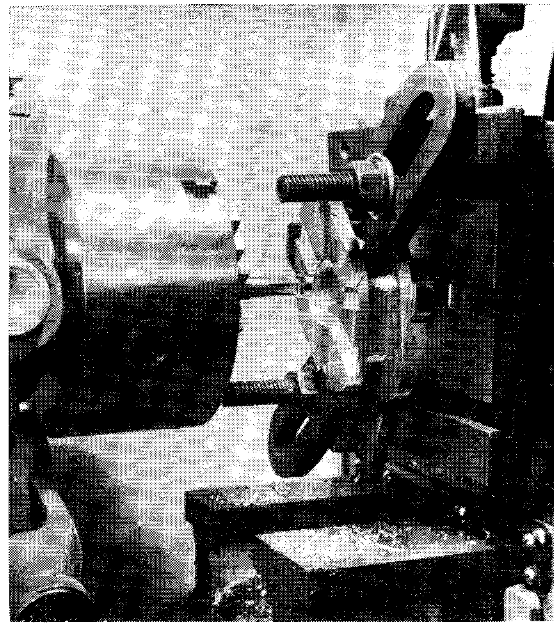


Fig. 5. Milling spoke grooves.

The holes for the dowels which secure the block to the rim should be jig-drilled from the block, and the block, dowels and latch-pivot may be sweated to the rim or secured with Loctite. The retaining collar for the latch is secured by a push-fit 1/16 in. pin, and the hole for this is drilled in place, through collar and pivot in one operation. Actually I used a taper-pin here, which meant drilling the hole at No. 55, and reaming it with the appropriate taper reamer. But a parallel pin will do equally well.

I have been asked if the latch should be case-hardened, and certainly this may be done, but I do not judge it to be really vital.

In practise it will not be found possible to make a tiny scroll which the drawing shows at the outer end of the spring, and it may be just turned up as seen in the photographs. Bending the spring to shape with round-nosed pliers is not difficult, but with the spring secured to its block, some adjustment of the bends may be necessary to get the pawl to take up the correct "drive" and "free" positions.

My spring, by the way, did not need rehardening and tempering: it had plenty of spring left in it. But if the reader's does not, it should be hardened right out, and tempered to dark blue.

Fig. 4

It is a source of some pleasure to me that the wire-rope available for the model is made by a firm who in the past have made many thousands of miles of rope for the full-size engines. A small thimble must be made for the end of the rope. Cut a strip of thin tinplate about 3/16 in. wide, and about 3 in. long to provide a hand-grip. With a rawhide or rubber mallet beat its edges over on the rounded edge of a strip of 16 gauge steel gripped in the vice; or the hollow may be punched in on a lead block using a punch. See Fig. 6 A-D.

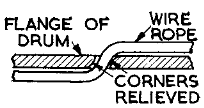
Trim the edges with a smooth file, and then bend the workpiece round a stub of 3/16 in. rod in the vice, to form a horse-shoe shape. Cut off to length, and file the ends to a mitre, so that they will meet correctly when the bending is finished, which is the next stage. The end of the rope should be fitted round the thimble, and spliced into itself, if you or a friend have the nautical knowledge. The joint is then "served", or wrapped with wire — 5 amp fuse wire is just the job. Failing splicing, the end should be served, and sweated up with solder paint.

Approximately nine yards of wire rope is the correct length, and the inner end is passed through a hole drilled in the outer rim of the drum, and secured by the clamp. The hole is relieved on its corners, so to speak, to avoid fraying the rope.

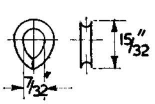
Having wound on the rope, its outer end was passed under and over the last coil or two on the drum. On the prototype, in her working days at least when I saw her, it was additionally secured to them with a piece of binder twine passed through the thimble and tied off. On the model a piece of thin thread will represent this.

As described in the 3 August 1973 issue, the right hand hind wheel is drawn by two pins which pass from its hub into a driving boss which is keyed to the hind axle outside the main bearing. This is further seen in Fig. 7: note that the pins do not go through to the outside here.

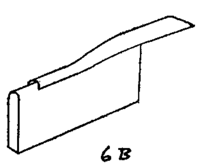
To be continued.



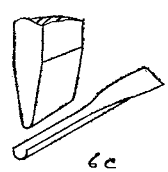
6D



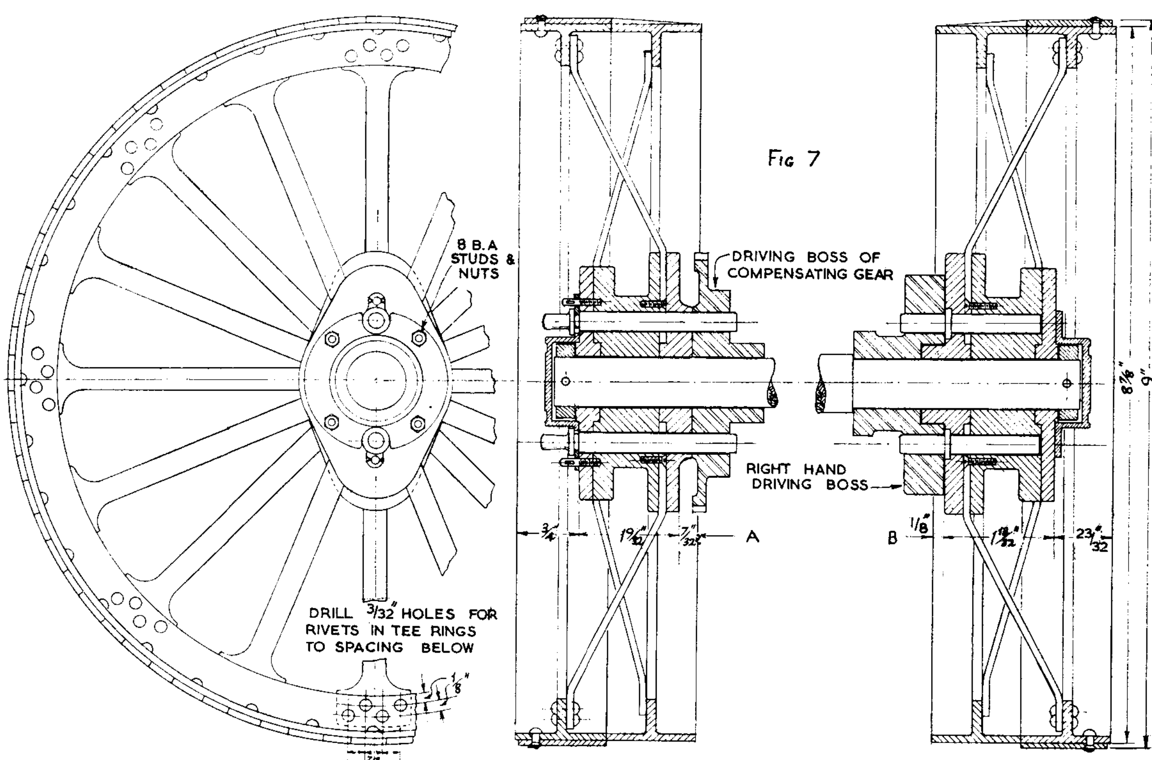
6A



6B



6C



HOT AIR ENGINES

by R. Sier

JUDGING by the number of letters in recent editions of Model Engineer, it would appear that there is considerable interest in hot air engines. I hope the following illustrations and brief notes will foster further interest. I am in debt to Jonathan Minns for the opportunity to photograph his collection of engines; most of them are of unknown make, but some may be recognised by a fellow reader of *Model Engineer.*

Figs. 1 and 2 are two examples of the small Robinson Engine. The first has an overall height of 31 in. with an 15 in. flywheel. Power piston 4 in. dia. by $3\frac{1}{2}$ in. stroke. Displacer $6\frac{1}{4}$ in. dia. by $2\frac{1}{4}$ in. stroke. The second is 21 in. in height with a $13\frac{1}{2}$ in. flywheel. Power piston $4\frac{1}{2}$ in. dia. by $2\frac{5}{8}$ in. stroke. Displacer 7 in. dia. by $1\frac{3}{4}$ in. stroke Both were probably gas fired. These engines built to Robinson's patent of 1886 were capable of quite hard work. A small coal-fired Robinson installed at Bodorgan Station, Anglesey was used for some fifty years pumping water in to the locomotive water tank until it was retired in 1949 by British Rail.

Fig. 3 is the Heinrici; note the brake on the right hand flywheel which is supposed to regulate the power output, but one cannot think of a more wasteful or inefficient way of doing it. Overall height 30 in. with 10 in. flywheels. The power piston is $2\frac{1}{2}$ in. dia. with $2\frac{1}{2}$ in. stroke and displacer 3 in. stroke. Water cooled.

Fig. 4 is another Heinrici and would appear to be for wall mounting. Overall height 19 in. with 8 in. flywheels. Power piston 2 in. x 2 in. stroke, displacer $2\frac{1}{4}$ in. stroke.

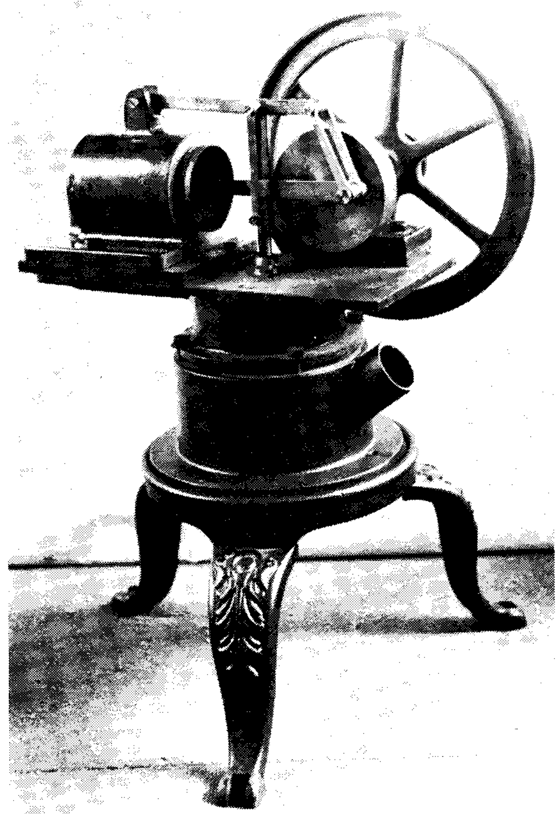
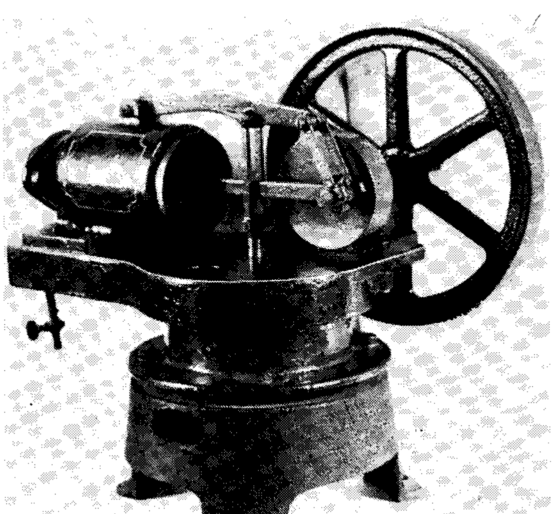
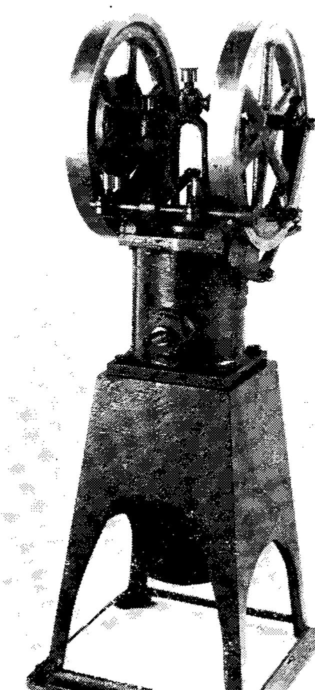


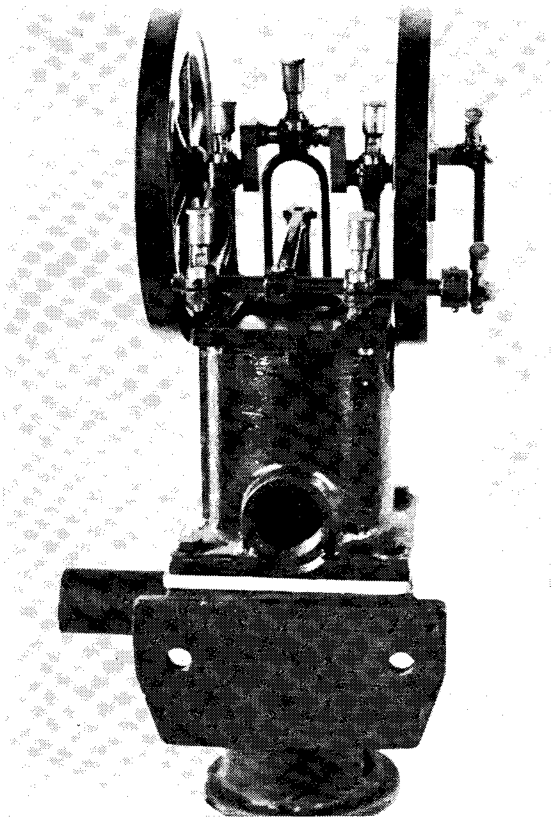
Fig. 1.

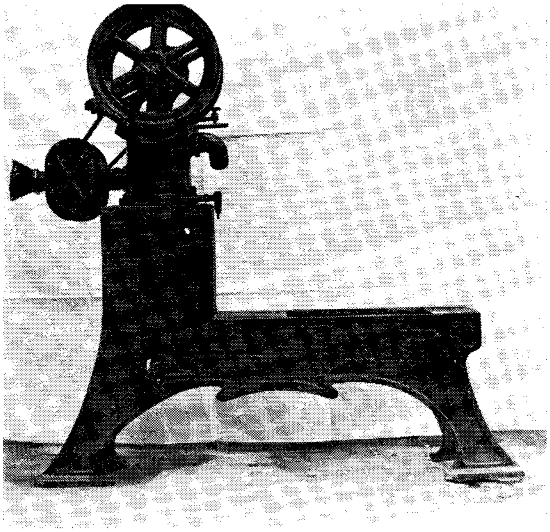


Left: Fig. 2.



Right: Fig. 3.





Left: Fig. 4. Above: Fig. 5. Below: Fig. 6.

Figs. 8A and 8B are of an interesting small motor with an oscillating power piston, the whole assembly tips back to enable cleaning of the heater chamber, note also the ingenious drive to the water pump. Forced water cooling and spirit fired, of unknown make. Overall height 11 in. with a 6 in. flywheel.

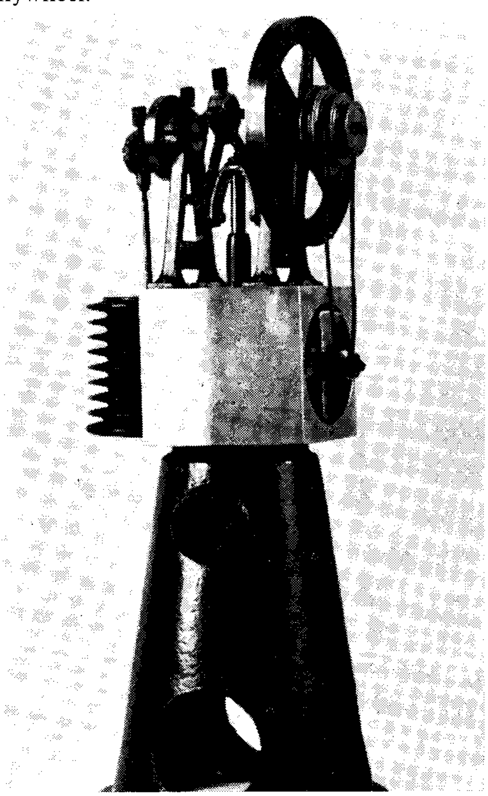
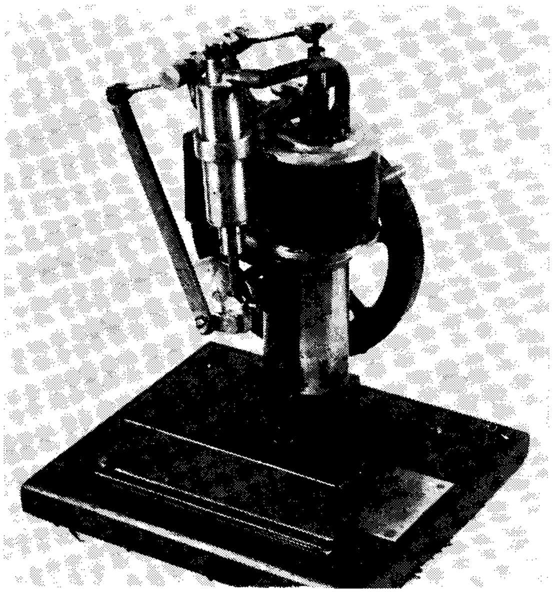
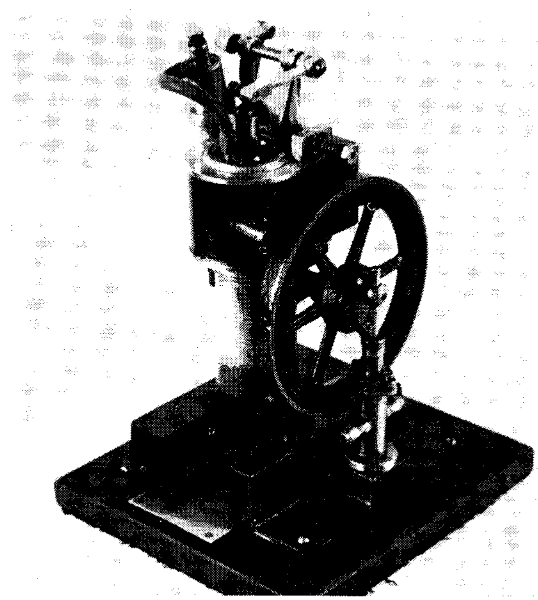


Fig. 5 is of an engine which I am at present restoring. The motor is a standard $2\frac{1}{2}$ in. Heinrici which drives a Roots blower by belt drive off one of the flywheels. Overall height and length is 37 in. x 38 in. The air from the blower is passed round the cold end of the engine. A small non-return valve admits air when the internal pressure falls below atmosphere. In Postbag 15th June Mr. G. K. Hughes describes an engine very similar to this one; unfortunately the burner is missing, so it is difficult to see whether it was used for gas production as in his letter, perhaps Mr. Hughes may recognise the arrangement.

Fig. 6 is an example of the Kyko engine which was also produced as a fan, and has ball bearings instead of the usual plain bearings, with forced air cooling, overall height $19\frac{1}{2}$ in. with $5\frac{1}{2}$ in. flywheel and power piston $2\frac{1}{8}$ in. dia. by 1 in. stroke. Displacer 2 in. dia. by $1\frac{1}{2}$ in. stroke, probably gas fired.

Fig. 7 is of unknown origin; note the intermittent drive to the displacer which I am told is very noisy in operation. Overall height $25\frac{1}{2}$ in. with $11\frac{1}{2}$ in. flywheel. Power cylinder $2\frac{3}{4}$ in. dia. by 2 in. displacer has $\frac{3}{4}$ in. stroke Water cooled and spirit fired.

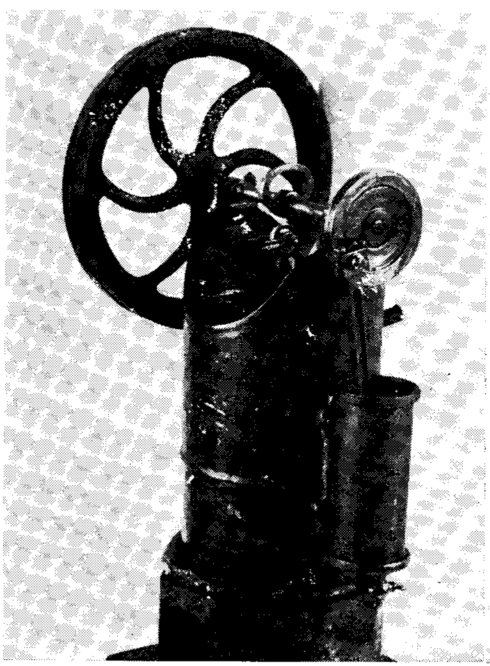




Above: Fig. 8A. Below: Fig. 7.

Above: Fig. 8B.

Below left: Fig. 9. Below right: Fig. 10.



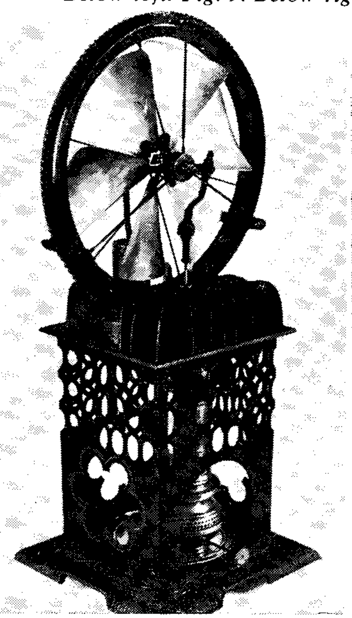
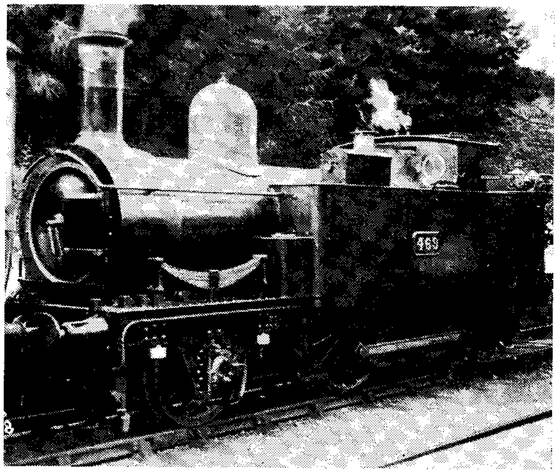


Fig. 9 shows a fan of interesting design but of unknown make. Bicycle spokes are used to support the fan and the outer supporting rim is cast in the form of a cycle tyre. Air cooled and heated by a type of oil lamp. Overall height 27 in. power cylinder $1\frac{1}{2}$ in. dia. by 2 in. stroke, displacer 2 in. dia. $2\frac{1}{4}$ in. stroke.

Fig. 10 is another fan on a brass tripod of elegant proportions. Air cooled and heated as before by an oil lamp of unknown make.

To be continued



Introducing

METRO

A new locomotive for 5 in. gauge based on the Great Western Railway "Small Metro" class

by Martin Evans

WHAT! Another Great Western? But before I start to apologise for describing two products of the famous Wiltshire locomotive works in succession, perhaps I might remind supporters of the products of Crewe, Doncaster or Eastleigh that in the past, the Great Western was rather neglected by contributors to *Model Engineer.*

A look through the M.A.P. catalogue of locomotive drawings shows that the following "live steamers" have been described for which drawings are still available:-

L.M.S. and pre-group associated companies	13
L.N.E.R.	8
Southern Railway	8
Great Western Railway	5
American types	3
Free-lance and B.R.	5

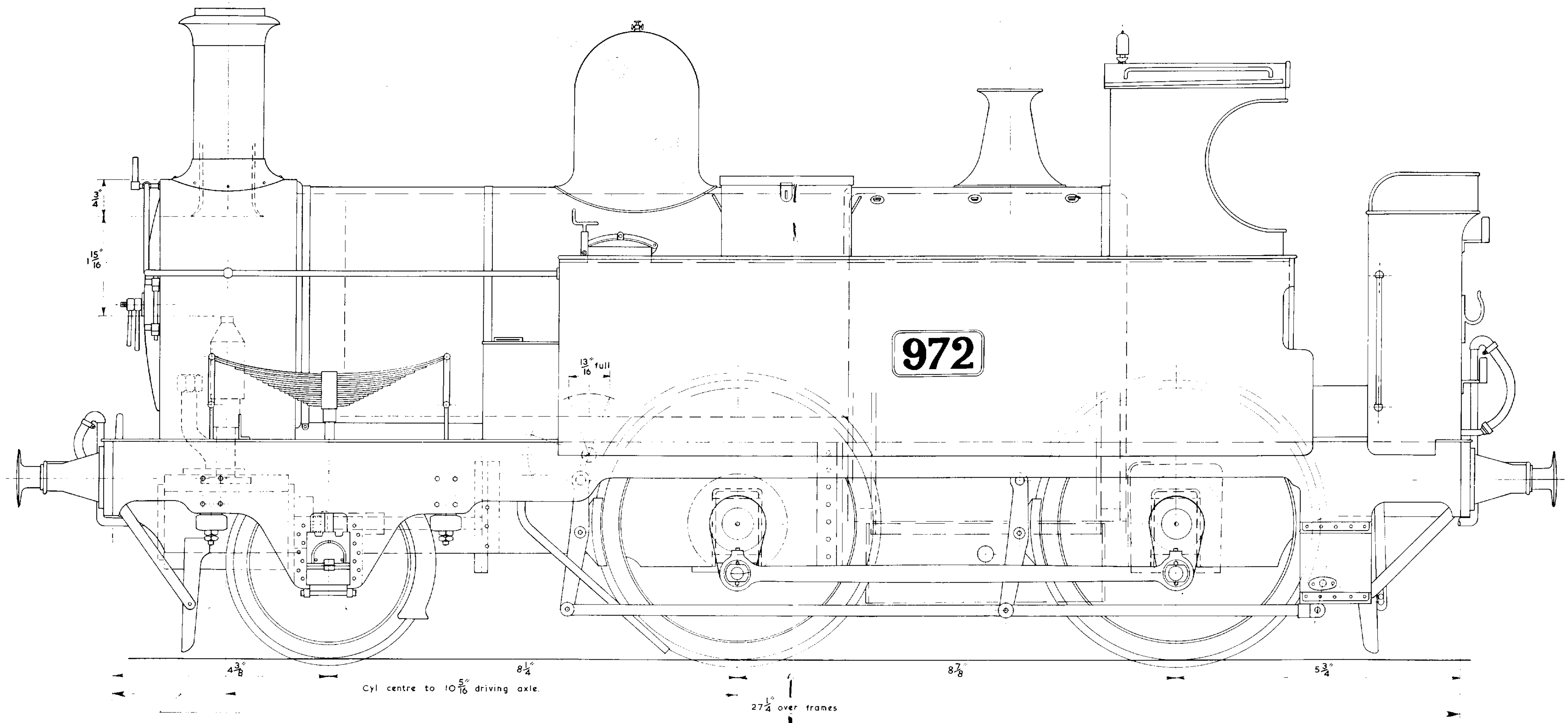
Apart from the question of the locomotive company, I thought that there was a demand for another very small tank engine for 5 in. gauge, something that would be powerful enough to keep up with the big "club" locomotives, yet small enough to go into the boot of a small car. Further, I felt that many of our older readers would welcome an engine that would not be too heavy to carry single-handed, as not all of these gentlemen can call upon the help of fellow club members, particularly when loading their locomotive at home, preparatory to a day at the track.

Then of course there is that vexed question of cost. I don't need to remind readers of the high cost of castings nowadays. This has not only been brought about by the high cost of the raw materials, but by the inability or unwillingness of the foundries to cater for the needs of the model engineer. But before we blame these foundries, do not let us forget that they are in great difficulties over obtaining suitable labour — very few young men today want to go into foundry work. Also we cannot blame the foundries for preferring to supply their larger industrial customers, rather than tackle the more intricate and less profitable loose pattern work beloved of the model engineer.

Prices

While on this subject, do not let us blame the model engineering trade either, for this price business. The Trade are doing their best to support us, in spite of the fact that every time we at *Model Engineer* bring out a new design of model, they have to make a number of new and expensive patterns, and the cost of these has to be spread over a comparatively small number of castings. Anyone in the mechanical engineering profession will confirm that it is very difficult to find first-class pattern-makers today, and their productions are accordingly very expensive.

Pondering over the question of a small engine that would satisfy the conditions I have just mentioned, I thought I would take a look through those classic works by the late J. N. Maskelyne — "Locomotives I have known", and "Further locomotives I have known", and I duly came across what I thought would be welcomed by many locomotive builders — the little 2-4-0 "Metro" tanks of the Great Western. Actually the type selected was known as the "small Metro", the larger type, sometimes known as the "Dancers" had no spectacle plate — at least when first built — so did not appeal on that account alone.



According to J.N.M., the small Metros were amongst the liveliest little suburban tank engines ever seen in the London area. They frequently worked the fast outer suburban trains in spite of their limited capacity for coal and water, and J.N.M. often saw them hauling six or seven heavy bogie coaches and covering the 36 miles between London and Reading in the scheduled time of 42 or 43 minutes, attaining 60 m.p.h. in the process.

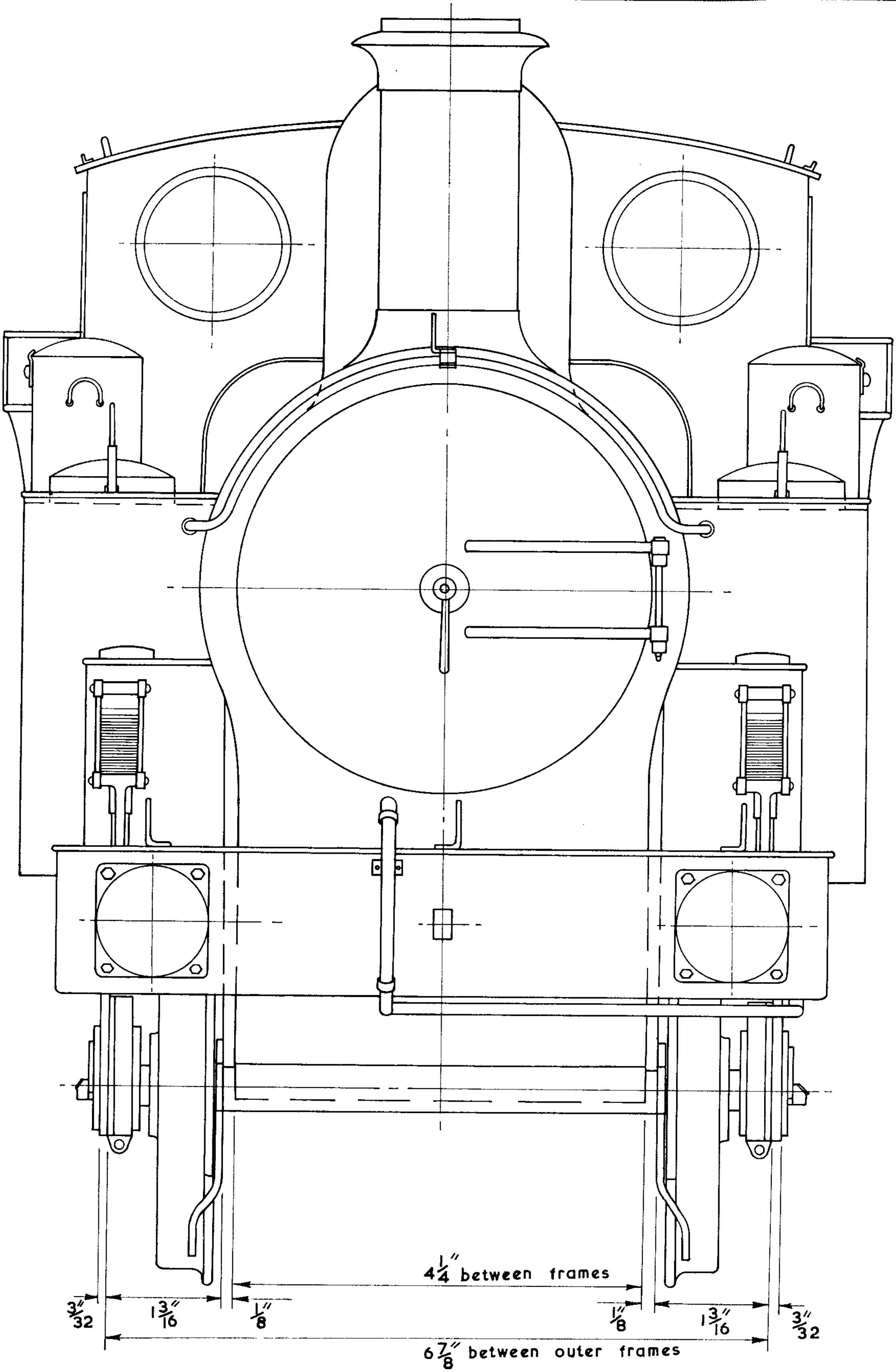
The small Metros dated from 1871, though a batch of 20 rather similar engines were built in 1869 and were subsequently modernised to make them uniform with the Metros proper, of which no less than 78 were eventually built. At first, many of these little engines were built without any protection for the enginemen at all, (for some unexplained reason, the early Railway Companies scarcely gave any thought to the comfort of their drivers and firemen, who must have been tough indeed to stand conditions in Winter!) but later on a small cab with the usual spectacle plate was provided. About 1920, the footplate was further improved by the fitting of a rear spectacle plate above the coaling plate of the bunker, which must have made the engines much more pleasant when going backwards.

The dimensions of these interesting little engines were as follows:- cylinders, with valves between the bores, 16 in. diameter and 24 in. stroke. Steam ports 1⅜ in. wide, exhaust ports 3¼ in. wide. Stephenson link valve gear with direct drive and the links with centre suspension. Full gear valve travel was 4½ in., with a steam lap of 1 1/16 in. J. N. Maskelyne gave the lead as ¼ in, with ⅛ in. exhaust lap (i.e. the opposite of exhaust clearance) but I think that J.N.M. might have been mistaken here, as these figures would not be likely to give good acceleration, for which the engines were noted. I think it more likely that the lead would have been ⅛ or 3/16 in., and the valves set "line-for-line".

Most of the class had the Belpaire firebox, as in my drawing. The boiler was 10 ft. 6 in. long between tubeplates, with a diameter of 4 ft. 3 in. It had 221 tubes of 1⅝ in. diameter, and was of course not superheated. The grate area was 14.6 sq. ft. and the working pressure 165 p.s.i.

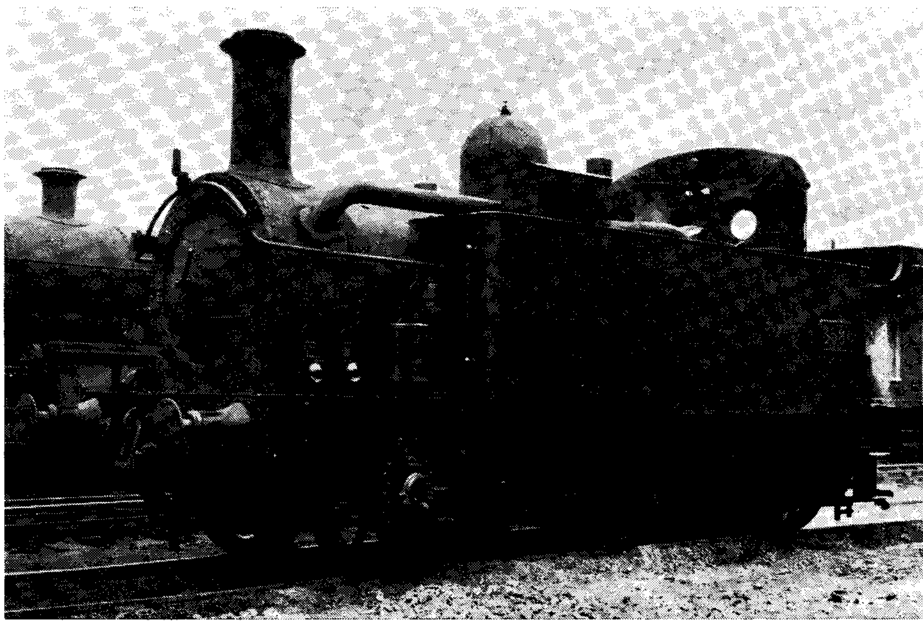
The tank capacity of these engines was 820 gallons, and the bunker carried 1 ton 12 cwt. of coal. Tractive effort was 13,900 lb.

In their early days, the Metros must have looked very smart in their green livery neatly lined out, with brass cast number plates in the middle of the side tanks, and with copper cap to chimney and polished brass dome and safety



4 1/4" between frames
3/32"
1 3/16"
1/8"
1/8"
1 3/16"
3/32"
6 7/8" between outer frames

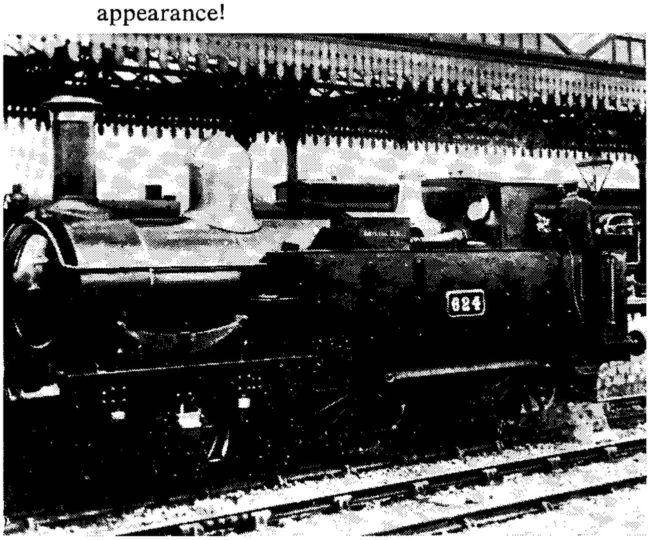
This is one of the "Large Metros," sometimes known as the "Dancers," fitted with condensing gear for working through the Metropolitan Railway's tunnels. Photographs courtesy Real Photographs Co.



Below: "Metro" class No. 624.

valve casing. But in more austere times (perhaps when Collett took over at Swindon?) all this finery was painted over, the chimneys being plain black, and the domes and safety valve casings green; I think they carried their brass number plates to the end — the last of the class was withdrawn in 1949, so she must have had a very long life indeed.

Now for a few words on the model. I have drawn her to our usual 1¹⁄₁₆ in. scale, but as I had to rely on the small drawing in J.N.M.'s book, I cannot guarantee that she is exactly to scale, though I don't think many Great Western enthusiasts will quarrel with her general appearance!



For the cylinders, I am adopting those provided by the trade for *Boxhill,* the 5 in. gauge Brighton "Terrier" which I described a few years ago, although I have had to lengthen the blocks and central steam chest slightly, to allow for the longer stroke. When we have to place the valves between the bores, I think the "common" steam chest is the only answer, but at least we have rather more room for the steam and exhaust connections and for the valve gear, than we had in the dimunitive "Terrier".

The cylinders, therefore, will be 1 in. bore x 2 in. stroke, and as this is on the small side for a passenger-hauler, I think we should go for a rather higher working pressure than is usually adopted for 5 in. gauge engines, viz. 125 p.s.i.

Boiler water feed might be a bit of a problem. Two injectors could be fitted, but great care will have to be taken to keep the water in the side tanks as cool as possible; perhaps a good thick layer of felt on the inside of the tanks, plus a small air space between this and the boiler will be the answer. As an alternative, we could fit a crosshead pump, as in *Boxhill.*

Although not a double-framed engine in the true sense, *Metro* will have ⅛ in. (or 4 mm.) thick main frames, to carry the driving and coupled axleboxes, while the outer frames which provide the bearing surfaces for the leading axleboxes can be ³⁄₃₂ in. or 3 mm. thick; these frames will be the full length of the engine and will incorporate the cab steps, so the whole assembly should be very rigid.

MAKING AN ENLARGER

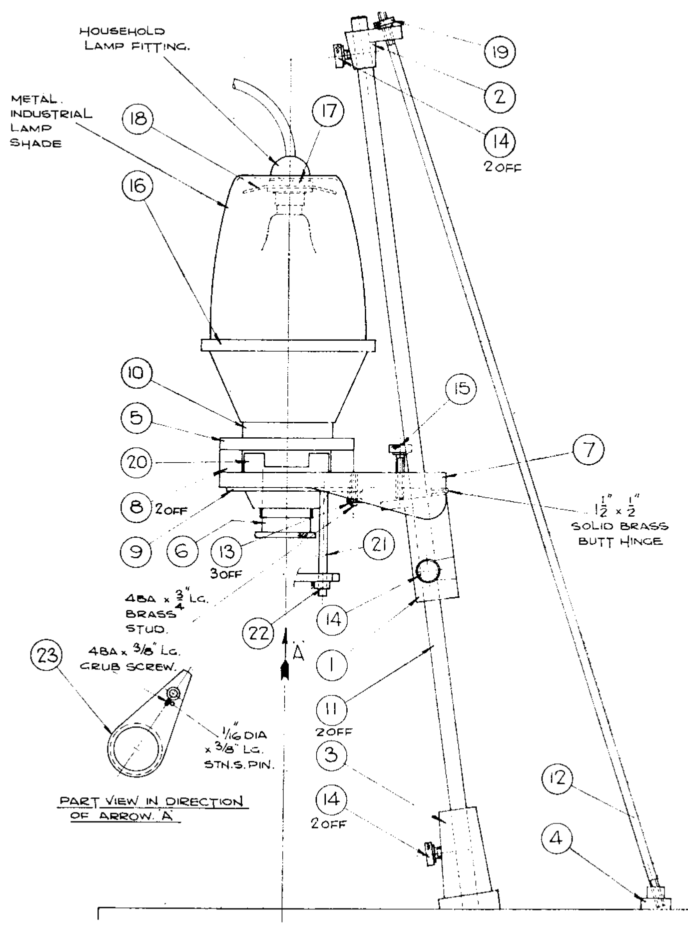
by D. H. Downie

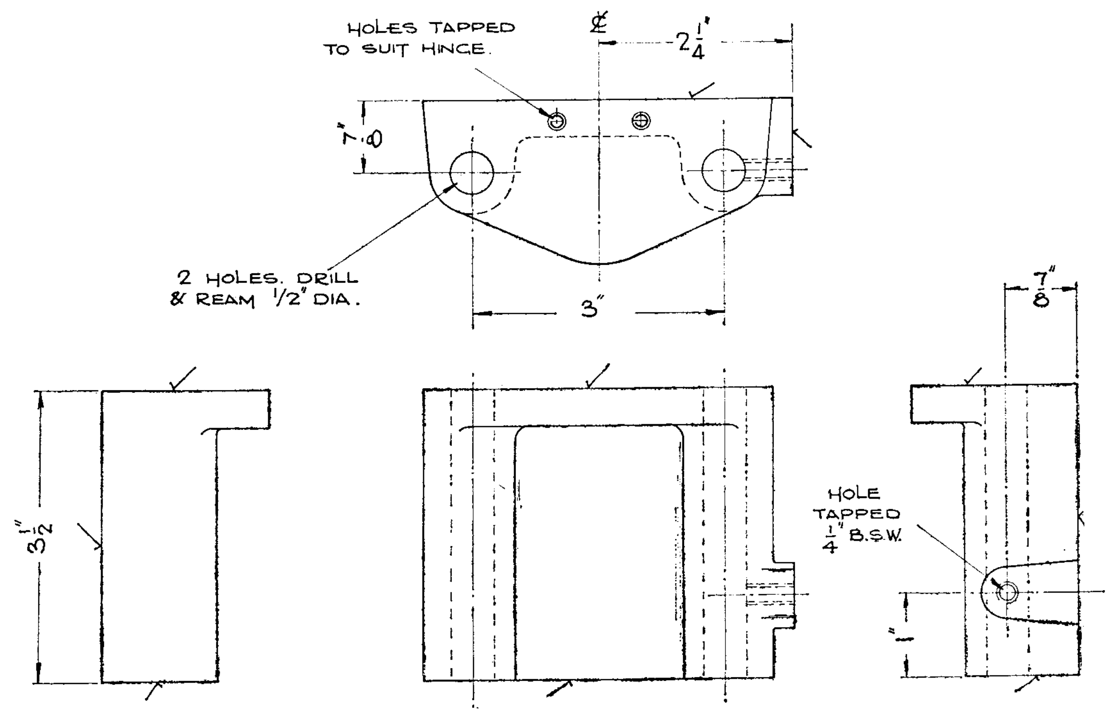
THE DESIGN FOR ENLARGERS for amateur use has not changed much in the past 30 years except in minor details. Price is often the deciding factor and one gets what one pays for. In general, enlargers have not kept pace with camera design.

A weakness of many enlargers is the tendency of the enlarger head to droop after some use. This results in the negative carrier being no longer parallel to the surface of the baseboard. This has been encountered in very expensive enlargers and is difficult to cure. For small negatives a condenser and opal lamp illumination system is very satisfactory. The negative carrier can be glass or glassless and experience has shown the glass carrier to be most reliable in giving the advantage of a perfectly flat and immovable negative. Single column enlargers suffer from lack of rigidity especially when the head of the enlarger is used towards the top of the column. In this position it is affected by the slightest vibration and big enlargements are not as sharp as they should be.

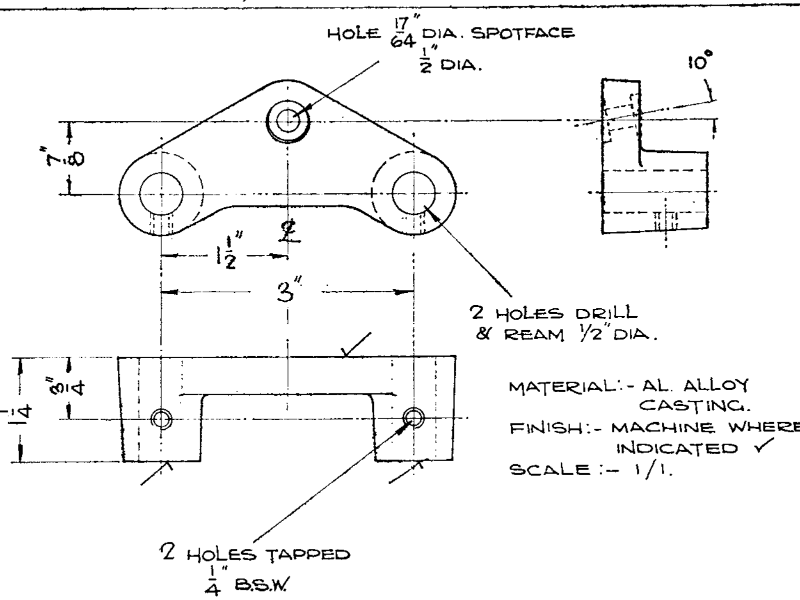
This enlarger was designed by the author for his own use and to overcome the failings mentioned. Important features are the extreme rigidity gained by the triangular structure supporting the head. The adjustable tilting negative platform ensures accurate parallelism of negative plane to baseboard. Yet it can be tilted to correct converging verticals when they occur in negatives of buildings etc. All components can be quickly removed for cleaning, dust is an enemy to good enlarging; after cleaning, all parts will go back accurately in plane and collimation. A photo-

The completed enlarger.

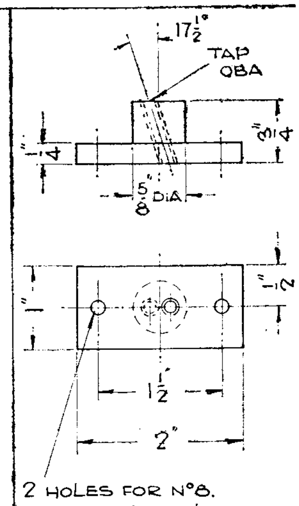




(1) MATERIAL :- AL. ALLOY CASTING.
FINISH :- MACHINE WHERE INDICATED ✓
SCALE :- 1/1.



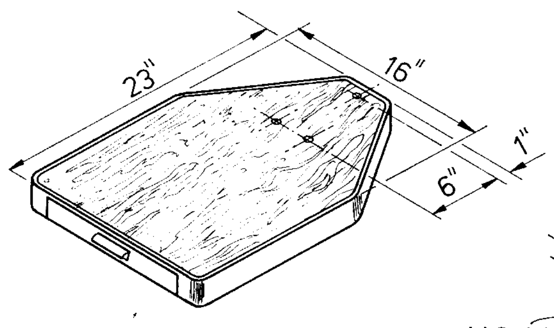
MATERIAL :- AL. ALLOY
CASTING.
FINISH :- MACHINE WHERE
INDICATED ✓
SCALE :- 1/1.



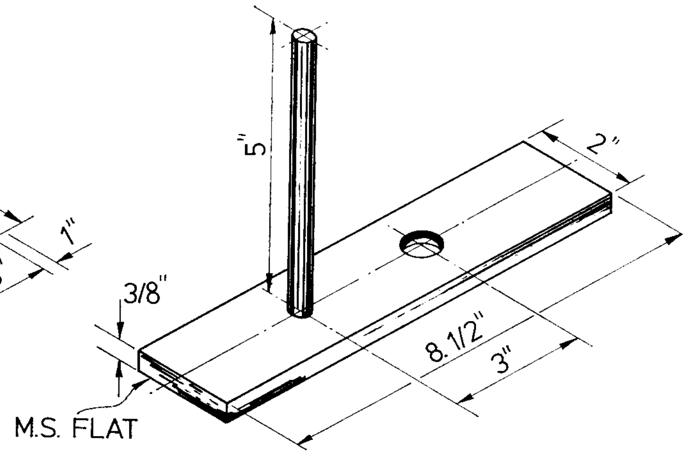
(4) MAT :- M. STEEL.
FIN :- MACHINE.
SCALE :- 1/1.

grapher who does not enlarge his pictures is missing a lot of pleasure and would be surprised to find how superior his own work is compared to the local 'D.P.' service.

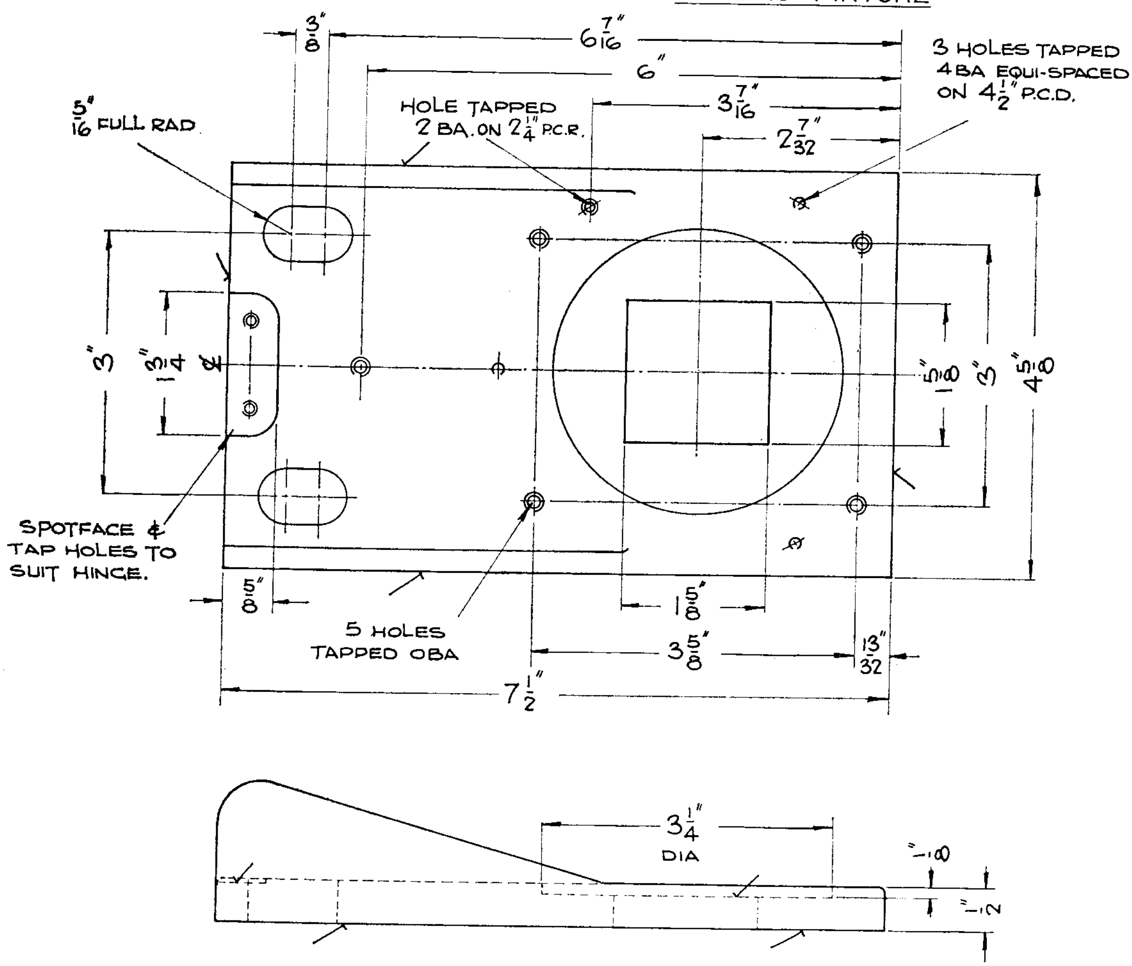
This enlarger is easily stripped down for storage and erected again in a matter of minutes. No sheet metal parts or pressings are used. Accuracy of the whole assembly is ensured by the use of



BASE 1"–3/4" BLOCKBOARD



DRILLING FIXTURE



MATERIAL :- AL. ALLOY CASTING.
FINISH :- MACHINE WHERE INDICATED ✓.
SCALE :- 1/1.

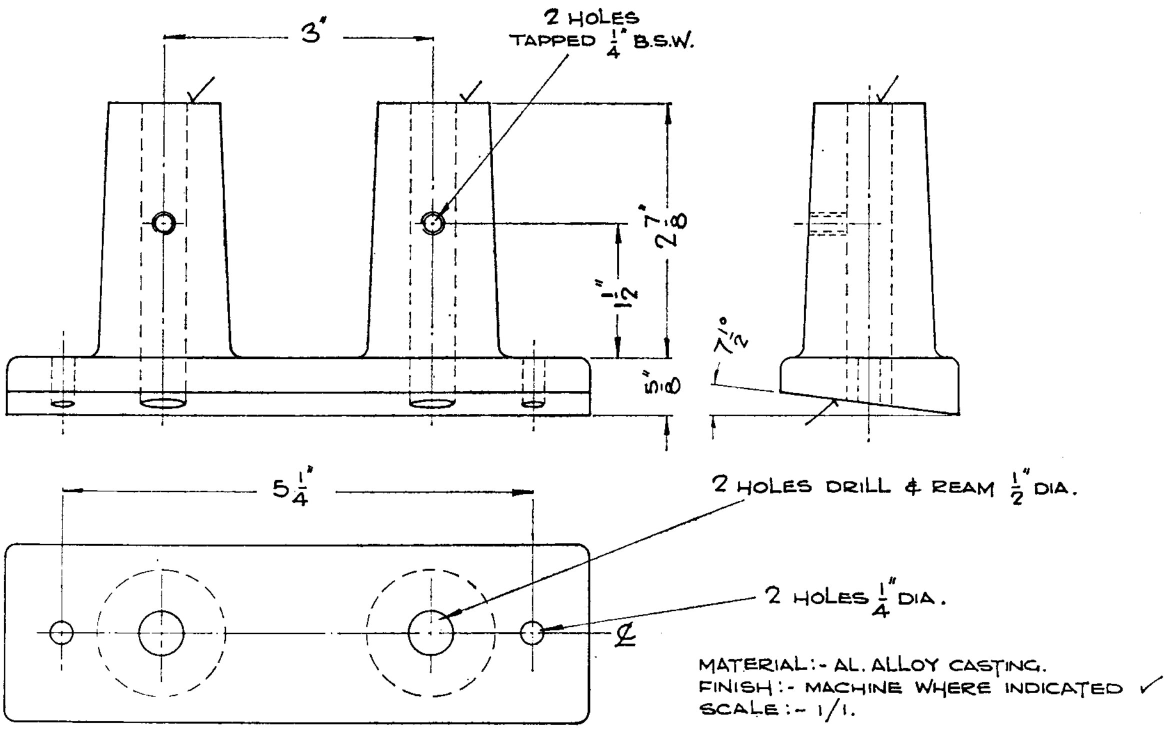


Figure: 3.

machined solid all alloy castings. These, machined with the skill possessed by the model engineer, will result in a luxury enlarger of the precision class. The lamphouse problem was neatly solved by using a standard steel industrial lamp shade readily obtainable.

The Patterns

These are simple one piece patterns as the drawings plus a 3/16 in. machining allowance. An interesting job for the school or college wood shop. Most school metal shops have casting facilities in Aluminium alloy and students are most enthusiastic in collecting alloy scrap when it is for a "take home" project or to equip the school darkroom and enjoy photography as a "liberal studies" subject. Follow my sequence of machining and you will have no real problems.

Prepare the baseboard first. This is of ¾ in. or 1 in. blockboard shaped as the photograph. Glue and pin ⅜ in. thick strips of mahogany or beech around the edges. Make a simple drawer arrangement underneath to store your paper. No need to cut elaborate joints, the strength of modern glue is such that half lap or simple butt joints pinned and glued are satisfactory. With the base finished you have a convenient foundation on which to assemble the parts as they are machined.

Bottom Bracket (Pt. 3) Sliding Head (Pt. 1) and Top Bracket (Pt. 2).

For a datum face, machine the bases of all three castings. Mark out the ½ in. dia. holes at 3 in. centres on the opposite ends. Clamp to drilling machine table, centre drill, then drill and ream to ½ in. dia **one hole only** in each. Drilling only is sufficiently accurate if after centre drilling you drill ⅜ in. dia. then open out to ½ in. dia. finished size. Use lubricant on all machinery operations to avoid built up edge on the tools and poor finish. Now make up a simple fixture as my sketch. Clamp the fixture on to the drill table in the correct position for 3 in. centres. Mount each casting in turn on the fixture, clamp and drill the three castings in succession without disturbing the table or fixture. The pitching of the holes must be to close accuracy to allow the head to slide freely. If you use this simple method you will be pleased with the result when you assemble. The base of the bracket (Pt. 3) is now machined off at an angle of 7½ deg. to give the correct tilt to the columns. To make it easy for local students I introduced a hardwood packer planed at the 7½ deg. angle to go under the bracket. Set out, drill and tap the ¼ in. Whit. holes in the castings; prepare the two ½ in. dia. rods from b.m.s.

To be continued.

Watching the wheels go round

by "Chuck"

CHUCK may well be excused for imagining that one of the reasons for the Steam Engine being so popular a subject with model makers is the final fascination of being able to watch the wheels go round. He frankly admits to the same fundamental failing in this respect and at any time will willingly join the queue. Added to this, of course, he has had the privilege of living at a time when the sight of moving machinery of all kinds was commonplace — and he has his memories.

Not least of these memories was of the gas engine. The "open crank" type engine. Many of these were run on heavy oil or paraffin and not on gas at all, but of course the general effect was the same. They performed all sorts of duties — pumping water, driving machinery in small workshops, providing electricity on remote estates and so on, and Chuck even knew of a gas engine driving the mincer, for making sausage meat, at the rear of a butcher's shop.

Of the gas engine it could be said that while it was unashamedly an internal combustion engine; it was, frankly, only the combustion which was internal! Everything else was freely exposed to view. And, while the combustion could not be seen, it most decidedly could be heard!

If, as was indeed likely, the engine was equipped with a "hit-and-miss" type governor, not only could the combustion be heard, but the mis-fire as well. The resultant rhythm which went something like this: — Thump!- thump!- thump!- CHISH!- thump!- CHISH!- thump!- thump!- CHISH!- thump!- thump!- thump!- . . . would have had the modern pop group licked to a frazzle! And all this was accompanied by the rattle of the valve gear and the odour of hot oil!

All the foregoing only leads up to an excuse for Chuck's sudden ambition to make a model of one of these beasties to which the crowning glory would have been twin flywheels! But, as will be seen, the locating of the timing wheels on one side of the engine would have meant the placing of the second flywheel at an ungainly distance from the main frames. Thus Chuck had to be satisfied with a single wheel and since this was to be chopped out of a solid chunk of bronze, perhaps the decision was a happy one.

No Sparks

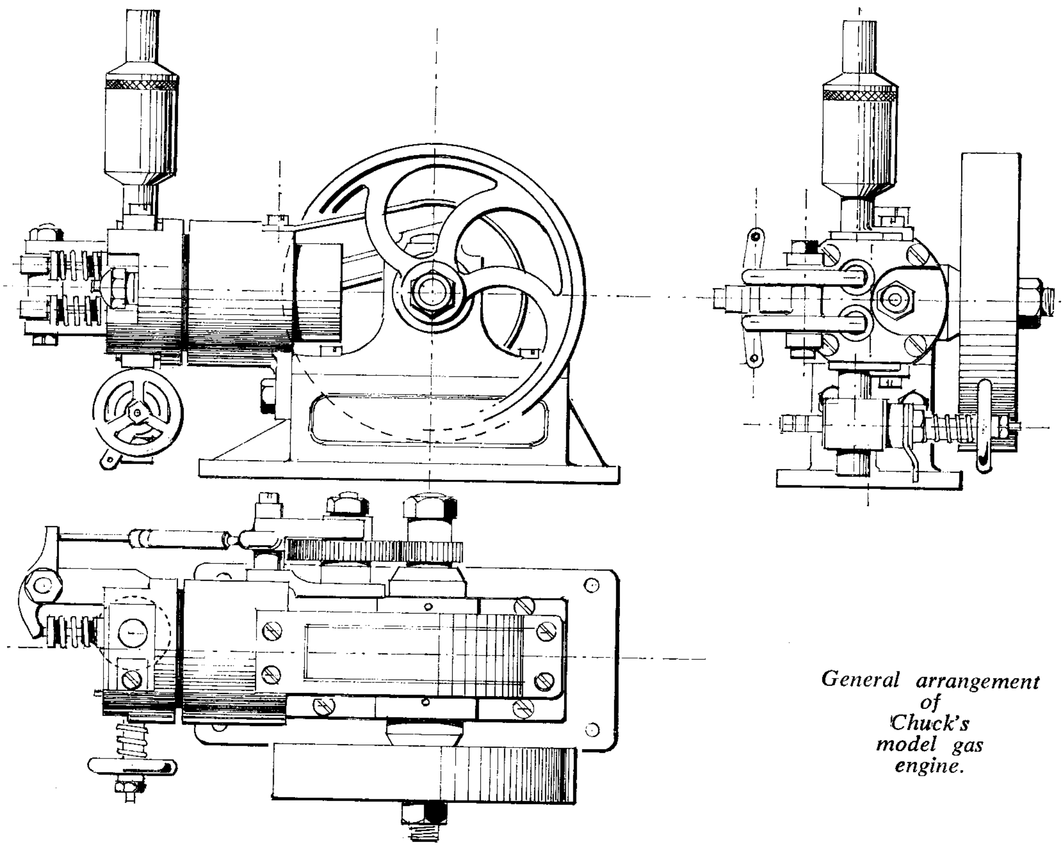
The engine Chuck decided to make follows no prototype, but is largely based on a mixture of memory and imagination. He makes no claim to engine "design", although many of the features may prove to be novel, but he enjoys the added challenge of being able to arrange things to suit himself and still make 'em work. Part of the incentive was the realisation, quite a few years ago, that these miniature four-stroke engines could easily be run on glow plugs, thus obviating the need for complicated electrical ignition.

Chuck was one who suffered from the apparent idiocyncrasies of spark ignition as applied to miniature engines and older readers may remember an article written some years ago when he frankly admitted that some of his engines were heavier on starting-cords than they were on fuel!

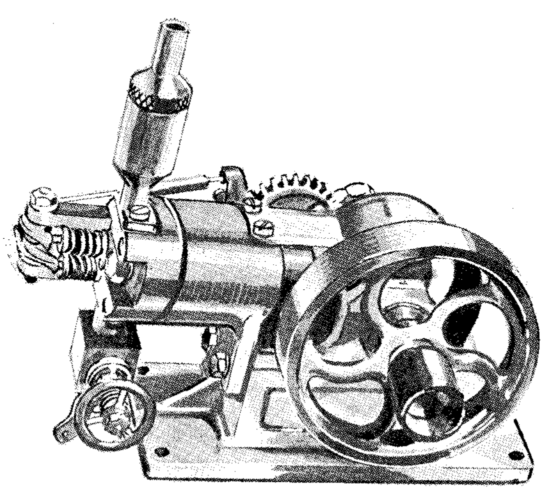
Sub-miniature ignition coils and dodgy contact points may well have contributed to the difficulties and, perhaps, Professor Chaddock put his finger on the problem when he told Chuck that the hydro-carbons, on which the engine depends for its function, have a deleterious effect on the ignition system. On full-size engines the problem does not arise because of the physical distance which separates the spark-producing equipment from the working parts. But on a miniature engine the contact-breaker, for example, is frequently mounted directly upon the timing gear and completely exposed to atmospheric fouling to boot!

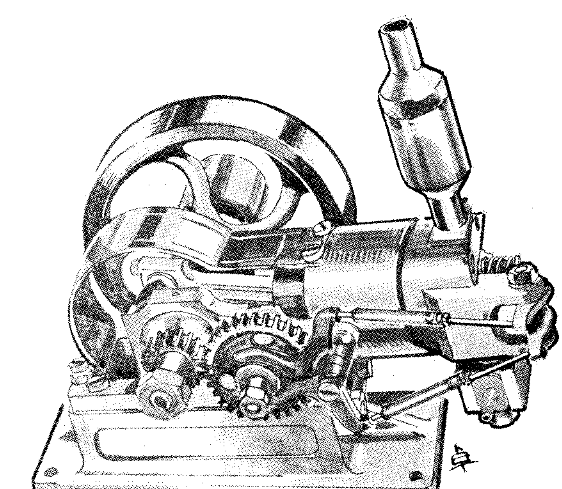
It is more than likely that the idea of making use of glow-plugs as applied, for example, to commercial two-stroke aero engines, had occurred to modellers all over the world. It was an obvious thought, and many made use of it. The question, however, of what happened to the glow of the plug during the prolonged idle period of the four-stroke cycle may well have led others to doubt the practicability of the system. Since commerce had no use for miniature four-strokes, there appears to have been practically no development of the principle and it seems that amateurs, like Chuck, are the only ones to show any interest in the possibilities and thus there is still much ground to be covered and many interesting facts to be learned.

Readers who remember the Chuck cartoons will realise that the old lad was not averse to a bit of experimenting at odd times, often with quite disastrous results! And his tentative adventure into the realms of glow-plug ignition was a sheer "Chuckism" if ever there was one.



General arrangement of Chuck's model gas engine.



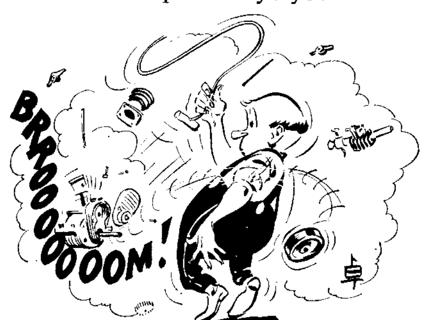


Engine No. 2, in his early experience with engine building many years ago, was an O.H.V. model of approximately 5 c.c. capacity; machined (if the word is applicable) on a Super Adept lathe and from any odd lumps of material he could lay his hands on. This engine with spark ignition, started for him (in front of a witness, too!) at the first pull of the string! Beginner's luck, of course! The engine soon exhibited (as did many of those that followed) all the temperament of the breed and was eventually relegated in disgrace to the dark corner of the workshop shelf.

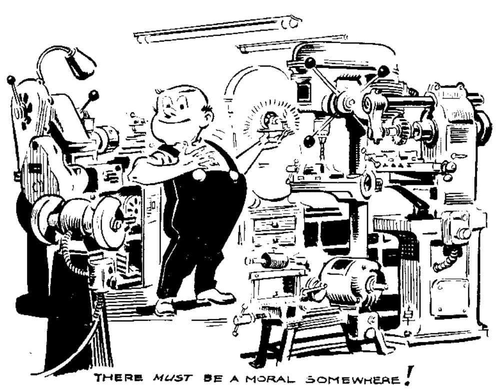
As the thought developed in Chuck's lively mind, this old and forlorn engine again found itself, probably with some surprise, clamped to the bench, awaiting the inevitable "thrashing" it usually sustained before it could be reluctantly persuaded to exhibit a glimmer of life. It was the work of a moment to exchange the spark-plug for one of the "glow" variety and Chuck seems to remember that the only alcohol for fuel that he had by him at the time, was methylated spirit laced with a drop of commercial glow fuel. Be that as it may, the battery was connected and the flywheel swung.

The result, to say the least, was spectacular! The engine had been assembled by a beginner and, as it had been some time since it had given its builder the satisfaction of so much as a brief run, little attention had been paid to the locking of nuts and screws and so on. The engine just screamed, uncontrollably, to life in a way it had never performed before and, within seconds, commenced shedding its working parts in all directions!

By the time Chuck had managed to get his finger on the trigger, so to speak, the thing banged to an abrupt stop with its flywheel spinning about the floor of the shop like a yo-yo!



SHEDDING ITS WORKING PARTS IN ALL DIRECTIONS!



THERE *MUST* BE A MORAL SOMEWHERE!

Recovering from his surprise, he set about retrieving the odd nuts and bolts, springs, pushrods and so on, which were now scattered behind the lathe, under the benches and in all the usual inaccessible places (the standard equipment in most amateur workshops for the reception of errant components in unguarded moments).

With appropriate attention paid, this time, to the securing of these accessories, Chuck made his second essay. To cut a long story short, the day eventually dawned when the old engine had a Veron Marlin planing, multi-channel, across the pond! And this duty it could sustain without limit.

What! No Castings?

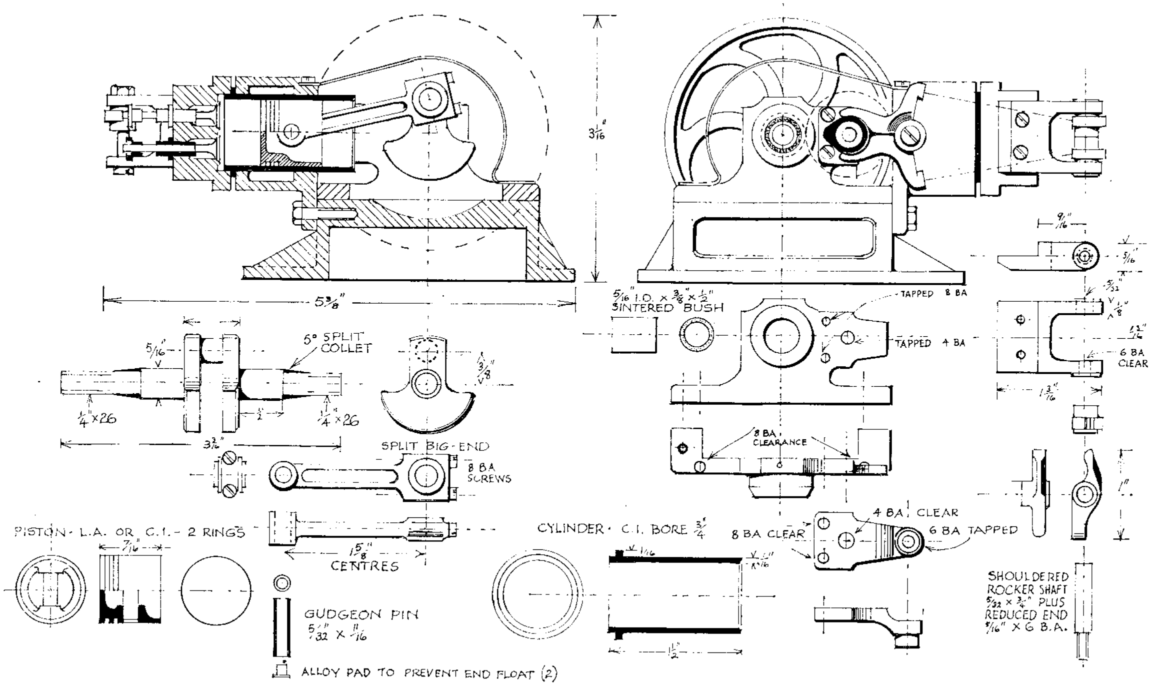
Chuck's model gas engine then is NOT a gas engine! It runs on methanol! With luck on our side it can be started by spinning the flywheel with the fingers. If it is at all reluctant to start, a cord pulley is screwed on the extension of the crankshaft and it is an instant starter. The exhaust is clean and the odour little worse than that of the toy steam engine run on meths. When Chuck has had the privilege of demonstrating some of his models at club meetings in the area this little engine never fails to give a satisfactory account of itself.

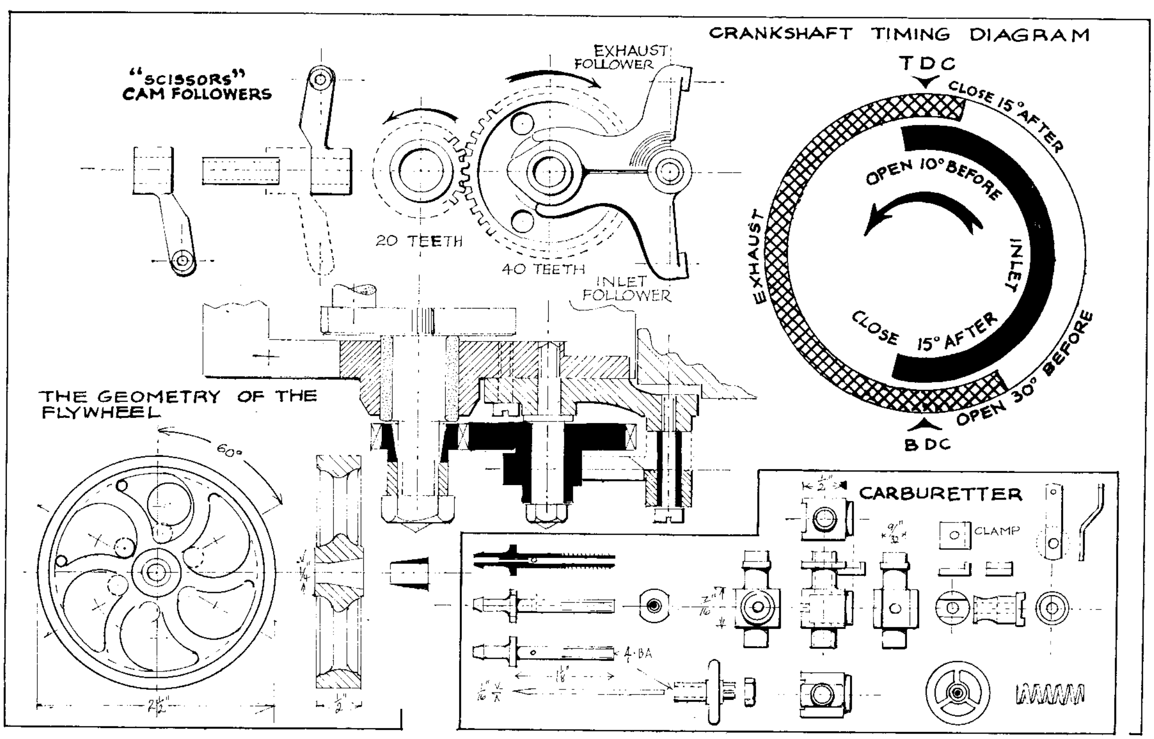
No actual castings have been used for this model. The iron for cylinder, piston and rings is home cast but as bar for turning; otherwise the whole of the model is machined from solid material, mostly duralumin from the scrap box. None of the pieces is very large. The heftiest, the base, required a block 4 in. x 1 in. x $1\frac{3}{4}$ in.

Chuck does not presume to instruct readers in this process. He believes it to be a good deal more popular than that of making one's own castings at home. Anyhow, it made for a change for him. It was, in fact, something of a challenge, particularly when it came to the flywheel, which was made from a disc of bronze, 3 in. dia. and $\frac{1}{2}$ in. thick. Its size made it necessary to saw it from the bar by hand.

He likes to make his crankshafts of high tensile material and since he did not have a H.T. bolt about 3 in. long and with its head in the middle instead of at one end, he made it in two parts. The pin was machined solid on one web and the other fitted to it. This made a split connecting rod (as shown in the drawings) unnecessary, so the big-end was made plain and slipped on before the shaft was permanently assembled. Apparently with success too! But, unhappily, Chuck does not remember how he accomplished this feat — and being a firm believer in "let well alone" has no intention of dismantling the motor to find out!

The main frames which carry the sintered bushes which serve as main bearings to the crankshaft and also, on one side, the timing gears, were cut in the first instance from one solid piece of dural. This enabled Chuck to ensure that the journals were in line. The two sides had ultimately to be separated down the middle so that they could be assembled with the crankshaft. Of course, the slitting saw left a space between them, a millimetre wide, which when the frames were finally assembled onto the base, was filled with





small rectangles of paxolin.

The part which we will call the cylinder wrapper; i.e., the aluminium sleeve into which the liner proper fits and which has, on its underside, the bracket or flange which bolts to the base, was also turned out on the inside to form a water jacket for cooling. But no coolant has ever been used. Methanol as a fuel runs remarkably cool. If such an engine were put to continuous duty, however, it would probably be another matter. Cooling is certainly needed on Chuck's marine engines which run on the same fuel, although an early converted engine of 5 c.c. having a finned cylinder, is happy enough with a 2 in. dia. fan driven by means of an O ring from the crankshaft.

Paradoxically, while on the subject of engine cooling, Chuck has found that while the engines themselves run at a reasonable temperature on methanol, the exhaust pipe is quite another matter! Commercial two-strokes, running as they do on a very oily fuel and with an even oilier exhaust, are able to employ rubber or polythene tube for exhaust extension. Not so Chuck's engines, polythene melts instantly and rubber or neoprene goes up in a cloud of evil-smelling smoke! Which is a bit of a humbug from our old friend's point of view. He takes pleasure, from time to time, in running some of his engines on the bench in his workshop. There is a steel tube for the purpose, which penetrates the wall into the atmosphere and the same has attached to it a length of neoprene tube which, in turn, can conveniently be connected to an engine exhaust. But there is something of Hobson's Choice about the matter. The option is one of choosing between exhaust fumes or stinkin' rubber! Methanol, by the way, is by no means the final word. You should see some of 'em go on paraffin! But more about that, perhaps, at a later date.

A Well Equipped Workshop

This brings us to the valve-operating mechanism, which is not going to please the experts at all! Both valves are operated by one cam! But let's face it! There must still be some home workshops where, apart from a lathe as a main item of equipment and possibly a small sensitive drilling machine, the most versatile weapon is still the humble file! And this is one instance where a man who is handy with this tool, and not afraid to use it, could have the sophisticated, "mill it or bust" merchant at a disadvantage.

It is only a few days since Chuck Junior (or Son of Chuck, if you like) showed Chuck Senior an article in a "home" woodworking magazine on how to make a kitchen stool! The description, illustrated at some length, involved the use of circular saw, planing machine, mortiser, spindle moulder, pillar drill etc. etc. In fact just about every item of woodworking machinery imaginable. You name it, he needed it! Ultimate value of stool £2.50. Value of gear? Well, Junior, running through the list of advertiser's products, gave up the calculation when he reached £1,000! There *must* be a moral somewhere! Well, maybe Chuck's valve gear is the answer. Having prepared the blanks required, the humble file can do the rest.

What *is* involved, anyway? To begin with, the timing of the engine relies upon three components. The cam and two followers. The cam itself can take almost any form so long as it has a lobe on it. In fact a simple eccentric may well serve the purpose. The followers are cut to resemble the shapes in the drawing but with the "tappet" ends left somewhat longer than would eventually be required.

The actual finishing of these three items is shelved until the remaining parts of the engine are completed and can be assembled. Still unhardened, they can then be temporarily fitted for timing the engine. Chuck does not believe he exaggerates when he says that almost any valve events can be accommodated in this system, but we're not looking for ultimate efficiency:—only satisfactory running.

Depending on the width of the lobe, i.e., be it a sharp profile or an obtuse one, the followers will either almost meet when the piston is at t.d.c. or be at a relative distance apart. The important feature is that they will both be riding on a cam flank and that therefore both valves will be open. Both the cam flanks and the followers can then be modified until the desired overlap is obtained. This is not a big job as only small amounts of material are being removed and the components must be checked frequently 'in situ' to make sure that the marks are not being over-shot.

At the other end of the scale the opening of the exhaust valve and the closing of the inlet valve can be regulated in the same way. A cardboard disc fixed to the flywheel and suitably marked off in degrees helps to get the events pretty close. Chuck gives a timing diagram which, if followed, will most certainly work. In this case, of course, it is the extremities of the followers that are adjusted, by shortening, until by observation the valves are seen to be opening (or closing as the case may be) precisely on the marks indicated by the cardboard disc. It will be realised that, for all of the foregoing, the timing train will have to be complete and the gear locked on the crankshaft.

Lubrication presents very little problems with this engine. One simply points an oilcan in the appropriate direction and gives a squirt as needed. There is a well or reservoir under the crankshaft and, no doubt, the big-end could have been fitted with a dipper. But here we come to the question of scaling down nature or "the sparrer and the eagle!" We're dealing with the sparrer and even at a "tick-over" his wings flap a good deal faster than do those of the eagle. Our engine sounds to be nicely throttled back when she's doing 1,000 r.p.m. and at that speed the oil from the well is getting sprayed all over the place! So a little bit and often is the order of the day, and Chuck finds the occupation quite pleasurable in any case. A jolly good excuse for watching the wheels go round!

From Chuck's point of view, little seems to be known about the function of this "hot spot" type of ignition as applied to four-stroke engines and he has been fumbling about for years without being able to decide the question of what compression ratio for what fuel. There does, however, seem to be little doubt that, within limits not yet clearly defined, the higher compression ratios function more successfully than the lower ones. The compression can be raised to the stage where the engine becomes difficult to start. Not because it fails to fire, but because it persists in firing too soon. There seems, therefore, also to be a direct relationship between the compression ratio and the ignition timing.

But for successful running the matter is one of arriving at a compression ratio which will keep the plug glowing after the battery has been detached. It is also desirable to be able to use the fuel without dope and without the admixing of other ingredients which is always a messy job. To this end some of Chuck's more recent engines have practically no combustion chamber at all. The face of the cylinder heads have been scraped flat and the face of the block likewise. The two parts are simply held in close contact by the holding-down bolts, without packing or goo, and the joint does not leak. The valves are recessed into pockets with clearance enough to allow the gases free passage past the heads and the remaining combustion space is the cut-away round the business end of the plug.

A Good Deal Of Water

In the case of this little gas-engine, as the drawings indicate, there *is* a combustion chamber because the cylinder head is bored out large enough to fit tightly over a spigot extended from the cylinder barrel. At the time he built this motor Chuck thought that this was the best way to maintain pressure tightness. Thus the compression ratio is not particularly high. (Heaven knows what it really is!) Methanol does seem to vary as a fuel, batch by batch, and if the particular stock of the moment fails to keep the plug hot in this engine the remedy is the addition of about 5% nitro methane or amyl nitrate. (Either seems to have the same effect.) When neither of these is available a satisfactory addition to the pure methanol is about 10% commercial glow fuel such as Nitrex. True, this latter adds a certain amount of oil, too, but this does no harm, is totally burned, and probably functions as an upper cylinder lubricant.

A good deal of water is produced by combustion when the carburant is methanol and a new engine is likely to exhibit signs of rust in the combustion chamber. The small addition of oil to the fuel in a case of that sort is obviously beneficial.

Chuck's "carrrbrettoot" (as a Scottish acquaintance of his used to call it) for this engine is just about the simplest type, with barrel throttle, imaginable. The tiny handwheel is the mixture-adjusting screw and this, made of dural, has a screwed collet at the outer end for gripping the 1/16 in. brass needle. No elaborate fuel feed is necessary and no float chamber. The engine will run its low-level "mustard tin" fuel tank until quite dry which seems to indicate that the combination of capilliary action and syphoning is quite satisfactory for a motor of this size and duty. With the throttle fully open, of course, the engine goes like billy-ho! and looks absurd for its type but at the other end of the scale, at slow speeds, looks and sounds quite characteristic and will plod along for hours.

MODELS TO MAKE

SIR,—A few months ago I acquired a lathe and after many hours of practice with "off cut" pieces of metal I am now fairly competent in turning and facing. I would now like to attempt some working models but must confess I am totally green where models are concerned.

I should explain that I am blind; although my wife reads to me the articles in M.E. she finds it difficult to describe the diagrams, and neither of us understand all the terms used in model making; there are no Braille books on engineering of any kind. I do not know any blind model engineers and if there are, would be grateful for any advice they can give me, and would be very pleased to hear from them.

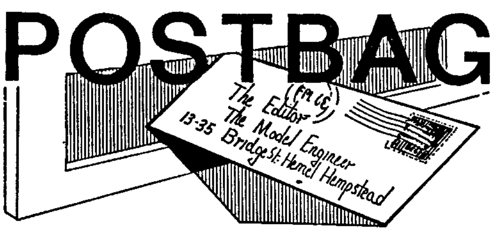
Perhaps some of your readers have models that were started but never finished—because of lack of interest and time. I would like to hear from them, as this kind of thing will enable me to "look", take them apart and learn about construction.

I must point out that owing to other disabilities I am unemployed, so nominal prices, please, for such items with as much information as possible about them.

8 Douglas Haig R.D.
Salisbury,
Wilts.

E. J. CHIPPERFIELD

POSTBAG



The Editor welcomes letters for these columns. He will give a Book Voucher for £1.50 for the letter which, in his opinion, is the most interesting published in each issue. Pictures, especially of models, are also welcomed. Letters may be condensed or edited.

Boiler Safety

Sir,—My service I think! In reply to Mr. Cain's withering backhand I also hope nobody will rush outside to their oil tank with a tyre pump. Nevertheless my examples still stand.

1. Of course you can exert a pressure with your thumb, and any other instrument. Practically every tool in the workshop does its job by exerting pressure, a force applied to an area. My thumbprint covers about half a square inch. I can shove about 50 pounds on the scales without injury. Hence 100 p.s.i.

2. My friend in the workshop next door does not know about Grashov's formula, but he does make oil tanks, and he does blow them up with the shop compressor to test for leaks. He normally gets about 50 p.s.i. by the time he is satisfied that the tank is sound, but the phone rang on one particular occasion, and, since the compressor is set to cut out at 100 p.s.i., the pressure kept on rising. I happened to wander in to scrounge something on this occasion, and spotted the tank and pressure gauge. I quickly decided to come back later! Nevertheless the tank withstood it, and it certainly did not bulge more than about six inches, on each side. However, I was in error on the metal thickness. In fact the 6 ft. x 4 ft. tanks are 12 s.w.g., not 14 s.w.g. as I stated. I would also add that my friend is a beautiful welder, as this incident proves, and he is still with us!

3. My published letter omitted the important detail of dividing the circumference in inches times the pressure by two for each inch of barred length. The issue had already gone to press when I phoned Mr. Evans to put this right. Apologies for an indignation caused. The tension on the barrel seam is HALF the figure given in my letter.

4. The figure of 5,000 horsepower as the content of a 5 in. gauge boiler seems ridiculous, but is true on paper. It implies that *Torquay Manor*, with an overall efficiency of one per cent, will do the work of half a horse with a full boiler, full pressure and no fire for two minutes. It probably will. However the boiler will not do what one visualises as 5,000 horsepower worth of damage if it explodes owing to the instant drop in temperature as the pressure is instantly reduced. Proximity of the victim is a vital factor, and the main hazard would be flying shrapnel if one was six feet away from the explosion. There is nothing like practical experience for getting an understanding of such matters. It is very simple to blow up a few containers, with suitable precautions, to get a working knowledge of the degree of danger. It seems to the writer that all of us who play with steam should get to grips with our subject in this way.

The purpose of my letter was not to debunk the dangers of steam, but simply to get it in proportion. We are exposed to danger during every second of our lives. We come to terms with most of it. Let us realistically come to terms with the dangers of model steam locomotives by facing the practical facts, rather than the gloomy forebodings of people who often appear, from their remarks, to do all their steaming from an armchair.

There is most certainly a parallel between compressed air, or gas, or any other compressible medium, in the testing of pressure vessels. If it holds air pressure it will hold steam at moderate temperatures, less the reduced strength of the material due to the higher temperature. The only difference is that the energy content of superheated water is higher than that of air, therefore there is a greater volume of steam released in an explosion than the volume would be if the vessel contained air, and the danger is therefore greater, but the shrapnel would be impelled with the same pressure energy.

On the subject of safety valves I hasten to Mr. Cain's end of the table on the importance of valves being of adequate capacity. The safety valve must release all the steam a boiler is capable of generating when forced to the limit of grate, fuel and blower without exceeding the maximum approved pressure of the boiler. Otherwise it is not a safety valve at all, and engines that are not adequately equipped are not uncommon in my experience.

To Mr. Bollen, and anyone else who doubts the cocoa tin experiment, I would point out that it is quicker to try it in the workshop than to write a letter disputing it.

Thame

E. C. MARTIN

Beam Engine Restoration

SIR,—We are engaged in the restoration of the 68 in. Cornish beam pumping engine at Dorothea Slate Quarry near Caernarvon, North Wales.

If any of your readers has photographs of the engine or quarry taken prior to the closure in 1970, I shall be most grateful for details as we are also doing research on the history of the engine and such items will be of the greatest help.

Wynton, Bates Lane,
Helsby, WA6 9LJ.

RUSSELL BAYLES
Industrial Steam Preservation Group

Pumping Stations

SIR,—Although Mr. Mallinson spent his working life erecting pumping plants, many cases of water mains connected to steam boilers apparently escaped his notice; I can recall at least 20 instances where boilers were so fitted for filling or washing out. I admit there are not many instances where the pressure of the water mains exceeds industrial pressure, but I can give another instance where this occurred. This was at Malvern Electricity Works, the boiler pressure being some 20 p.s.i. below that of the mains; the boilers could be fed in emergency from the high pressure main in Madresfield Road, although the normal feed was two Weir pumps.

Now as to the case I mentioned, the surface pumps supplying the main were coupled directly to the engine shaft, so where is the difference between this and any other engine driven feed pump? The 440 feet head against which the pumps were working, precluded a blowback even if a check valve failed, as the boiler pressure was only 160 p.s.i. and as to the boiler becoming completely filled, this only required the neglect of the stoker, when it could occur with any type of boiler feeding, injector, or pump.

As to the 'Law' saying every boiler must have two separate feeds, many traction, and ploughing engines were turned out of the works with just one pump, or one injector. Another means of feeding was often added by the owner to increase the reliability of the engine's working. I recently saw two boilers being dismantled which had only one injector between them; this was on an Abbott's pumping plant providing hydraulic power for hoists etc. The analogy of the domestic hot water system, does not enter into the matter.

Newcastle-upon-Tyne. E. H. JEYNES

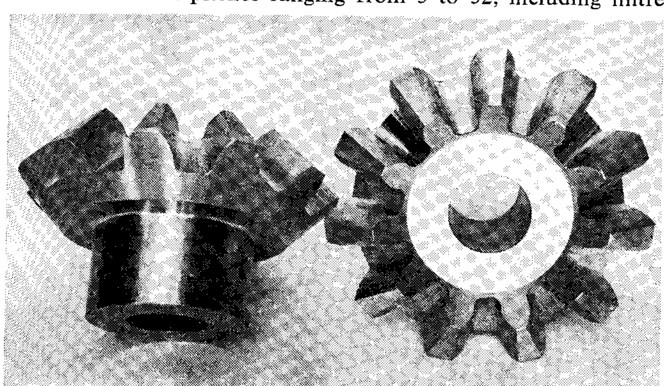
Cutting Bevel Gears

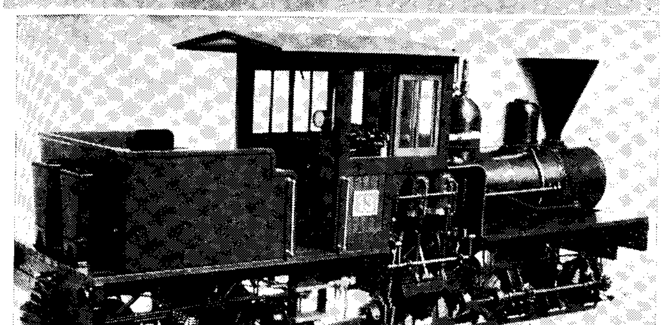
SIR,—Mr. D. R. Machin (Making Bevel Gears, M.E. 17th August, 1973) could have saved himself a lot of unnecessary work and obtained a more satisfactory result if he had referred to page 89 of another old Brown and Sharpe book; "Practical Treatise on Gearing".

The parallel depth method of cutting bevel gears (see M.E. 15th November, 1964) avoids the hand filing of the small ends of the teeth, and furthermore, uses standard spur gear cutters, selected to suit the pitch at the *small* ends of the teeth (hence special thin cutters are not necessary). Also, the cutter's offset is simply ¼ of the pitch of the cutter.

I have had experience of this method in over 40 pairs of gears in ratios from 1:1 to 5:1 and diametral pitches ranging from 5 to 32, including mitre gears from 10 up to 36 teeth, in steel, cast iron, aluminium and stainless steel. Applications include a marine propeller out-board drive transmitting 25 horsepower at 4500 r.p.m., a contra-rotating fan drive, table feed drives for milling machines, and transmission gears for a 3½ in. gauge "Shay" locomotive (built by R. A. Fardon—see picture below left).

A pair of mitre gears is illustrated in the attached photograph; which shows clearly the tapered tooth thickness obtained by a central gashing cut followed by two off-set cuts in each tooth space (note the space which was painted with blue marking after the gashing cut to emphasise the two subsequent cuts).





Nedlands, Western Australia. R. S. MINCHIN, Senior Lecturer in Mechanical Engineering

Society for Ashford (Middlesex)

SIR,—I am interested in establishing a Model Engineering Club in the Ashford (Middx.) area.

I have made tentative enquiries regarding the use of a certain building in the Ashford area and as a result I have been invited to make a formal application for its use. Before doing so I think it necessary to have some idea of the number of people that might attend, at least in the early stages.

Through the courtesy of your columns I therefore take this opportunity to ask that anyone who might be interested in such a club to please contact me at my home as early as possible.

30 Hughes Road, Ashford Common, Middx. Ashford 57548. RAY MATTHEWS

Locomotive adhesion

Sir,—I read your comments on Locomotive Adhesion in Smoke Rings and I quite agree with you that the driver's handling of the regulator is a most important factor in controlling slipping when starting heavy loads with a steam locomotive. I worked on all the Stanier designs produced for the L.M.S., and other companies' locomotives too from time to time. Perhaps a practical engineman's views will be of interest to readers of *Model Engineer*.

Sir William Stanier's "Pacifics", class fives, tank engines and freight locomotives were all first rate machines. I don't think he designed a bad one whilst working for the L.M.S. Railway Company.

Any troubles with adhesion were caused mainly by two things: Worn tyres through being kept out of the shops too long, and badly designed steam sanding gear, which I found was also the case with other companies' locomotives too. It is a fact that you could have all sanding equipment working correctly on leaving the Motive Power Depot and after 10 minutes use none of them would work at all. Why? Well for one thing the sand in use came directly from the beaches and was full of pebbles and sea shells, which promptly blocked up the sand traps. The sand driers in the engine sheds were incapable of filtering the sand properly and no attempt was ever made to improve them as far as I know. The condensate from the steam produced an effect like trying to get wet salt out of a salt cellar on the dining-room table. The sand boxes were in the wrong places, particularly on tank engines where any water spill would always get in and stop the gap. A favourite dodge of enginemen when working heavy trains out of Euston was to take a cork out of the trailing sandbox, when dropping down to the rolling-stock. This wasn't in the book, but I can assure you the performance on starting was far superior to anything the steam sanding gear could produce. The American practice of putting sandboxes on the top of the boiler was far superior to ours and for the life of me I could never understand why it was never applied here. Finally I would say this: The performance of the Stanier "Pacifics" was well up to modern electric practice, and his immortal class fives will be remembered for all time.

Stoke-on-Trent A. D. YATES

Wilson Turret Vice

SIR,—I would be much obliged if any of your readers could help me regarding the Wilson Turret Vice. I am unable to assemble this and think that I may have lost a vital part. Perhaps some reader who owns one of these vices would be willing to allow me to examine it, or could lend me a drawing of the vice.

73 George Street, B. BUTLER
Romford, Essex.

Generators

SIR,—I read with interest the contribution by W. Broughton on small steam generating sets using motor-cycle dynamos. Perhaps a few words about these generators, from personal experience, may be of some help to those who wish to use them on stationary plants and model traction engines, etc. These small DC dynamos were produced in quantity from the late 1920's until the middle sixties mainly by Lucas and Miller and have a continuous rating of about six amps at six volts pressure. The earlier types had what is known in the trade as third brush control of the output.

A simple movement of the small narrow brush round the commutator altered the output as required, ideal for model work. After about 1936, a change was made to a simple two brush unit using the automatic voltage control regulator between dynamo and battery. The merits of these regulators are arguable but in practice they have been a source of trouble on all types of motor vehicles since they were introduced and where no ammeter is available one never knows what the charge rate is. If it is intended to use motor-cycle dynamos of this type on model generating sets working at full output for fairly long periods then large holes should be made in the end casings without weakening the structure too much. And a small fan should be fitted in the armature shaft to draw a column of cooling air through the windings as it rotates. The dynamo should also be insulated if possible from heat from the steam engine bed, etc. We have tried these things in practice with excellent results. As a point of interest the reason for the change to alternators in the motor industry is that they are better suited to mass production methods, simpler to make and reliable in service. The headache begins with the rectifiers which are likely to remain the motor electrician's nightmare for many years to come.

Stoke on Trent. A. D. YATES

Quartering Wheels

SIR,—May I be allowed space in which to offer my sincere apologies to readers and yourself for the nonsense in my letter — Issue 3466 — and also to thank George Hill for straightening things out.

Several sketches were made during the "figuring" process and I must have inadvertently used one of these as an aide-memoire when writing the letter.

Mr. Hill's drawing shows a correct arrangement, although savants who prefer to have the R/H crank leading will still have to do some homework as I now intend to rejoin my poor little D.T.I. in the doghouse!

Elstead, Sussex. F. M. COLLINS

New Diesel

SIR,—You may recall my two *Pansies*, which featured on the cover of M.E. No. 3343, 19 April, 1968. *Mohawk* has now steamed 171 hours and *Choctaw* 185 hours. Each has covered around 500 actual miles. They have now been joined by a B.R. type 2 Diesel in 5 in. gauge and some more steamers are in the shops.

The "Diesel" is powered by a 36 c.c. side valve petrol engine which, I believe, is an Edgar Westbury design for a lightweight W.D. charging unit. This drives a car dynamo which delivers up to 11 amps at 20 volts to a second car dynamo which has been converted to a series motor. The maximum drawbar pull is 16 lb. and the highest speed is about 12 m.p.h. There are no batteries in this locomotive; to date it has run 42 hours.

As you have probably heard we now have a regular "mountain road" at the Malden Society (Thames Ditton). It doesn't worry the 7¼ in. gauge locomotives but the smaller engines really have to work. When a *Pansy* runs on an Open Day hauling one of the Club 7¼ in. gauge passenger cars with 4 or 5 people on board, each exhaust beat sounds like a pistol shot. There is a firework display from the chimney and at the end of the afternoon the smokebox is filled with ash to above the level of the crossbar! The diesel cannot manage this load but will haul three adults on a 5 in. gauge truck over the mountain pass at a reasonable speed.

Ashford GEORGE MARDEN

Lathes

SIR,—I was most interested to read Mr. Jeynes' article on Lathes (M.E., 5 October 1973, p956). I would, however, like to point out that there is an error in the caption to the illustration at the bottom left-hand corner of the page.

The lathe whose section is shown here is not a standard lathe with a back tool-post for parting off. It is a duplex lathe, manufactured by Whitworth's in about 1850. These lathes had two complete slide rests to enable two cuts to be made on the same workpiece at the same time, and were intended for the production of shafts. Since the two tools acted on the same horizontal diameter this had the effect of damping out chatter.

Whitworth's exhibited two of these duplex lathes at the 1851 Exhibition, one of 18 ft and the other of 36 ft between centres. A very similar illustration of a section of one of these lathes is shown at page 287 of Vol. 1 of the Official Catalogue.

While each slide rest was fully independent for adjustment of the tools, the screw with the gear at the end was cut right and left handed so that the saddles could be run in and out from each other at the same rate so ensuring an equal stress on the shaft being turned.

Bristol. A. P. WOOLRICH

We regret that owing to insufficient space, "Jeynes Corner" and "Modifications to a 5" gauge Lion" have had to be held over to the next issue.—Ed.

CLUB NEWS

Hitchin Society

The Hitchin (Herts) and District Model Engineering Club have headquarters in Grove Road, Hitchin. Inside the spacious clubhouse there is a well-equipped workshop for the use of members. Outside, there is an outdoor track for 3½ in. and 5 in. gauge locomotives in the form of an oval about 400 ft. around. The Society has three locomotives of its own, and many members have engines under construction. During the winter months, some new passenger cars are under construction, and slide shows, lectures and visits are arranged from time to time. New members are welcome, and they should contact the Secretary, Mr. B. Thompson, 35 Rivershill, Watton-at-Stone, Herts., SG14 3SD.

News from Ickenham

From the "Ashpan", the journal of the Ickenham and District S.M.E.. I see that Derek Jenkins has recently been appointed Programme Secretary after Fred Matthews had completed a very successful three-year term in this office. Fred is continuing the major overhaul of *Butch,* and with Peter Reynolds' help has now finished the new boiler with larger firebox.

The working parties on Sunday mornings and Friday evenings have been well supported, and Peter Reynolds, Chief Signal Engineer, has done a good job in rebuilding the relay rack and making a new illuminated diagram, both as plug-in units mounted in the new signal box. The track itself is looking very neat and tidy with much of the ballasting completed and foundations laid for brick arch bridges over the ditch.

The I.D.S.M.E.'s "Mini-Rally" was not well attended, but Peter Morgan's 4-4-0 No. 1000 did a good afternoon's run, and Laurie Greene's 0-NG-0 and the Society's Speedy also ran. On the 3½ in. gauge track, Fred Matthews' two locomotives and Ted Cuckney's 0-6-0 kept the track circuits busy.

Secretary: Mr. D. Jenkins, 199 The Fairway, South Ruislip, Middlesex.

CLUB DIARY

Dates should be sent five weeks before the event. Please state venue and time.

December 7 Dublin S.M.E.E. Talk by Mr. G. F. Hickie on "Collecting Data". City Quay School.
December 7 Lincoln M.E.S. Club Night. Unitarian Chapel, High Street, Lincoln. 7.30 p.m.
December 7 East Sussex Model Engineers. Club Social and Ladies Night. The Mercatoria Hall, Mercatoria, St. Leonards-on-Sea. 7.45 p.m.
December 7 Stockport & Dist. S.M.E.E. Bits and Pieces. 8 p.m.
December 7 Rochdale S.M.E.E. General Meeting, Lea Hall. 8 p.m.
December 7 Romford M.E.C. Competition & Watson Shield Night. Ardleigh House Community Association, 42 Ardleigh Green Rd., Hornchurch, Essex. 8 p.m.
December 8 S.M.E.E., Informal Meeting — Traction Engines, Road Vehicles. 28 Wanless Road, London, S.E.24. 2.30 p.m.
December 10 Clyde Shiplovers' & Model Makers' Society. "Hebridean Memories" by Dan MacDonald. Kelvingrove Art Gallery Museum. 7.30 p.m.
December 10 Peterborough S.M.E. Film Evening. Clubhouse, Lincoln Road. 7.30 p.m.
December 10 King's Lynn & Dist. S.M.E. Monthly Soc. Meeting — Auction.
December 11 Romney Marsh M.E.S. Annual Dinner at Lydd Airport. 7.30 p.m.
December 11 Crewe M.E.S. "The Lancashire & Yorkshire Railway" by Mr. R. Mills (illustrated). Queens Park Hotel, Wistastion Road, Crewe. 8 p.m.
December 12 Birmingham S.M.E. Film and Slide show with a difference. Sheepcote Street.
December 12 Harrow & Wembley S.M.E. Locomotives. B.R. Sports Pavilion, Headstone Lane. 7.45 p.m.
December 12 Norwich & District S.M.E. Projection of Members' 8 mm Films. The Assembly House, Norwich. 7.30 p.m.
December 12 Southampton & District S.M.E. General Meeting. Hospital Broadcasting Association Studio Centre, Little Oak Road, Southampton. 8 p.m.
December 12 Sutton Coldfield Railway Society. "Switzerland — Lake Area Electric Lines", By M. Ballinger. Wylde Green Library, Emscote Drive, Little Green Lanes off Birmingham Road. 7.30 p.m.
December 12 Cannock Chase M.E.S. Lecture Meetings — John Acton. Lea Hall Social Club. 7.30 p.m.
December 13 Sutton M.E.C. "More railway accidents" by D. E. Tidbury. Club House off Chatham Close, Sutton, Surrey. 8 p.m.
December 13 Leyland, Preston & Dist. S.M.E. Roebuck Hotel, Leyland Cross, Leyland. 8 p.m.
December 13 Harlington Locomotive Society. Antique clock manufacture: Illustrated chat by horologist Chris Arditti. 8 p.m.
December 14 Colchester S.M.E.E. "Firefly" progress meeting. Club House, Old Allotments, Lexden. 7.30 p.m.
December 14 Stuart International Model Engineering Club. Annual General Meeting. White Hart, Nettlebed, Oxon.
December 16 Birmingham S.M.E. Childrens' Christmas Party. Illshaw Heath.
December 17 Leicester S.M.E. Bits & Pieces Auction. Royce Institute, Crane Street, Leicester.
December 17 North Wales Model Engineering Sociey. Meeting. Penrhyn New Hall, Penrhyn Bay, Llandudno. 7.30 p.m.
December 17 Stafford & District M.E.S. 5 Shelmore Close, Stafford. Auction and Sale Night. New Inn, Broad Eye. 7.30 p.m.
December 17 Peterborough S.M.E. Informal Evening and Christmas Draw. Clubhouse, Lincoln Road. 7.30 p.m.
December 17 Wigan & Dist. M.E.S. Co-operative Guild Room, Thompson St., Whelley, Wigan. 7.15 p.m.
December 18 Derby S.M. and E.E. Talk by visiting speaker. Carriage & Wagon Welfare Centre, Longbridge Lane, off Ascot Drive, Derby. 7.30 p.m.
December 19 Birmingham S.M.E. Christmas Cheer. Illshaw Heath.
December 19 Guildford M.E.S. Bits and Pieces Competition at HQ, Stoke Park. 7.45 p.m.
December 19 Sutton Coldfield Railway Society. 16 mm Films Night. Wylde Green Library, Emscote Drive, Little Green Lanes, off Birmingham Road. 7.30 p.m.
December 19 Cannock Chase M.E.S. Workshop Night. Cardinal Griffin School. 7.30 p.m.
December 19 Swansea S.M.E.E. Film Show. H.Q., Heol-y-Gors, Cwmbwrla, Swansea. 7.30 p.m.
December 19 Bristol S.M.E.E. History of Beer Making and Bottling Engineering. A. Johnson, Works Engineer, Avonmouth Bottling Plant (Courage). Unitarian Hall, Lewin's Mead. 7.30 p.m.
December 20 Harlington Locomotive Society. Members' 8 mm movie evening. 8 p.m.
December 20 Sutton M.E.C. Members' 8 mm cine films in Club House off Chatham Close, Sutton, Surrey. 8 p.m.
December 20 Hull S.M.E. Workshop topics by P. Truby. Trades & Labour Club, Beverley Road, Hull. 7.45 p.m.
December 20 Nottingham S.M.E.E. Members' Slide Night. Friends' Meeting House, Clarendon St., Nottingham. 7.30 p.m.
December 21, 22 and 23 Model Exhibition. King Edward's School, Broa Street, Bath, Somerset. 12.00 — 21.00 each day.
December 21 Dublin S.M.E.E. Progress Report on Club loco. "Springbok" held at City Quay School.
December 21 Rochdale S.M.E.E. Auction Night. Lea Hall. 7.30 p.m.
December 21 Colchester S.M.E.E. Christmas Party in Club House, Old Allotments, Lexden. 7.30 p.m.

Continued on page 1185

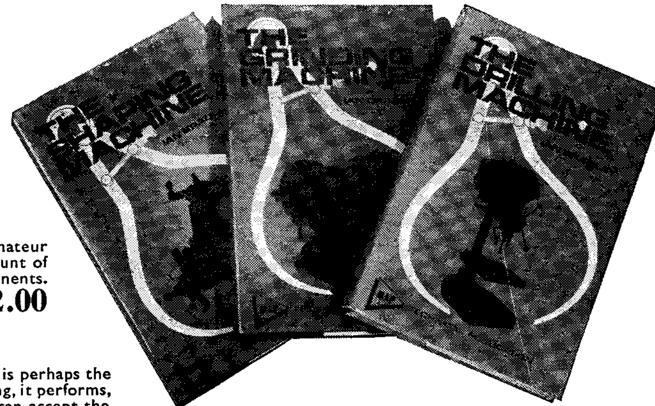
TRADE NEWS

New Vernier Dial

A useful vernier dial suitable for the saddle handwheel of Myford ML.7 and Super-7 lathes has recently been introduced by J. T. Lavis of 15 Goddington Road, Bourne End, Bucks.

The complete set comprises a nicely finished dial calibrated in inches and tenths, a vernier backing plate to match, both items being plated in an attractive satin finish, plus suitable washers, countersunk screws and Allen set-screw. An illustrated booklet giving comprehensive instructions for fitting is also included.

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



184 THE DRILLING MACHINE

The Drilling Machine, even in its simplest form, is such an important item of equipment in the small workshop that it deserves more detailed written treatment than it normally receives.

In an attempt to gather together in one book as much relevant information as possible, the author addresses himself primarily to amateur workers and others whose requirements are covered by single spindle machines.

8½ x 5½ in., 168 pages, 91 tone, 84 line. Casebound. **£2.50**

185 THE SHAPING MACHINE

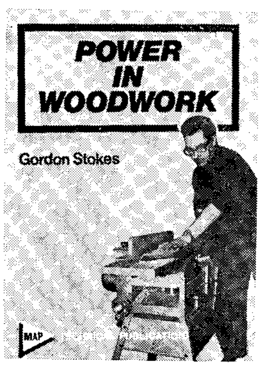
The shaping machine has for some years increased in popularity in both amateur and professional workshops. In this book the author gives an historical account of the machine, followed by a general description, then goes on to detail its components.

8½ x 5½ in., 104 pages. Copiously illustrated line and tone. Casebound. **£2.00**

186 THE GRINDING MACHINE

Of all the machines in the amateur or small workshop, the grinding machine is perhaps the one that is always taken for granted. In its simplest form as used for tool grinding, it performs, when correctly used, one of the most important services in the shop. If we can accept the premise that sharp tools, in their many forms, are essential to satisfactory workshop practice, then the reader will benefit from the information and advice within these pages.

8½ x 5½ in., 144 pages, 96 line, 48 tone. Casebound. **£2.00**



222 POWER IN WOODWORK

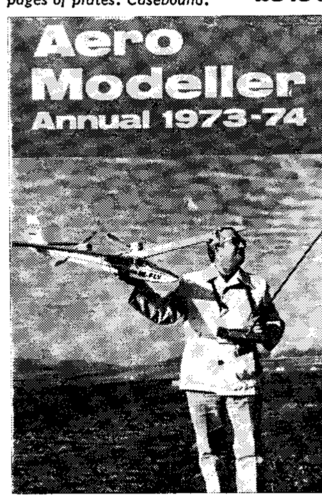
Gordon Stokes, technical consultant editor of Woodworker magazine, tells which tools to buy, how to care for them and how to get the best use from them. A book for the beginner; the author enthuses over a pastime which can give so much satisfaction to so many people. Over 200 illustrations.

8½ x 5½ in. 128 pages. Casebound. **£3.00**

200 SIMPLE MODEL LOCOMOTIVE BUILDING

One of LBSC's best-known 3½in., gauge locomotives, "Tich" is the subject of the "words and music" which serve as an introduction to the ordinary man's best home-built model locomotive.

9½ x 6 in., 268 pages, plus 29 pages of plates. Casebound. **£3.50**



196 AEROMODELLER ANNUAL 1973/74

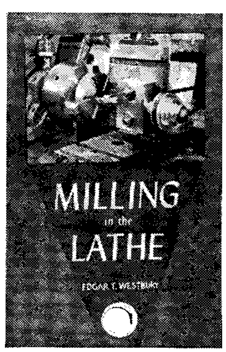
A full mixture to suit all tastes. The Annual was the first to foresee the model helicopter, electric power, use of carbon fibres and foam plastics, and this year's volume maintains the proud reputation now upheld for 26 years of continuous publishing.

8½ x 5½ in. 144 pages. Printed boards. **£1.00**

37 MILLING IN THE LATHE

The use of milling cutters of various types; milling without special appliances; the vertical slide, port cutting, end slotting; squaring and levelling; rotary spindle attachments, copying and planetary milling; driving cutter-spindles; indexing gear; divided headstock, division plates; application of processes.

7¼ x 4⅞ in. 160 pages. **80p**



MAP

HOW TO ORDER. Ring round the reference number of the titles you have chosen. Carry out totals to cash column and then total up at the bottom; Postage rates are as follows 10p up to £1.00, 15p up to £1.50, 20p up to £2.00. Post free above £2.00.
Registered England 328308
Registered office
12/18 Paul Street, London EC2A 4JS

184	222
185	196
186	43
200	37

Name ....

Address ....

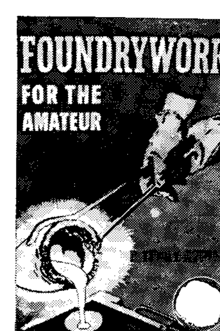
.... £

43 FOUNDRYWORK FOR THE AMATEUR

B. T. Aspin

A really exhaustive book on mould and pattern making, and pouring metals to produce castings for model making or other purposes.

7¼ x 4¾ in. 108 pages. Illustrated. Paperback. **50p**



MODEL & ALLIED PUBLICATIONS LIMITED, P.O. BOX 35, Bridge Street, Hemel Hempstead, Herts.

CLUB DIARY

from page 1183

December 21 Harrow & Wembley S.M.E. Film night and/or Talk on Electrification of the railways. The Pavilion, B.R.S.A. Sports Ground, Headstone Lane. 7.45 p.m.

December 21 Stockport & Dist. S.M.E.E. Talk by Mr. J. Handcock on "Sentinels". 8 p.m.

December 21 Romford M.E.C. Jumble Sale. Ardleigh House Community Association, 42 Ardleigh Green Rd., Hornchurch, Essex. 8 p.m.

December 26 Guildford M.E.S. Boxing Day run on track at HQ, Stoke Park. 11 a.m.

December 26 Peterborough S.M.E. Boxing Day Steam Up. 10.30 a.m.

December 26 Romney Marsh M.E.S. Boxing Day Meeting at 87 Rolfe Lane, New Romney, Kent. 2 p.m.

December 27 Sutton M.E.C. Steam Rally Organ Music, by L. H. Williamson. Clubhouse off Chatham Close, Sutton, Surrey. 8 p.m.

January 1-12 S.M.E.E. "Model Engineer" Exhibition. Seymour Hall.

January 2 Guildford M.E.S. Film show on railway topics by Mr. Potter. HQ, Stoke Park. 7.45 p.m.

January 2 Cannock Chase M.E.S. Slide Show — Items of general interest by Matt Jeffrey. Lea Hall Social Club. 7.30 p.m.

January 2 Sutton Coldfield Railway Society. Special Railway Literature Evening. Wylde Green Library, Emscote Drive, Little Green Lanes off Birmingham Road. 7.30 p.m.

January 2 Harrow & Wembley S.M.E. Committee. B.R. Sports Pavilion, Headstone Lane. 7.45 p.m.

January 3 Hull S.M.E. Memories of Malaya: Slide show and talk by E. Armstrong. Trades & Labour Club, Beverley Road, Hull. 7.45 p.m.

January 3 Sutton M.E.C. Members' work. Clubhouse, off Chatham Close, Sutton, Surrey. 8 p.m.

January 3 Leyland Preston & Dist. S.M.E. Roebuck Hotel, Leyland Cross, Leyland. 8 p.m.

January 4 Rochdale S.M.E.E. A.G.M. Lea Hall. 7.30 p.m.

January 4 East Sussex M.E. Members' Slides (Limited to 10 best slides each). At Mercatoria. 7.30 p.m.

January 4 Lincoln M.E.S. Club Night. Unitarian Chapel, High Street, Lincoln. 7.30 p.m.

January 4 Romford M.E.C. Competition Night. Ardleigh House Community Association, 42 Ardleigh Green Rd., Hornchurch, Essex. 8 p.m.

January 4 Stockport & Dist. S.M.E.E. Bits and Pieces. 8 p.m.

CLASSIFIED ADVERTISEMENTS

Rate: 5p per word. Minimum twelve words 60p. Use of Box Number 25p extra. Display Classified Advertisements: £2.25 per single column inch (Column width 2 in.). Full particulars on application. Advertisements, with remittance, should be sent to Classified Department, Model Engineer, P.O. Box 35, Hemel Hempstead, Herts., at least four weeks before issue. Classified advertisements must be pre-paid.
The Advertisement Manager reserves the right to refuse or suspend advertisements without giving any reason. Every care is taken to avoid mistakes, but the publishers cannot be held liable in any way for clerical and printing errors or omissions. Receipt of "copy" for publication implies acceptance of these conditions by the advertiser. Whilst every care is taken to exclude advertisements from doubtful sources, no responsibility can be accepted by the publishers for the bona fides of advertisers.

WORKSHOP EQUIPMENT

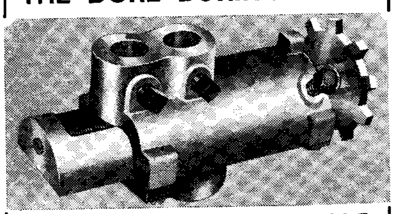
OXFORD ARC WELDERS

Give you the full control of the welding current essential for quality welding from the thinnest materials upwards. No gimmicks — just properly engineered oil — and air-cooled arc welders from **£38.** Free catalogue from:

C. G. & W. YOUNG (Oxford Welders) Colne Road, Twickenham, Middx.
Tel: 01-894 5168 and 01-894 7767.

Bench drilling machine. 'Kerry Drillmaster'. Large tee slotted table 15 in. x 11 in. $\frac{1}{2}$" Jacobs chuck. M.E.M. Switch, chuck guard, 3 phase but would easily convert to 1 phase, as new £64. Co-ordinate table to convert above machine into a vertical mill. 5 in. x 5 in. movement. Also incorporating a 5 in. diameter rotary table. Brand new, never fitted. £38. Also 5 in. diameter lathe 3 jaw chuck, fair condition £7. 11 Lyon Avenue, New Milton, Hants. M

THE DORE BORING HEAD



As shown in use at the last M.E. Exhibition. Castings supplied with centre hole in slide screwed for Myford lathes. £5.95 plus 25p postage. Send S.A. 9 x 4 envelope for leaflets.

DORE ENGINEERING
1 Drury Lane, Dore, Sheffield
Tel: 362307
Visitors by appointment only please
NO WEEKEND SERVICE

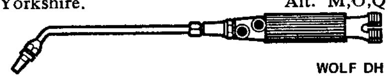
3½" Milnes. s.c. lathe in working order. Tools and some accessories £40. Quantity of 00 equipment and 6 locos. £30. Large number unbound M.E.'s Tel. Thanet 65655. M

Boiler construction, repairs, etc. Brazing, silver soldering your existing parts, staying, pressure testing, plate flanging to your specifications. S.A.E. with drawings, Phil Bevan, 34 The Leam, Grange 1, Daventry, Northants. M

PERFECTO

5" and 7" hand and power shaping machines. 3" machine vices. 6" x 12" Tool and cutter grinders.
Stamp for lists.
PERFECTO ENGINEERING CO. LTD.,
Claymill Rd., Barkby Rd., Leicester.
Phone 0533-768384

Very small screw assortments. 12BA steel and brass screws with nuts and washers, about 900 pcs., £2.72 each. 10BA ditto, about 900 pcs, £2.72 each. 8BA ditto about 800 pcs., £2.12 each. Or all three for £6.55 (prices include VAT & post). C.W.O. please. Bernard F. Wade Ltd., Dept. 3, Skipton, Yorkshire. Alt. M,O,Q



WOLF DH

UNBEATABLE OFFER OF CRAFTSMAN MADE BRITISH BRAZING/WELDING TORCH.
SUPPLIED IN BOX CONTAINING, BLOWPIPE, SPANNER AND A SELCTION OF 'D' TYPE NOZZLES. Price £8.50 + 25p p & p
SEND S.A.E. FOR LEAFLET TO D.T.G. TRADING
THE GARAGE, MIDDLE CROSS ST., WOLVERHAMPTON

SAVE £££'s ON NEW LUXURY TOOLS

BLACK & DECKER — **All with maker's guarantee**

	List price	*Our price*	*P&P*
D520 $\frac{3}{8}$" Drill	13 70	9 80	30p
D720 $\frac{1}{2}$" 2 sp Drill	15 35	10 95	35p
V820 $\frac{1}{2}$" 2-sp Drill	16 45	12 45	35p
V830 $\frac{1}{2}$" 2-sp Ham Drill	19 75	14 25	35p
V850 $\frac{1}{2}$" Multi-sp Drill	19 75	14 25	35p

ABSOLUTELY FREE Our special accessory kit with each of the above Drills

GD80 Drill Stand	6.55	4.50	30p
D935 Vice for GD80	2.15	1.70	10p
D985 D/L 5" Saw Attachment	9.90	6.95	25p
D945 D/L Sander Attachment	6.00	3.95	25p
D986 Jigsaw Attachment	5.99	3.90	15p
D994 24" Lathe	10.39	7.35	35p
D990 Saw Bench	6.87	4.85	30p
Workmate WM225	21.95	18.20	50p
Workmate WM525	25.25	20.50	Free
Workmate WM325	27.45	22.50	Free
D390 Power Sander	12.05	8.95	25p
D1103 Router	13.15	9.95	25p
DN25 Drill Sharpener	10.95	8.75	25p
DN55 5" Saw	17.55	13.95	35p
HD1250 Router	50.60	40.95	Free
HD1000 7" Saw 2$\frac{1}{2}$" cut	34.10	25.70	Free
DH1215 9" 3$\frac{1}{4}$" Cut	54.72	39.55	Free
SD0250 P/Plane 3"	63.80	50.95	Free
SD0201 Sander	37.95	29.95	Free
Grindermite SAG 115	35.20	27.95	Free
DN35 Power Jigsaw + 3 blades	10.36	7.55	25p
GD56 2-sp. Jigsaw	19.25	15.40	30p

STANLEY BRIDGES

XL330 $\frac{3}{8}$" 2-sp. Drill	14.25	10.95	30p
XL404 $\frac{3}{8}$" 4-sp. Drill	18.90	14.50	30p
XJ424 $\frac{1}{2}$" 4-sp. Drill	21.89	17.85	35p
AR/DV Dovetailer Att.	13.75	11.35	35p
XK/SH 6" Saw	16.99	13.75	30p
H267 Router 1$\frac{1}{2}$ h.p.	76.72	61.95	Free
WOLF Grinderette	35.15	28.55	Free
Wolf 5573 Belt Sander	76.95	63.95	Free
Wolf Planerette	39.60	31.95	Free
BURGESS Sprayit 122	28.10	23.50	Free
Burgess B/Saw + 3 blades MkII	32.45	28.30	Free
Burgess VT72 Hobby Kit	9.85	8.25	10p
Miniplaner fits any Dr.	7.15	5.95	30p
Copydex Jointmaster II	4.95	3.95	20p
Weller 8200D kit	6.55	4.95	25p
C.K. Mill/Dr. Std. 499	32.75	27.95	Free

Prompt despatch, 4 or more items half postage, orders over £25, post free in U.K. Money refund assurance. We have thousands of delighted customers. MAIL ORDER ONLY. Catalogue on request. Send C.W.O. to: NORTH LONDON MAIL SUPPLIES (Dept ME), 168 Finchley Road, LONDON, N.W.3.

CLERKENWELL SCREWS LTD.
107/9 CLERKENWELL RD., LONDON, E.C.1. **01-405 6504**
Welcome your enquiries for Brass and Steel Screws, Nuts and Washers 0-8 BA in Rolled and Turned, also 10-12 BA in Turned, Whitworth and B.S.F. in Rolled Threads only. All Heads. (Minimum one gross any one item.) Goods sent C.O.D. Post or on Payment of Pro-Forma invoice. 24-hour service for stock items. **Send for Lists.** Orders of £1 minimum accepted.

For Sale. Myford ML7 lathe on stand with motor, four assorted chucks and tools £110. Buyer collects. Tel. 061-973 8960 evenings. M

For Sale. Model No. 1 3½" Perfecto lathe 3 and 4 jaw chucks, motor, switch. 8 months old £125. R. Moore, 36 Grange Road, Chad Estate, Coseley, Nr. Bilston, Staffs. M

COMPLETE BRAZING OUTFIT. Two high pressure regulators with cylinder contents gauges and working pressure gauges, brazing torch, nozzles and spanner, $\frac{1}{4}$" hoses with safety fittings, protective goggles and cylinder key. Suitable Oxy/acetylene Oxy/propane brazing and welding. Send SAE for leaflet to **DTG TRADING, Middle Cross Street, Wolverhampton.**

Excellent ML7 on stand, motor, reverse, chucks, faceplate, steadies, vertical slide, other accessories lot £150. 35 Manitoba Way, Selston, Notts. M

For Sale. 3½" screwcutting centre lathe of unknown make. Motorised and on its own stand, 3 jaw chuck, 2 faceplates and a steady. Buyer collects. £25. Tel. (Home) Edenbridge (Kent) 2419. (Business) Lodge Hill 3125. M

DORE-WESTBURY VERTICAL-MILLING MACHINE
All materials needed to complete the machine are supplied. Work not only on main castings but on all components that the home constructor would find impossible or difficult to machine has been done. 3½" lathe and drill will complete.
ROTARY TABLES
3 types of rotary table kits suitable for use with the Dore-Westbury and other machines.
THE M.E.S. SURFACE GRINDER
This can be completed in the ML7 lathe and drilling machine. All materials along with part machined castings are supplied.
Castings and parts for the
M.E.S. 5" CAPACITY LATHE STEADY
Specially designed for the ML7 Lathe. Quick and simple to construct.
S.A. foolscap envelope please for illustrated leaflets
MODEL ENGINEERING SERVICES
6 Kennet Vale, Brockwell
Chesterfield, Derby S40 4EW
Tel.: Chesterfield 79153
Eckington 3218
Visitors welcome by appointment

Myford Super 7, M.L.7 and M.L.10, Perfector and Unimat lathes and accessories, etc.

Quotations given for purchase of complete workshops.

G. M. H. Bunce & Co. Ltd.,
206 West Street, Fareham (4136)

ML7 faceplate 9″, fixed steady, travelling steady, long boring table, new, shop soiled £18. Caldwell, Poplar Cottage, Hill Side Road Long, Ashtow Nr. Bristol. M

Sealion, Kittiwake, Gemini, Elaine, Mastiff. Castings etc. Large S.A.E. to John Whelan, 4 Broadley Park, North Bradley, Trowbridge, Wilts. BA14 0SS. Tel. 022-14 62446. M-P

ENGINEER'S HIGH SPEED TWIST DRILLS

Quality guaranteed. Genuine discount prices.

Size	Price	Size	Price	Size	Price
1/64	**10p**	9/64	**9p**	9/32	**23p**
1/32	**9p**	5/32	**10p**	5/16	**29p**
3/64	**8p**	11/64	**12p**	11/32	**34p**
1/16	**7p**	3/16	**13p**	3/8	**35p**
5/64	**7p**	11/64	**13p**	13/32	**44p**
3/32	**8p**	7/32	**16p**	7/16	**70p**
7/64	**8p**	15/64	**17p**	15/32	**70p**
1/8	**9p**	1/4	**19p**	1/2	**85p**

Your own sel., min. order £1 p&p free.

10-piece set in plastic box (1/16″ to ¼″) £1.15 inc. p&p.

Complete satisfaction or money refunded. Cheque/PO with order. Extensive range of hand and power tools available. Send 5p for illus. cat. of tool bargains to:

MILLHILL TOOLS LTD., STEVENTON, NR. ABINGDON, BERKS, OX13 6SW.

Ball bearings, ⅜″, 6mm., 8mm., bore. 1st class races. 4 for 55p, 8 for £1, Post free, large S.A.E. for lists of surplus tools, and materials. 28 Oakdale Road, Weybridge. MN

Sale. Part finished 5″ G 'Speedy', boiler part complete. 5″ G West country castings, various other castings. Offers. Carriage extra. Bagg, 298 Kingston Road, Ashford, Middx. M

SAVE £10.00 UNIMAT OFFER

Unimat Lathe comp. with Motor and 3 Jaw Chuck.

Recom. Price £82.50 inc. VAT

Our Price **£72.50** inc. VAT (carr. £1.00 extra)

SAE for Lists please

Bonds o' Euston Road Ltd.,
357 Euston Road
London NW1 3AL
Phone 01-387 5441

Wanted. Change wheels for South Bend lathe 18 DP. R. V. Dales, 42 Kingsbury Road, Coundon, Coventry. CV6 1PH. M

Grip true collet chuck, 25 collets, ⅛″ to 2′ perfect order. £20 plus carriage, 29 Pentland Road, Bonnyrigg, Midlothian. M

PRESSURE GAUGES

¾″ or 1″ dia.

0-80 lbs 0-100 lbs
0-120 lbs 0-150 lbs

PRICE

£4.00 ea (inc. VAT inc. carr.)

Bonds o' Euston Road Ltd.,
357 Euston Road,
London
NW1 3AL
Phone 01-387 5441

ML7 good condition, 5″ geared head S.S. & S.C. 7″ Shaper on stand. All motorised ready for use. Brigg, 73 Keighley Road, Cowling, Keighley. Tel. Xhills 33052. M

'Minnie' 1″ scale T.E. Set of 20DP gears inc. Steering Gear. Price **£5.94** set (includes VAT)

Carriage an extra 44p

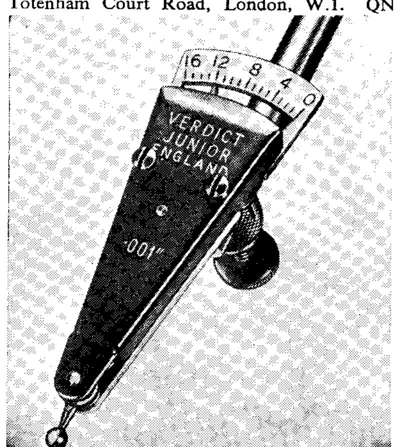
1933 1″ scale T. Engine. Set of 20DP Gears inc. Steering gear. Price **£5.94** set (includes VAT).

Carriage an extra 44p

Bonds o' Euston Road Ltd.,
357 Euston Road,
London NW1 3AL

For Sale. Boley Leinen watchmaker's lathe, compound slide, drill chuck, collets etc. Excellent condition. £70. Staking set, punches. £5. 8″ Burnerd Griptru 3 jaw chuck 6TP1 x 2″ £15. plus carriage. A. Lewis, 12 Brynheulog Street, Penydarren, Merthyr Tydfil, Glam., S. Wales. M

Buck & Ryan for Lathes and Workshop Accessories. Drilling machines, grinders Electric tools, surface plates, etc. — 101 Totenham Court Road, London, W.1. QN



TREAT YOURSELF THIS CHRISTMAS

— if no one else will — to a VERDICT JUNIOR TEST INDICATOR

This reliable test indicator has a scale reading 0—.016″ on both sides, and its slim width allows it to be used in confined spaces prohibitive to dial type indicators. Photo shows actual size. With thumb screw, Price: £2.83.

MAGNETIC STAND

The 3″ high Minormag stand with 1″ dia. magnetic base enables any test indicator to be used in many positions. 15 lbs. pull load. With thumb clamp for ¼″ dia. extnesion arm, Price: £2.86.
3″ long extension arm 15p extra.
Complete assembly only £5.74.
Prices include VAT, postage etc.

REDHEAD ENGINEERING
55 Westlands Way, Leven, Hull, HU11 5LQ

You should see my Cat! It has 5,000 interesting items; mechanical and electrical gear and materials. Send S.A.E. today to K. R. Whitson, Dept. ME, New Mills, Stockport. QP

ML7. All equipment, motor, 4″ 3-jaw, 6″ 4-jaw. Excellent condition, £135. 27 Moor Road, East Dene, Rotherham. LM

Mild steel Hexagon bar ends. 1.1/8″ — 2.¾″ A/F ½ cwt parcels. £3 carriage paid. E. B. Adams (Eng.) Ltd., 230 Main Road, Gidea Park, Romford, Essex RM2 5HA. Alt. K-C

Myford Lathe, vertical slide, 4 jaw chuck etc. Plus "Rob Roy" castings — part finished. Also parts "Rainhill" and 5″ 0-4-0. Stone 3714. M

YOU COULD DO IT — IF YOU COULD SEE IT

And you can see with the Versator BINOCULAR MAGNIFIER. This high quality instrument comes complete with case and instructions for only £9.50 inc. p&p. Money back if not satisfied.

MASON & GANTLETT LIMITED
29 Surrey St., Norwich

Wanted. Set Dolphin petrol engine castings 10 cc., also 3½″ gauge track parts. 1 St. Bridges Close, Sand Bay, Weston Super Mare. M

For Sale. "Versechoyle Mandrel". Veteran hand lathe complete and original with compound slide and chuck. Offers. S.A.E. with enquiries. Box No. 2958, Model Engineer Office, P.O. Box 35, Hemel Hempstead, Herts. HP1 1EE. M

Complete home workshop for sale, as a set or individually to best offers. Inculding Pallas milling machine with vertical dividing head etc. 3½″ Myford screwcutting B-G lathe and accessories and numerous hand tools. Tel. Stanford Le Hope 71830. M

Lorch 2½″ centre precision lathe. Many accessories £85. Also circular saw, band saw and other tools. Griffiths, Maytrees, Exning, Newmarket (Exning 304). M

CARBON TAPS AND DIES

Sets in Wooden Box

0BA—10BA — £13.15

⅛″ ME—⅜″ ME — £13.15

Price includes VAT

Carriage an extra 44p

Each set contains: 1 Die for each size, Diestocks, Tap Wrenches and Taper and Bottoming Taps of each size

Bonds o' Euston Road Ltd.,
357 Euston Road,
London NW1 3AL

Maximat V10 lathe with every tool and attachment for turning, drilling, milling, srew and gear cutting. A complete workshop in one unit. Single phase. 1—Oldak Mark 1 variable speed precision bench drill. Single phase. Available ex stock from Wm. Young (Kilmarnock) Ltd., West Langlands Street, Kilmarnock, Ayrshire. KA1 2QA. Tel. Kilmarnock STD 0563/22408. MN

FINAL CLEARANCE BARGAINS

Genuine Swiss Precision Engineers Files 10 Assorted Shapes & Cuts 3″-4″ long £1.50. Ditto 5-7″ long £2.00 Swiss Needle Files 12 assorted shapes & lengths £1.25. Special Parcel 50 assorted small Swiss files £5.00. Patent Deburring Tool £1.75. Model Makers Precision Bench Block £2.25 worth double. Silver Solder 24″ sticks 50p. CWO. Post Free. **B & B (Dept ME), 17 Lingfield Road, East Grinstead, Sussex.**

MODELS AND MATERIALS

Exchange wanted for 5″ Gauge Crampton loco, or would purchase any near or completed 5″ gauge locomotive, or boiler. For Sale early 1974 7¼″ gauge G.W. Castle class, from works drawings. All above strictly private and strictly cash. Box No. 2956, Model Engineer Office, P.O. Box 35, Hemel Hempstead, Herts. HP1 1EE. M

CHERRY'S

WE WILL PAY
THE BEST PRICES FOR MODELS ANYWHERE, WE REQUIRE MODEL LOCOMOTIVES FROM GAUGE "O" TO 10¼", TRACTION ENGINES, MARINE ENGINES, STATIONARY ENGINES, EARLY TINPLATE MODELS, BOILERS, ETC., ETC.

Single items or collections bought
Distance no problem
Write, call or telephone

CHERRY'S LIMITED
62 Sheen Road,
Richmond, Surrey, TW9 1UF
Telephone: (01) 940 2454

250 ft. 7¼" gauge aluminium track, 1 point, fully sleepered complete with fishplates. Offers, buyer collects. Haynes, Vicarage, Glastonbury. Tel. 2362. MN

Wanted Part finished G.W. loco, Speedy or similar. West, 13 Lymore Avenue, Oldfield Park, Bath. M

If you have a model to sell, consult STEAM AGE. Though specialising in Locomotives and Traction Engines we are interested in buying models of all descriptions.

STEAM AGE 59 CADOGAN STREET LONDON, S.W.3.

3½" 2-6-2 N.E. type tender loco, chassis 75%, boiler shell, tender frames and wheels, £100. Tel. 061-748 3572. M

For Sale. Little used 7¼" Battery electric loco by Cromar White, with heavy duty batteries and charging set, original cost £619. Offers. Worley, 'Gaiters', Bishops Walk, Croydon, CR0 5BA. 01-656 1155. M

For Sale. 5" G 0-6-0 tank loco. Complete chassis with drawings and parts of boiler. £150. o.n.o. Tel. Cambridge 861027 after 6 p.m. M

5" Gauge loco 0-6-0 Speedy, for sale, good steamer, boiler bronze welded, can be seen running by appointment £450. K. Oldfield, 299 Winn Gardens, Sheffield 6 Tel. 340367. M

RAILWAY EQUIPMENT
For 3½" to 10¼" GAUGES
Complete sets of track parts, points, bogies, wagons, carriages, signals, etc. Electric, Diesel and Steam Locomotives Railway planning and construction. Send 10p for illustrated brochure.
CROMAR WHITE LTD,
Woodman Works, Durnsford Road, London, S.W.19. Tel.: 01-946 1033

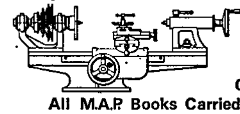
Nameplates from steam locos. Collector will purchase or exchange. Good prices paid. Tel. Denham 4217. Write, Bill Curtis, 6 Savay Lane, Denham, Uxbridge, Middx. UB9 5NH. Alt. M-S

Sale. Bassett-Lowke scale 0 gauge steel railway track 9 ft. by 3 ft. on base fits any table. £20. 449 Redditch Road, Kings Norton, Birmingham. M

Wanted unfinished, incomplete, rusty or neglected stationary and marine steam engine models, castings etc. Old stationary steam engines up to 3" bore size. Condition unimportant. P. B. Slater, 6 Hammerton Road, Bottesford, Scunthorpe, Lincs. Tel. Scunthorpe 4100 (Business hours). M

Myford division plates, quantity end mills, drills T/S, parallel, quantity small ballraces. Lists. Couzens, Rosecare, St. Genny's, Bude. M

CALDWELL INDUSTRIES
LULING, TEXAS 78648
Catalog $1.00



Machine Tools
Steam Engines
Locomotives
Steam Tractors
Gasoline Engines
All M.A.P. Books Carried in Stock

Belliss & Morcom Compound Steam Engine, 27/64 B.H.P. (4' 8" x 2' 4" x 6' 3" high). For — Collector/Museum/Export. Offers. Contact A. J. DuBock. Tel. Staines 55298/9 (Day). M

Wanted. 5" loco in good condition, with brazed boiler, but possibly 3½" Britannia/Lassie may suit. Good price paid. 26 St. Stephens Road, Winchester. Tel. 65099 (evenings). M

PEN-Y-DARRAN

Model and Prototype Engineers
Scale Models for Civil and Mechanical Engineering Projects
A SMALL, VARIED SELECTION OF GOOD WORKING STEAM MODEL LOCOMOTIVES AND STATIONARY ENGINES IN STOCK.
3½"-7¼" G. Dr/PASSENGER CARS
on Display. Limited amount of orders accepted (S.A.E. with all enquiries please)
We ALSO invite orders for SCALE WAGONS, SIGNALS & LEVERFRAMES in 5" and 7¼" GAUGE

2 TRIM BRIDGE, BATH, SOMERSET. Tel: 4790

From NOVEMBER 1st business by appointment only.

Working Stuart 10H steam engine, boiler, all extras, just built, parts cost over £44. Accept £40 o.n.o. Tel. 01-449 1746 (Barnet) M

Wanted. 3½" tender in any condition for Atlantic locomotive. R. Field, Two Counties, Abney Court Drive, Bourne End, Bucks. Tel. 20138. M

Wanted. Stuart beam engine. Michael Pearse, Midtaphouse, Liskeard, Cornwall. M

10¼" gauge coal fired Stirling 8' Single loco and tender. 60 Southway, London, N.20. Tel. 01-445 8216. M

Surplus to requirements, 7¼" gauge "Cromar White" Hymek, as new. £600 o.n.o. Tel. Elstead (Surrey) 3002 evenings. LN

5" gauge fine bullhead track parts for sale. Suitable for display or passenger traffic. Weatherproof. Foolscap S.A.E. for list. 50p for sample parts Martin Engines, Thame Road, Haddenham, Bucks. Tel. Thame 2082. T/C

Pressure Gauges ¾" and 1" diameters. S.A.E. for descriptive list. F. Dinnis, 5 Ward Avenue, Cowes, Isle of Wight PO31 8AY. T/C

Wanted 2½" or 3½" gauge Loco needing slight repairs considered. Pearse. Midtaphouse, Liskeard, Cornwall. KLM

MODELS WANTED
OF ALL TYPES

Oakhill Museum, Oakhill Manor, Nr. Bath, Somerset
Tel.: Oakhill 210

Pre-war "0" or "I" gauge model locomotive and coaches sought, made by Marklin, Bing, Lowke or Hornby, good price paid. Proctor, 10 Church Hill, Patcham, Brighton. Tel. 553940. Alt. T/C

For Sale. Curwen-built 10¼" gauge Pacific Locomotive, Live steamer in L.N.E.R. apple-green. Full working order plus spare brake shoes, plugs, fire bars, etc. Complete with tools, £5,500. Tel. Cambridge 860153. LM

Drawings and castings for 22 close scale Steam Locomotives in 3½" & 5" Gauges, 8 Stationary Engines and workshop equipment.

New Drawings available
7¼" Gauge N.E. Ry 2-4-0 "Tennant" class
G/A Engine & Tender T/1—80p
Engine Frames T/2—80p
Cylinder & Valve Gear T/3—80p
Tender Frames T/6—80p
Tender Tank T/7—80p
All plus 10% V.A.T.
5" Gauge L.M.S. "Black 5" G/A engine 5/Black 5/1 80p. G/A Tender ST/8 80p. All plus 10% V.A.T.
Finished boilers, Locomotives, machined parts to order, we build up to 15" gauge main line types, Steam, Diesel Hydraulic, scale or free lance.
All classes of Models for Industry, Museums and private collectors.
Industrial Brochure Free to Bona-Fide enquiries. Catalogue of locomotives and stationary engines etc., 35p U.K. post included, all items subject to 10% V.A.T. except catalogues.
Visitors by appointment *only*.

H. CLARKSON & SON,
Model Precision & General Engineers,
Cast Iron & Non-Ferrous Metal Founders,
53-57, Layerthorpe, York. YO3 7XB.

Drawings for "Mountaineer" £6. "Jersey Lily" or "Immingham" £7.70, "Fishbourne" £8., Rail Motor No. 1 or "County Carlow" £4.30, "Elaine" £3.50. Overseas orders plus 75p. Six more designs in list No. 3. Send S.A.E. (foolscap) to Don Young, Smithards Lane, Cowes, I of W. Alt. I-S

Lincoln M.E.S. offer for sale 0-4-0ST 5" gauge loco. "Ann of Holland" and 3½"/5" portable track. Steaming by appointment. Offers over £200 invited. Full details: P. J. Layfiield, Sec. L.M.E.S., Westgate, Old Lincoln Road, Caythorpe, Grantham. M

T. H. Barker & Son, Baines Paddock, Haverthwaite, Ulverston, for bright mild steel, brass, copper, etc. 5p for list. M-Q

Wanted. 3½"/5" gauge Diesel outline locomotive (Electric/Petrol). 5 Wygeston Road, Bottesford, Nottingham. M

Allchin. New set Reeves spur gears £9. Boiler materials, set Reeves flanged plates, set firetubes, and Boiler barrel, all copper £9. Tel. Whitchurch (Bristol) 2006. M

STAINLESS STEEL TUBING

Model Engineering Pack—

1ft length of each:
.018" o.d. x .010" i.d.
.025" o.d. x .013" i.d.
.032" o.d. x .020" i.d.
.050" o.d. x .032" i.d.
.059" o.d. x .043" i.d.
.064" o.d. x .047" i.d.
.080" o.d. x .060" i.d.
.093" o.d. x .070" i.d.

£2.75 inc. VAT and P. & P.

Other sizes stocked
.012" o.d. — .25" o.d.

S.A.E. or list. Manipulation and Assembly to customers specification

The Stainless Tube & Needle Co. Ltd.
Riverside Works, Alcester, Warwicks.
Telephone Alcester 2696

WANTED
Railway Locomotives up to 10¼" gauge, Traction Engines, Marine & Stationary Engines.
Tel: Loughborough 67654
(Evenings and weekends Nanpantan 204).

PENDULUM BOB SHELLS
For longcase clocks, 3¾" diameter in 22 gauge brass, ready for making up £3.50 per pair plus post and packing, U.K. 10p, overseas 20p.
COMPLETE BOB
Lead filled with bottom block (tapped 5 BA for ¼" diameter rod), weight approx. 2 lbs., rating thread and square nut, front face polished and lacquered, £9 plus post and packing, U.K. 30p, overseas £1.30.
ELECTRIC BATTERY OPERATED CLOCK MOVEMENTS (Less dial and hand)
New, self starting, centre fixing, runs for approx. 1 year on 1½ volt cell, £3.50 each inclusive post and packing, U.K.
MERIDIAN CLOCKS,
Duncans Granary, Billingshurst, Sussex RH14 9DP
Tel. Billingshurst 2463
(Callers by appointment please)

BOOKS, PUBLICATIONS, ETC.

85 volumes M.E. unbound, £60 o.n.o. also 150 railway books (locos, biographies, Practical Mechanics 1842-1866, histories etc.) £100. Chaplin, Norhyrst, Ballasall, Isle of Man. Tel. Castletown 3577. M

"HOW TO MAKE A WEIGHT DRIVEN EIGHT DAY WALL CLOCK" by John Wilding.
Written in such a practical manner that the reader sits beside the author during the actual making of the clock. Lavishly illustrated with 101 photographs and 46 individual drawings.
Only £3.75, post free, from "THE HOROLOGICAL JOURNAL", Box No. 22, Ashford, Kent.

Model Engineers approx. 2,000 from 1924. Reasonable price per batch lot accepted. E. Eyre, 3 Chapel Lane, Croesyceiliog, Cwmbran, Mon. Tel. Cwmbran 3042. M

Offers wanted unbound Model Engineers. Copies 1936-1969 mostly complete from Vol. 101. Few copies Practical Engineers 1933/4, 8 vols. Workshop Practice, also unfinished model Hielan Lassie. Box Number 2957, Model Engineer Office, P.O. Box 35, Hemel Hempstead, Herts. HP1 1EE. M

Model Engineers, Vols. 103-138 2 copies missing. Also 423 'Mechanics' 1948-1956. Offers. Buyer collects. Waterton, 8 Red Doles Road, Fartown, Huddersfield. M

£80 "minimum" offered for M.E. volumes 1-80 (portions welcomed, available). Lambert, 60 Sallhouse Road, Rackheath, Norwich NOR 01Z. K-U

"Modelling Steam"?

John Fowler Spare Parts catalogue for Traction Engines 1910, 75p. A must for the historian and model engineer. Lists and illustrates every part in the construction of Traction engines and road rollers. Portable Agricultural Engines, delightfully illustrated with engravings of 19th century engines, 30p. John Fowler Instruction Manual for Traction Engines 1904. Covering day to day running and general maintenance, (Casebound) £1. From bookshops, preservation centres, or direct from the publisher; **Turntable Publications, 23 Portland Crescent, Leeds. LS1 3DR.**
(Please allow for postage if ordering direct).

Back numbers/volumes of M.E. available/wanted to help K. & E.S.R. funds. D. M. Randall, Birchley House, Biddenden, Ashford, Kent. Alt. I-K-O

American Railroad Boox modelling, diesel, steam trolley. "Model Railroader", "Railroad Model Craftsman", "Railroad Magazine", "Trains", "Traction & Models", etc. Subscriptions. List 6p. Clyde. Box 9, The Mount, Ewell, Surrey. Alt. Q-O

Steam Ploughing. No Steam enthusiast should miss "Ploughing by Steam". 360 pages packed with details of the mighty machines. £3 post free, signed if required, from C. R. Tyler, 10/12 Armour Road, Tilehurst, Reading, Berks. M

M.E. Vol. 86 to Vol. 134 complete, £32 o.n.o. 4" R. B. Drummond, 3 chucks, changewheels, equipment ¼ H.P. Offers, Knipe, Marbury, Abbotts Ann, Andover. Tel. Abbotts Ann 243. M

GENERAL

Wanted. Brass chain about 9 and 12 LPI. Also brass wire about .010-.020 diam. Billingsley, Roseland Stores, Veryan, Truro, Cornwall, TR2 5QA. M

Replica Models

Authentic reproductions of over 40 of the world's most famous guns realistic in every detail Send large s.a.e. for free illustrated colour catalogue to
Replica Models (UK) Ltd
DEPT J 34 NORTH ST HAILSHAM SX

Laboratory Apparatus and Chemicals. Send stamp for list to Beck Scientific, 147 High Road, London, N15 6DQ. Telephone 01-800 7342. M

Wanted. Complete 2 channel or larger radio control. Smith, Cossington P.O. Bridgwater, Somerset. M

Penfriends Home and Abroad. S.A.E. for details, European Friendship Society, Burnley, Lancs. T/C

AUTHENTIC RAILWAY COLOUR PAINT

This is what every model locomotive builder must have been waiting for! After many months of research we are now able to offer 20 different authentic locomotive colours. We also stock self-etch primer for brass, copper, stainless, etc. All at very competitive prices, and in sensible sized tins. Send S.A.E. for list to:
PRECISION PAINT CO.
P. O. Box 43, Cheltenham, Glos. GL51 5HR.
Trade enquiries welcome.

Make a Farm Dung Cart. Drawings prepared from actual old Lancashire tipping muck cart, one eighth scale to suit large harnessed shire (as marketed by Melba Ware) set of 10 detailed prints full size £3.95, including postage, from L. Tatlock, 138 Piggott Street, Farnworth, Nr. Bolton, Lancs. J-M

The World Ship Society, for ship-lovers throughout the world. 4p stamp (U.K.) for details and magazine from Dept. M.E., 431 Green Lane, Coventry CV3 6EL. U-O

ELECTRICAL

For Sale. Quantity of 10va Transformers 200/260v to 4/8/12v. 55p each, post and VAT extra. Reduction for quantity. Equipment & Storage Co. Ltd., 21 Hockerhill Street, Bishops Stortford, Herts. MN

Motors cap. start ⅓ H.P. 220/250/50/1 PH. 900 r.p.m. Shaft ½" x 1¾" endplate mounting £4.50 plus p & p. J. Heap, 44 Springhill Grove, Penn, Wolverhampton. M

Electric motors 12v-24v D.C. ⅛hp. 3,000 rpm 4 brush compact new, ½" shaft L/weight only £4.80 pp 60p. Also gearbox 10:1 ratio, ideal for above motor, for truck, train or mobile winch, £4.50 pp 50p. Transformers 240v 12-16volt 20 amps £7.50 pp 60p. Malden Transformers 134 London Road, Kingston on Thames, 546-7534. M

200/250 VAC. Venner time switches type TJSSP, 20A contacts switch on at dusk, off at dawn. Manual override, clockwork mechanism in event of power failure, fitted case. Type MSSP as above 30A contacts but less clockwork mechanism and case. Type TJSSP £4.20, type MSSP £2.75, post 30p. Sylvian Controls, 38 Warwick Road, Ash Vale, Aldershot, Hants. M

FIELD ELECTRIC LTD.
3 Shenley Road, Boreham Wood, Herts.
01-963 6009/3500
Electric Motors, Hoover or Crompton Parkinson reversible all continuous rating 200/250 V.A.C. Single Phase 50 cycle.
1/40 h.p. 1425 r.p.m. £2.00 carr. 37p.
¼ h.p. 1425 r.p.m. **£2.25** } carr. 60p
⅓ h.p. 1440 r.p.m. **£3.75** }
½ h.p. 1440 r.p.m. **£6.75** } carr. 50p
2800 }
¾ h.p. 2800 r.p.m. **£10.50** }
Geared Motors 200/250 V.A.C. 50 cycle Single Phase-Parvalux or Groydon
30 r.p.m. 40 lbs./ins. £5.50 carr. 50p
100 r.p.m. 40 lbs./ins. £5.50 carr. 50p
Bodine
71 r.p.m. 4.0 lbs./ins. £3.75 carr. 40p
Crompton Parkinson/Motorgear
35 r.p.m. Ratio 40.1 £7.50 carr. 60p
other types of geared motors in stock—for further details S.A.E.
Gear Boxes
David Brown
10.5/1 Ratio } £2.75 carr. 25p
14.5/1 ,, }
Solenoids
12 volt D.C. Pull Action 40p carr. 8p
240 volt A.C. Pull Action 50p carr. 8p
Counters
Mechanical 5 digits resettable 50p carr. 8p.
Electrical 110v. D.C. resettable £1.50 carr. 10p.
Large S.A.E. for Lists. Add 10% V.A.T.

Optical Encoders, proximity detectors. Send 9" x 6" S.A.E. Fibre Optic Suppliers (ME), P.O. Box 702, London, W10 6SL. M

Second-hand Synchronous Motors, ex-electric slotmeters 200/250 volts A.C. 50cc with geared mechanism, easily converted to own particular use. Various types. Large stock. Price on application. Tradex Meter Co. Ltd., 67 Maple Road, Surbiton, Surrey KT6 4AQ. Tel. 01-399 2234/5/6. T/C

A.C. Motors, self-start, induction 220/250v, 50 cycles, 1 phase 1,425 r.p.m., ¼ h.p. £4.25; ⅓ h.p. £5.87; ½ h.p. £7.87. Perfect and guaranteed carriage England 50p. Johnson (M.O.) Engineering Company, 319 Kennington Road, S.E.1. Tel. 01-735 1413.

BUSINESS SERVICES

Centrifugal casting service to the trade for the production of metal subjects in tin, lead alloy or zinc aluminium alloy. **Skinpackaging** service. Trade enquiries invited. S.A.E. for details P. Friman & Co. Ltd., 55 Rectory Road, Oxford, OX4 1BW. Tel. Oxford 47401/2. Alt. I-S

Interchangeable Watch Material etc. lowest prices (U.K. only) No list — quotations S.A.E. J. H. Young & Son, 133 London Road, Chippenham, SN15 3AN, Wilts.

PHOTOGRAPHY

"Projector Kits" Tax free model kits for combined 2" x 2" and 2¾" sq. slides. 25 mm, stereo. View-Master reels projectors, viewers, microfilm, readers, overhead projcors, screens. Episcope kit (5" x 5") £16.80. Opticals, fan motors, lamps. S.A.E. for brochure stating interest. Marshall Smith Ltd., 64 Norwich Avenue, Bournemouth. T/C

Printed in Great Britain by Thamesmouth Printing Co. Ltd., Southend-on-Sea, for the Proprietors, Model & Allied Publications Ltd., 13/35 Bridge Street, Hemel Hempstead, Herts. Published by the Argus Press Ltd., 12/18 Paul Street, London, E.C.2 to whom all trade enquiries should be addressed.
Registered for transmission by Magazine Post to Canada.

M.E. QUERY COUPON
DEC. 1973

MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION

MODEL ENGINEER EXHIBITION 1974

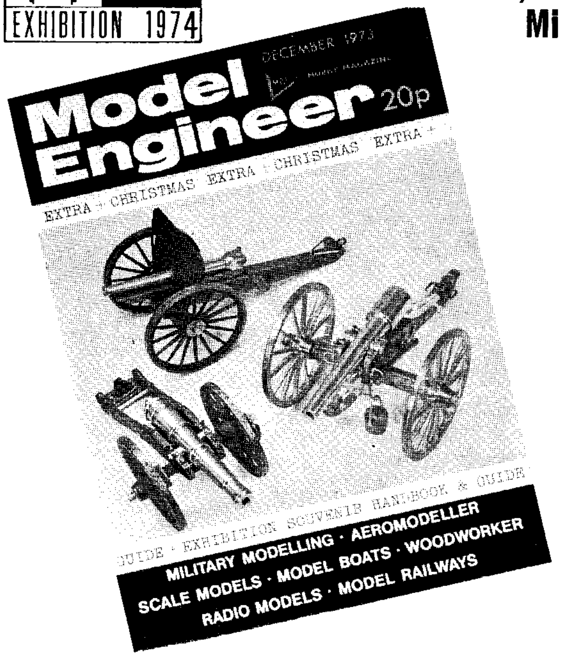
43rd GREAT SHOW!

SEYMOUR HALL, LONDON, W.1

1st January - 12th January 1974 (Not Sunday)

Daily 10 a.m. - 9 p.m. last Sat. closes 7 p.m.

Model Aircraft, Locomotives, Boats, Traction Engines, Military Models, Crafts.



COMPETITORS

£300 in prizes . . . some 30 cups, trophies and other awards. Championship Cups for permanent retention. A win confers 'Expert Status'! Edgar Westbury Memorial Challenge Trophy.

ENTRY CLASSES

Examples of every form of modelmaking activity on show. Model Engineering masterpieces, locomotives, traction engines, aircraft, boats, yachts, cars . . . simple plastic creations . . . Classes include Military Models (six classes) and Craft entries (furniture, glass-fibre, etc.).

WHAT WILL BE ON DISPLAY

OPEN PLAN arrangement of the MAIN HALL provides excellent access and viewing, whilst retaining the concourse round the WINNER'S PODIUM — (This year, we hope winners will fit this stand!) A slight change in S.M.E.E. WORKSHOP will allow spectators better viewing without blocking a door. 'Bill' Carter will again be in charge of the S.M.E.E. PASSENGER RAILWAY with non-stop service during opening hours for young and old. The team of experts from the Society will be providing practical work and advice to visitors.

LARGE FLYING CIRCLE — balcony to balcony — again in operation with even more exciting and expert models, and operators. All-electric models that do most of the things that i.c.-powered control-line models do. It gets better every year.

TRADE STANDS — We have increased numbers this year in view of increasing demand from exhibitors. These are in MAIN HALL; further trade and DEMONSTRATION STANDS in BRYANSTON ROOM will show construction techniques and use of tools.

Introduction of a MODEL ENGINEER WORKSHOP manned by the S.M.E.E. proved immensely popular and will be increased in size and scope, again with experts from S.M.E.E. in charge and assisted by M.E. consultants. Working models under compressed air will also be on show, i.c. engine testing with swinging field type Dynamometer.

BRYANSTON ROOM will again be a CLUBMEN'S CORNER with stands manned by the principal governing bodies, plus club unit demonstrations, and trade demonstrations.

LECTURE HALL will house the clubs connected with MILITARIA — British Model Soldiers Society, International Plastic Modellers' Society, etc. — and also display the entries in the MODEL SOLDIER classes.

BATTLE GAMES on announced themes with expert commentary.

BOATING MARINA: Timed sessions will be held. TRADE DEMONSTRATIONS of RADIO-CONTROLLED BOATS will be welcomed (please let us hear early), which will be varied with CLUB EVENTS (mainly in evenings) and STAFF EXHIBITS. There will be no selling at the poolside, but demonstrations can be announced and suitable display cards shown advising visitors where products, obtainable and information given. Club features or displays specially invited — drop us a line!

GALLERIES provide sitting-out space for several hundred persons, and offer best view of model aircraft flying. There will also be club exhibits displayed and entries in our BOYS' EXHIBITION, and other displays.

SOUVENIR GUIDE

Another CHRISTMAS EXTRA issue of Model Engineer will be coming out 2nd Friday in December with entries, trade stands, articles galore to assist the visitor and solace the stay-at-home.

PRIZE POOL ALLOCATION

Classes attracting six or more entries will enjoy prizes to value of: 1st £5; 2nd £3; 3rd £1. With over 12 entries: 1st £7; 2nd £4, 3rd £2; 4th £1. Classes under six will have 1st and 2nd only, or at discretion of the judges, may be combined with other classes.

REFRESHMENTS

Snack Bar in the Balcony Cafe, with tea, soft drinks, sandwiches, cakes, Restaurant Service (licensed) available on ground floor. Parties may book in advance.

Price of admission at the door will be: 35p adult, 20p child, inc. V.A.T. A child is regarded as anyone still at school. Children under five who have not started school and are accompanied will not be charged.

ADMISSION

Reduced admission charges for pre-booking as under:

Single and small number pre-booking tickets available from these offices. Adults 27½p, Child 15p. Parties of more than 10: Adult 22½p, Child 12½p. Teachers i/c parties free — one per 10 in party.

A combined family ticket can also be bought in advance.

Advance Bookings and details from:
EHIBITION MANAGER,
M.A.P. LTD., P.O. BOX 35,
HEMEL HEMPSTEAD, HERTS. HPI 1EE.

MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION MODEL ENGINEER EXHIBITION