5-18 January 1979 First and Third Friday Volume 145 Number 3600 40p

Model Engineer

MAP

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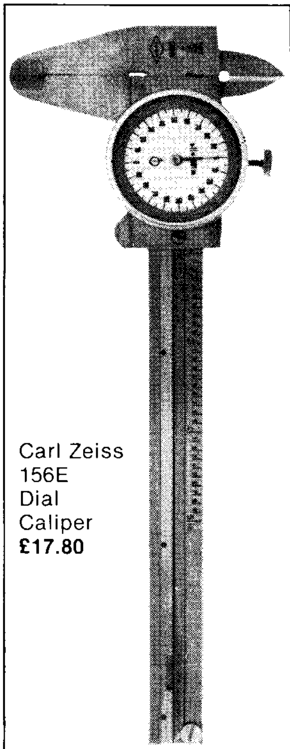
HOBBY MAGAZINE

MEASURING EQUIPMENT
by CARL ZEISS SUHL



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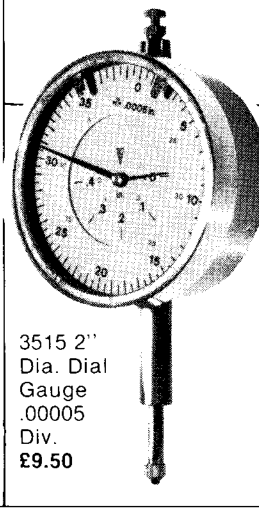

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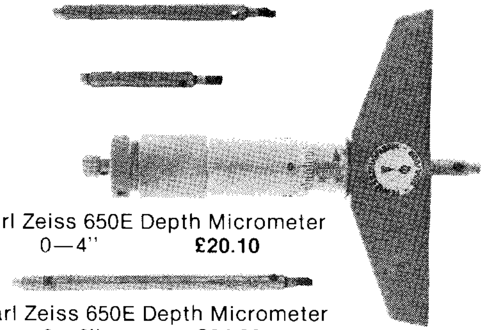

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Volume 145 — Number 3600

5 January 1979

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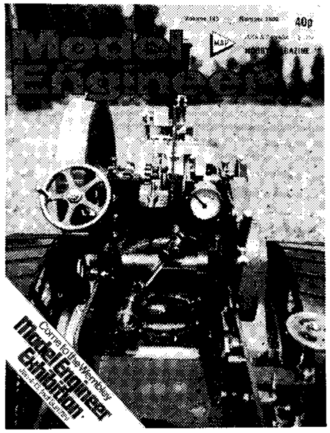

A traction engine built by Mr. Walter Merriott. Photo by D. L. Brown.

NEXT ISSUE

More of the Midland Exhibition.

The Editor is pleased to consider contributions for publication in "Model Engineer". Manuscripts should be accompanied if possible by illustrations and should also have a stamped addressed envelope for their return if unsuitable. While every care is taken, no responsibility can be accepted for unsolicited manuscripts, photographs, art work, etc.

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M.E. QUERY COUPON
JANUARY 1979

DON YOUNG DESIGNS

OUR NEW YEAR RESOLUTIONS

Our first aim must be to provide a SERVICE to builders of Locomotives to our designs. To this end we have kept **Drawing** Prices stable for almost 2 years now, of which we are justly proud. Although the inevitable will have to happen at the end of March, we promise to keep increases to a very minimum, and invite you to take advantage of the real bargains that are presently available.

We have increased **Castings** coverage of our more recent designs, and made improvements as experience teaches. We have in part to thank Messrs Reeves for this, and for their continued support of our earlier designs as published in M.E.

It is in the **Fittings** area that currently we are not properly supporting builders of our Locomotives, this due to general demand for our QUALITY items, and we must take drastic steps to improve the position. Therefore, from 1st January our General Fittings List is withdrawn. Until the end of March we shall concentrate on reducing the backlog of Orders, customers please note, whilst continuing production of Injectors. At 1st April we shall introduce our new List, with emphasis on Injectors and their ancilliaries; devoting any spare capacity to providing a SERVICE to builders of Don Young Designs Locomotives. Only in this way can we re-establish our watchwords of QUALITY and SERVICE to our valued customers.

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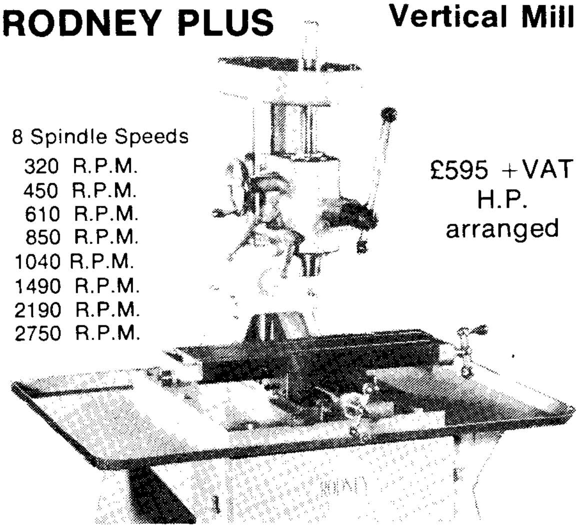

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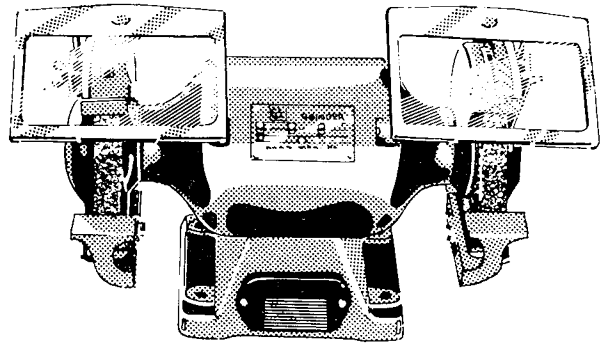

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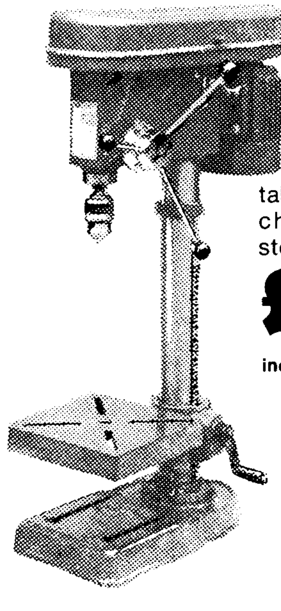

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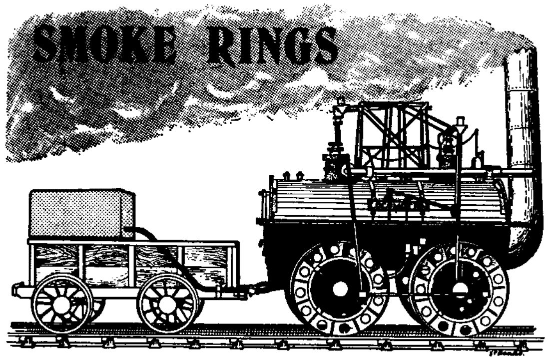


A Commentary by the Editor

Loco pictures

Mr. G. W. Bell, who lives near Exeter has sent me a cutting from "Express & Echo", the local paper, dated 4 November 1978, in which there appears an offer to readers. This is for colour prints of locos from Rocket to Evening Star — 60 in all. To claim the postcards, readers have to collect numbers which appear daily and pay the sum of 30p for ten cards. This goes on for six weeks until the set is collected. A nice idea and one which, I hope, could be repeated, particularly in other areas so more enthusiasts can benefit.

Oakhill Manor

On 16 July last year, Phase 1 of the Oakhill Manor Museum and Railway was officially completed and opened. The 10¼ in. track, which is set in beautiful surroundings, was very much appreciated by all who attended then and since — we have John Haining's report which will be published soon. Now Phase 2 is under way and planning permission is being sought to commence the construction of the museum side which, it is hoped, will become a model maker's Mecca. It will take some time for all this of course, but meanwhile, a Trust is being formed which will, among other things, assume the responsibility for collecting models. Already on the Trust are The Honourable John Gretton, Mr. Roland White, and Mr. Walter Harper. If you have any model(s) which you would like to loan or donate to the Museum, please contact Mr. Roland White at Latymer, The Drive, Belmont, Surrey (01-642 3710).

Anyone remember this loco?

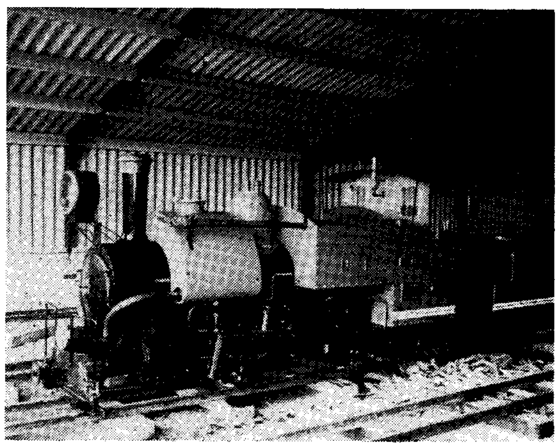
We have received a request from a Mr. Hollas to publish his efforts in tracing a G.N.R. loco built at the turn of the century by his father. The loco, I'm afraid we know no more about it, is in apple green (could be a Stirling Single?) and was lent, according to Mr. Hollas, to a museum in Halifax. It has since disappeared, hence the request.

Metrication

How much further will we progress towards metrication this year? The progress report for 1977/8 published by the Metrication Board last November seems to indicate that in the previous 18 months the progress "has been insufficient judged from the point of view of both Britain's competitive strength in world markets and the long term interests of people in their daily lives". The report also says that the use of metric units will increase in world trade, industry and technology and to avoid an "indeterminate period during which the inefficiencies and inconveniences of using the two systems side by side will grow" we ought to take out the proverbial finger and achieve the transition "in an orderly fashion". Well, quite a few industries now use metric units as readers will know and in our schools the craft teachers concentrate on this unit of measurement. For the model engineer his main concern is for gauge and length and until all future designs are made solely in metric, we will just have to do a bit of mental arithmetic. With most designs the emphasis is on safety rather than lightness and so if there is no exact equivalent for the dimensions given then we go to the size larger. It's all good practice anyway for if the Metrication Board gets its way it won't be very long before imperial measurements disappear.

That Milner loco

Back in July I mentioned Milner Engineering's Darjeeling Himalaya Mountain Railway loco which had gone to Carhaix. I have just heard from a M. André Joseph, a very capable photographer from Paris who visited Mur de Bretagne and sent us this picture of the loco in its new home. It's a pity that our monochrome reproduction cannot do justice to the photo — nor to the beautiful paint job on it — but visitors to that area of France can get some idea of what they will see. Our thanks go to M. Joseph for the photo.



THE MARSHALL PORTABLE STEAM ENGINE

by R. L. Kibbey

Part XIX *From page 1416*

REFERRING TO THE ASSEMBLY drawing of the pump in the last instalment and also the details in this issue, the function of the pump is as follows — with the by-pass valve closed, the outward suction stroke draws water up the suction pipe, lifting the ball valve shown in section CC of the assembly. During this stroke, the ball valve shown in section XX remains seated. On the delivery stroke, the ball valve in section CC closes and the delivery valve in section XX and also the non return valve in the boiler opens to admit the water. When the by-pass valve is progressively opened the delivery of water is shared between the boiler and the by-pass return pipe to the degree that the by-pass valve is opened. On the suction stroke, the by-pass valve cannot admit air because it is on the delivery side of the delivery valve (section XX).

Assuming that the David Piddington jig and planning sequence is followed, the machining of the body offers no particular problems, but considerable care in accurately marking out the various hole centres is obviously necessary. The valve casing is suitable for holding in the four-jaw chuck for facing both sides and for machining the 15/16 in. dia. outside diameter. Again, great care should be taken in setting out the position of all the drillings. The tapered bore for the by-pass valve will require the usual home-made reamer. This should be made at the same setting of the top slide and at the same time that the plug valve is turned. The turning tool must, of course, be dead on centre height, or else a barrelled shape will be produced.

Alongside the detail of the plug valve I have included a sketch of the recommended procedure for bending the handle of the valve. The hole in the bush used to hold the valve whilst bending should, of course, be reamed with the reamer made for the bore in the valve casing.

The delivery and suction valve plugs and the three water passage plugs are shown with the hexagons milled and with integral shoulder washer faces — a bit more trouble than using hexagon bar but I always think this gives a nice finish to the job as well as providing better spanner clearance in tight spots.

The clack or non-return valve seating which is screwed into the boiler boss is shown as made from bronze. I have precluded brass, firstly because of possible dezincification and secondly because of the thin wall between the internal and external screw threads.

As shown in the assembly drawing (Part XVIII) the recommended spring for use in this valve can be made from a spring out of a standard Schrader motor tyre valve. I picked up this tip from a fairly recent copy of *M.E.* (or maybe I was back tracking over some earlier copies). Anyway, I checked that these springs are rustless wire and have found several occasions to use them in similar valve installations.

The four holes tapped 7 BA in the boiler boss should be spotted through from the holes in the pump body. Note that I have shown these as blind holes. Should any of these holes break through, it will be advisable to coat the set screw threads with sealing paste on assembly.

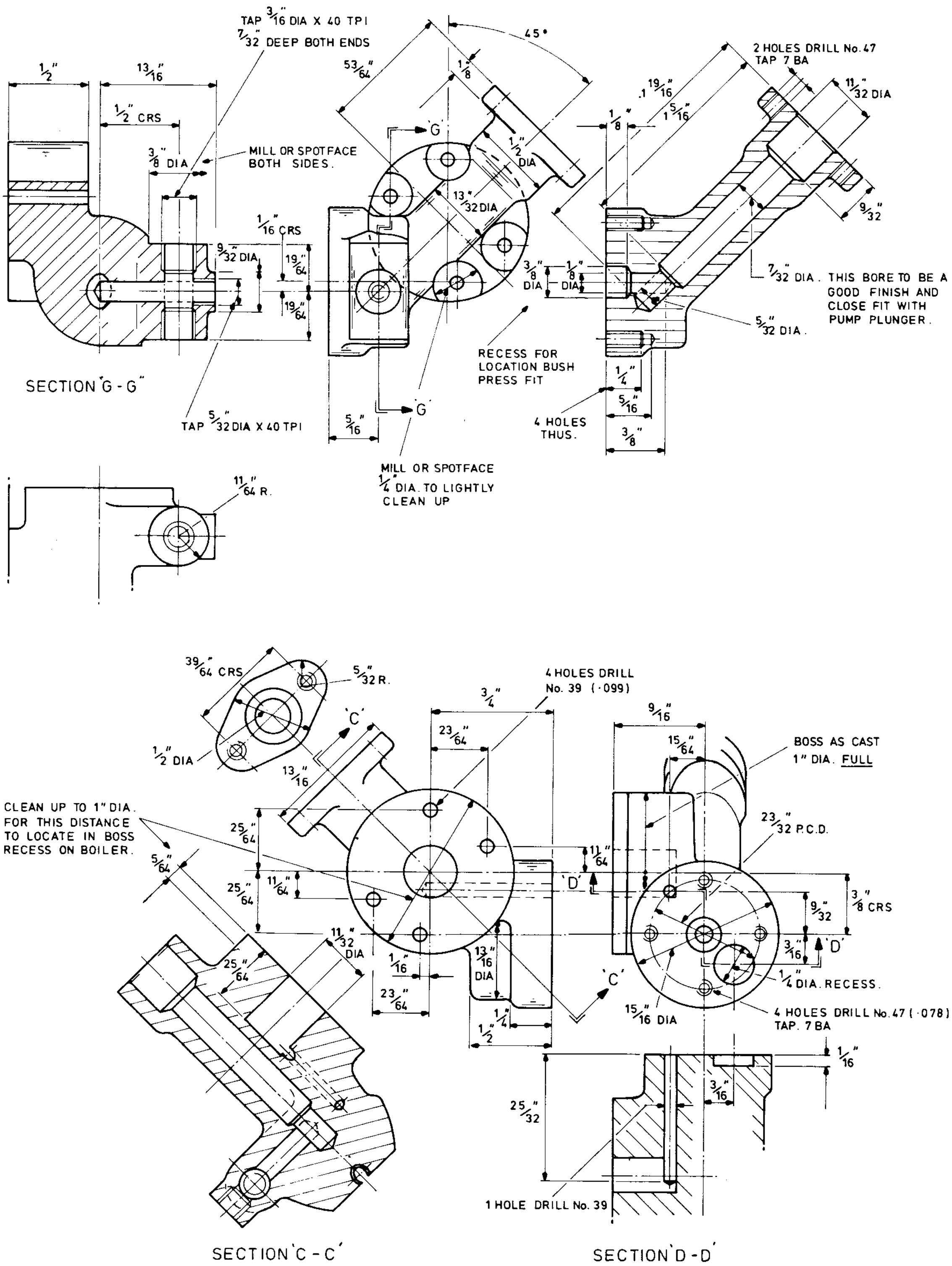
The eccentric strap is produced from a gun metal casting and the machining sequence follows the usual practice. Briefly, this consists of the following — holding lightly in the four-jaw, face both sides to just clean up (not to the final width yet). Next, secure horizontally in a machine vice on the vertical slide and drill the two No. 39 bolt holes. The ends of the bosses for the bolt heads and nuts can now be faced. The two halves can now be separated, preferably with a slitting saw about 3/64 in. or 1/16 in. thickness running between centres and square with the side faces of the straps.

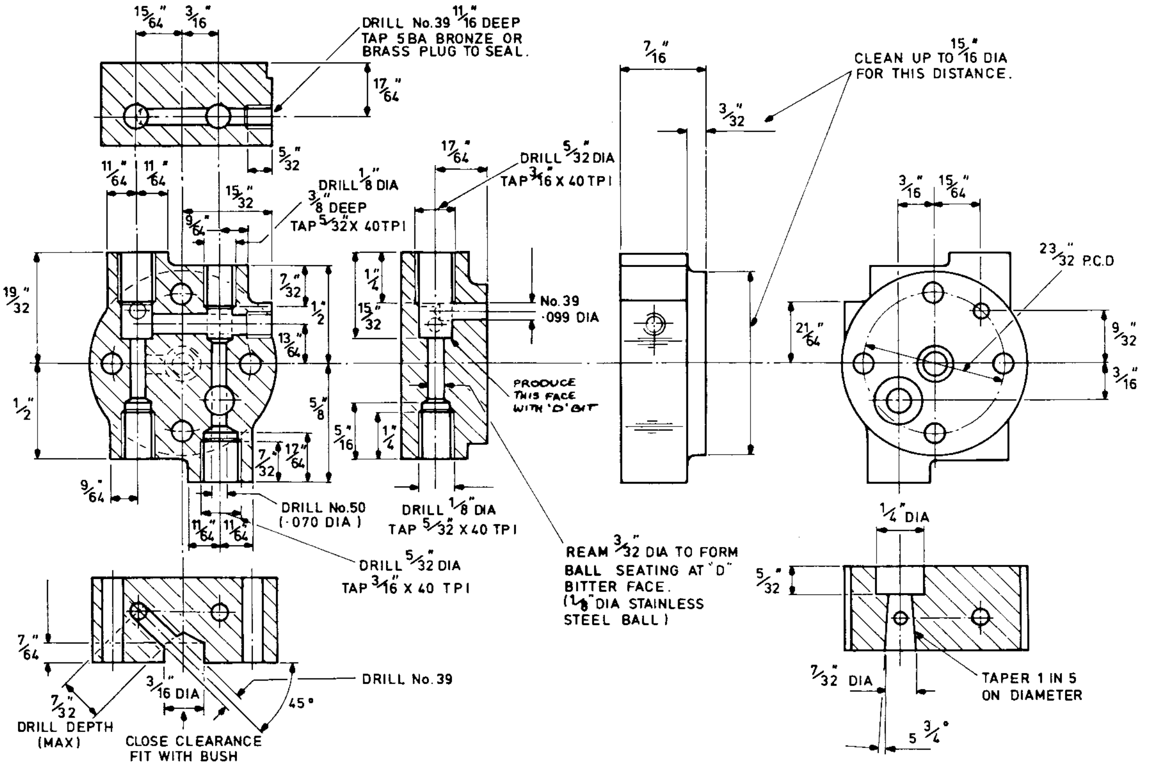
After bedding the abutment faces, bolt the two halves together and finish machine to the dimensions quoted. Take care to ensure that the bore centre line is coincident with the joint line. The .005 in. maximum relief machined on both sides is not an essential feature but improves the appearance.

The eccentric rod is shown fabricated in three parts, the foot and the fork end being machined separately and being finally Loctited together in the correct angular relationship. I make no apology for again stressing that close clearance fits and clean metal joints are essential.

The full-scale drawing of the engine side elevation prepared by Bill Hughes shows a water pump ram which scales 1/4 in. diameter. I purposely reduced this to 7/32 in. dia. on my design on the principle that this engine will almost certainly always be running in an unloaded state with resultant relatively low water consumption. Any builders who intend to work the engine hard under load might consider using a 1/4 in. dia. ram.

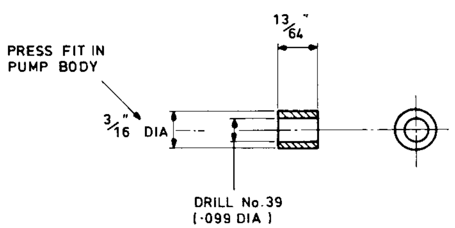
WATER PUMP BODY Matl. - BRONZE OR G.M. CASTING.

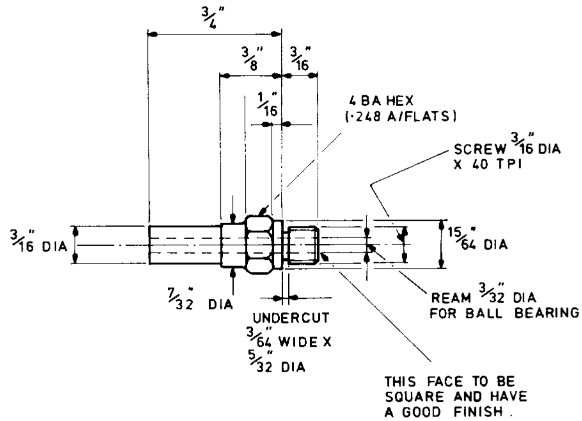




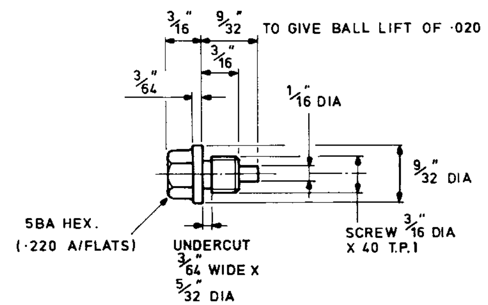
Water pump valve casing – material bronze/G.M. casting.

LOCATION BUSH - PUMP BODY
Mat^l - BRONZE OR BRASS

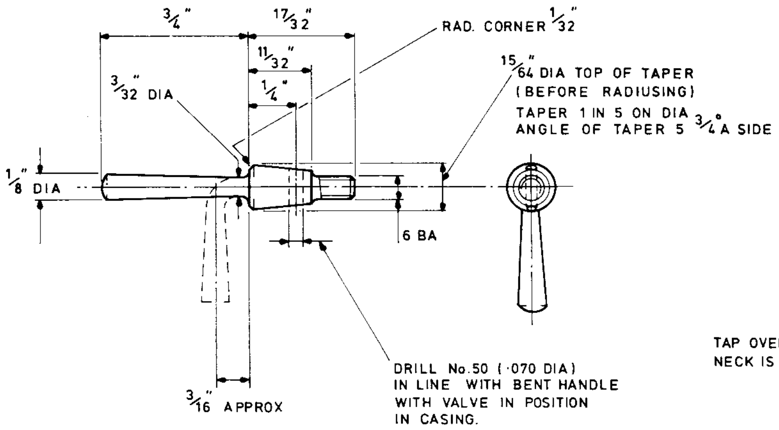




CONNECTION - WATER PUMP
SUCTION PIPE & CLACK SEATING - 1OFF
Mat^l.- PHOS BRONZE OR G.M DRAWN BAR.

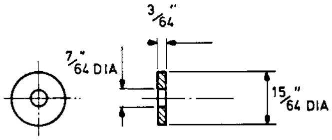


PLUG - SUCTION VALVE PASSAGE - 1 OFF
Mat^l. - BRONZE OR BRASS.

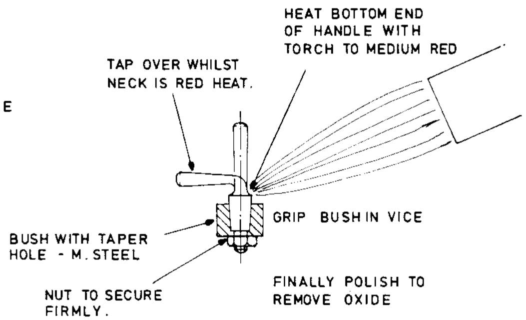


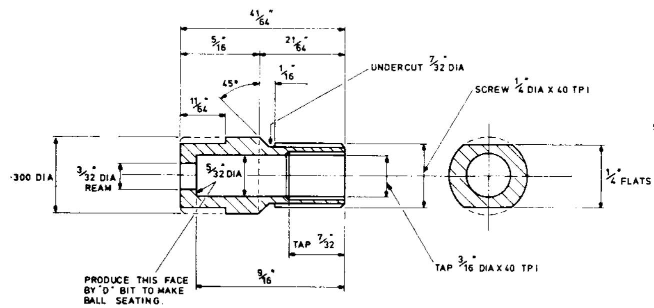
PLUG VALVE - WATER PUMP BY-PASS.

Matl. - STAINLESS STEEL

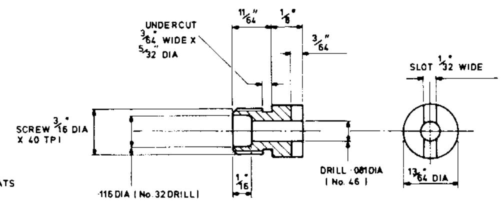


WASHER - PLUG VALVE
Matl. - STAINLESS STEEL
USE BRASS 6BA NUT.

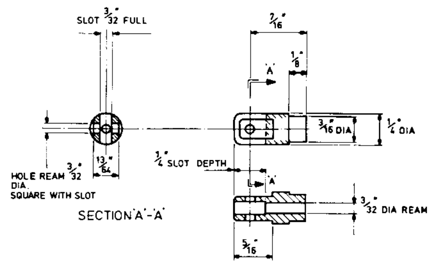




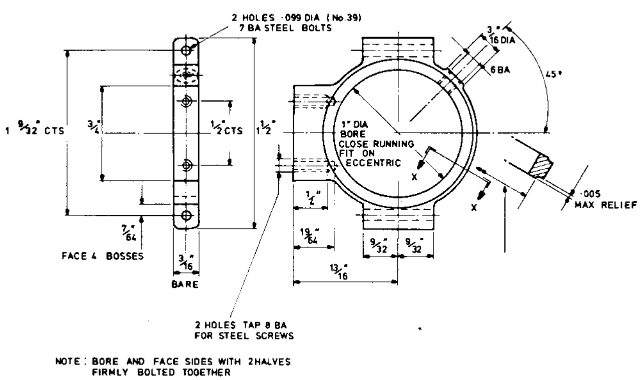
BOILER CLACK SEATING - 1 OFF
Matl - BRONZE DRAWN BAR (NOT BRASS)



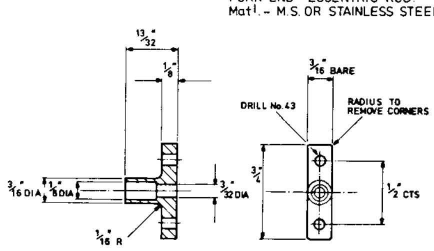
RETAINING PLUG -
BOILER CLACK SPRING - 1 OFF
Matl - BRONZE OR G.M. BAR (NOT BRASS)



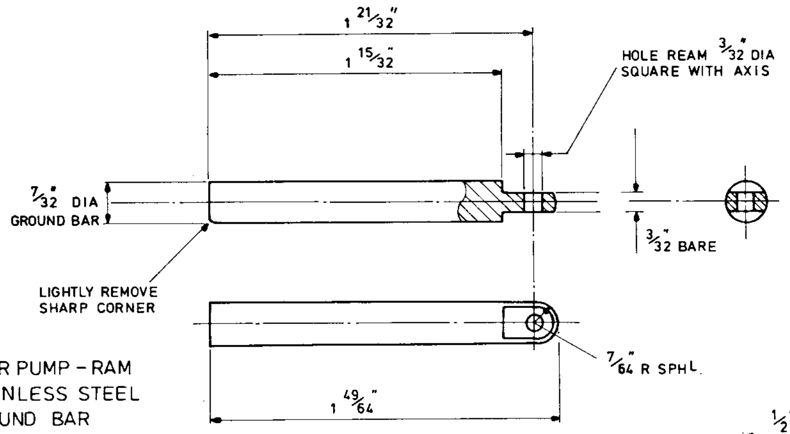
FORK END - ECCENTRIC ROD.
Matl. - M.S. OR STAINLESS STEEL



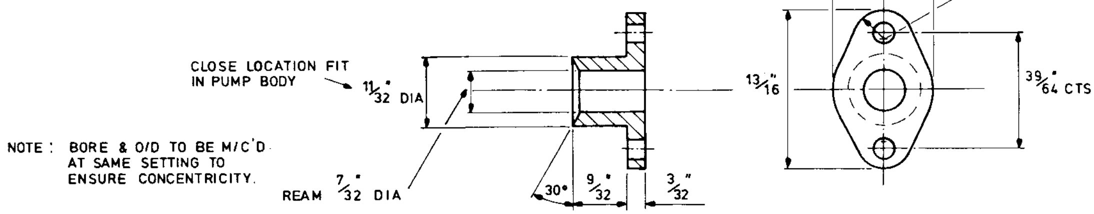
ECCENTRIC STRAP - WATER PUMP 1 OFF
BRONZE OR GM CASTING
(MAKE FROM VALVE ECCENTRIC STRAP CASTING)



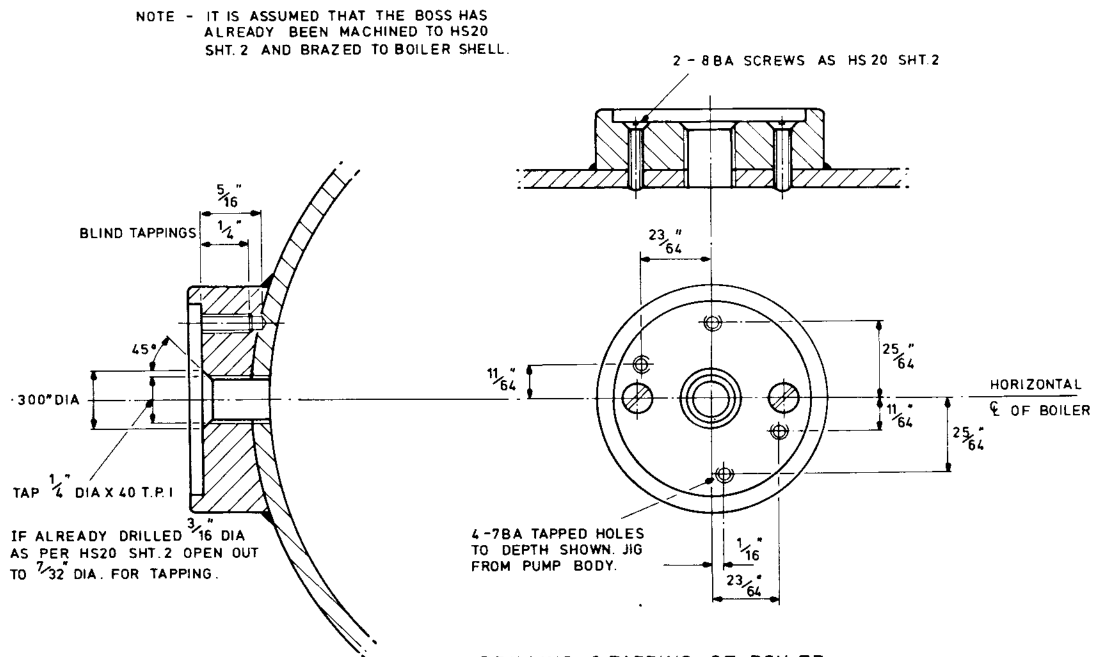
FOOT - ECCENTRIC ROD.
Matl. - M.S. OR STAINLESS STEEL



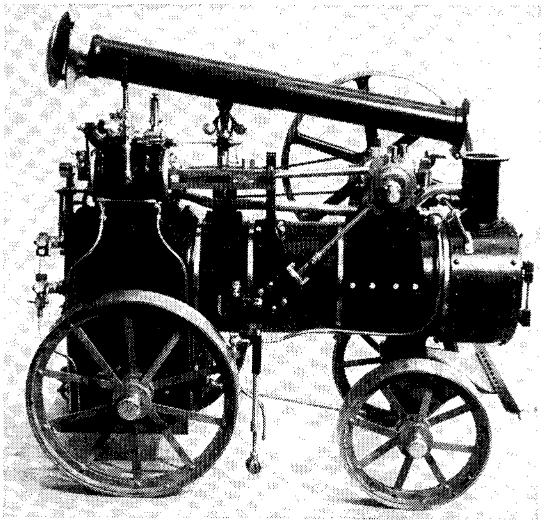
WATER PUMP - RAM
Matl. -STAINLESS STEEL
GROUND BAR

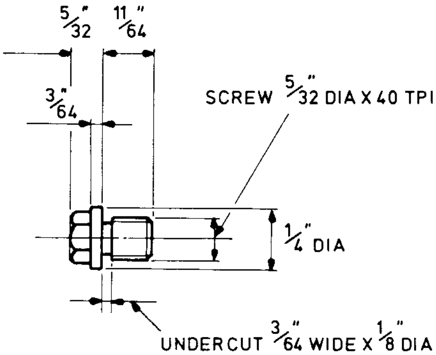


PUMP PACKING SLEEVE - 1OFF
Matl. - BRONZE OR G.M.

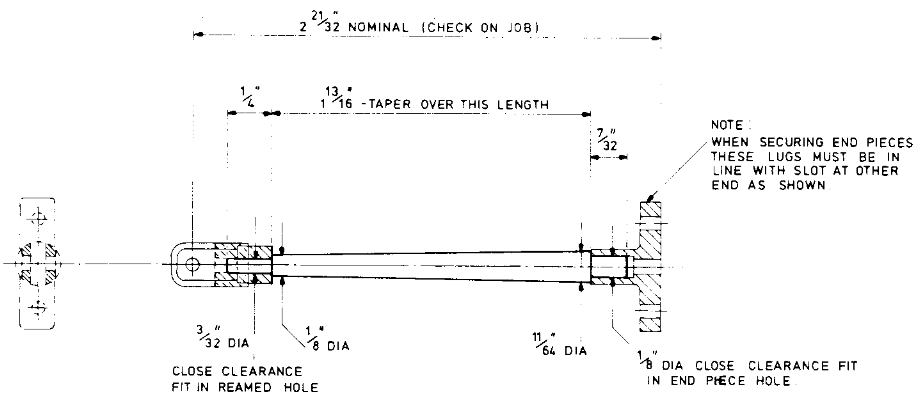


DRILLING & TAPPING OF BOILER
BOSS FOR WATER PUMP. REF. DRG. H.S.20 SHT. 2



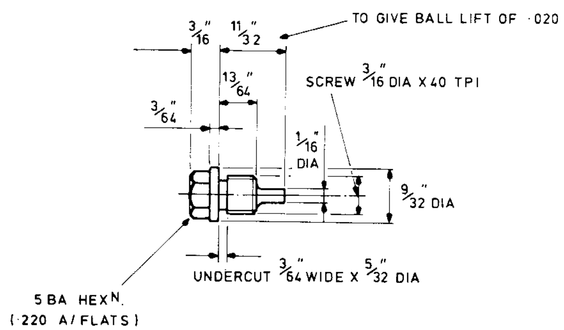


PLUG - WATER PASSAGES - 3OFF
Mat[l]. - BRONZE OR BRASS.

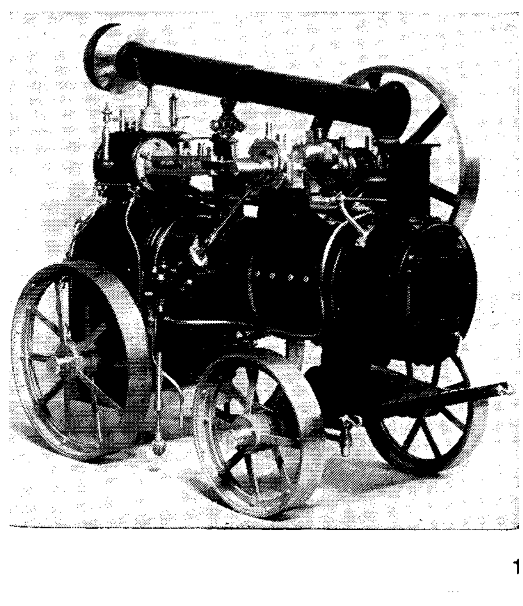


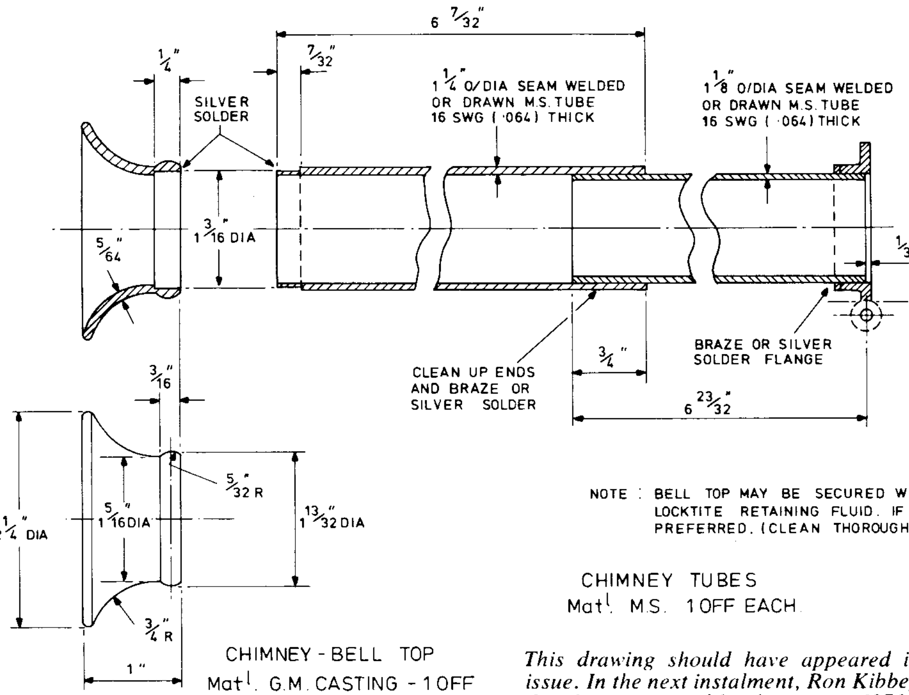
ECCENTRIC ROD - WATER PUMP - 1OFF
Mat[l]. - M.S. OR STAINLESS STEEL.

END PIECES TO BE SECURED WITH LOCKTITE RETAINING FLUID PART TO BE METICULOUSLY CLEANED BEFORE APPLYING.
(NOTE ANGULAR RELATION OF ENDS)



PLUG - WATER PUMP
DELIVERY VALVE - 1 OFF
Mat[l]. - BRONZE OR BRASS.





This drawing should have appeared in the 6 October issue. In the next instalment, Ron Kibbey describes boiler details not covered by the August 1976 issues.

CLUB DIARY

Dates should be sent at least five weeks before the event to ensure publication. Please state venue and time. While every care is taken, we cannot accept responsibility for errors.

JANUARY

5 **Romford Model Engineering Club.** Competition Night.
5 **Vale of Aylesbury M.E.S.** Progress Night and Judging for Chairman's Cup. Jubilee Hall, Bierton, Aylesbury.
5 **Huddersfield M.E.S.** Films shown by the Huddersfield Examiner.
5 **Stockport & District S.M.E.** Bits and Pieces. Parish Hall, Cheadle Hull.
8 **Wirral M.E.S.** Members' Movies. Victory Hall, Upton, Birkenhead. 7.30 p.m.
8 **Swansea S.M.E.E.** Annual General Meeting. 3 Gloucester Place, Swansea. 7.30 p.m.
8 **N. Wales M.E.S.** Meeting. United Reformed Church Hall, Colwyn Avenue, Rhos-on-Sea, Colwyn Bay. 7.30 p.m.
8 **Clyde Shiplovers and M.M. Society.** "Dug-out canoes of the Clyde" — George Appleby. Partick Halls, Burgh Hall Street, Glasgow. 7.30 p.m.
9 **Basingstoke & District M.E.S.** Meeting Night.
9 **Sutton Coldfield & N. Birmingham M.E.S.** Workshop Questions. Wylde Green Library, Sutton Coldfield. 7.30 p.m. for 8 p.m.
9 **Guildford M.E.S.** Executive Committee Meeting.
10 **Birmingham S.M.E.** Mastertrain quiz. Sheepcote Street. Now 14 February.
10 **Southampton & District S.M.E.** General Meeting. Malvern Hotel, Winchester Road, Southampton.
10 **Historical Model Railway Society, Chester.** Talk by H. J. Leadbetter on "Modelling Railway Buildings". Venue Y.M.C.A. Lounge, Old Palace, Vicar's Lane. 7.30 p.m.
10 **Andover & District M.E.S.** Bits and Pieces. Subs due. Swallow Hall.
11 **Hull Society of Model Engineers.** Rummage Sales of Engineering Oddments. Trades & Labour Club, Room 3, Beverley Road, Hull. 7.45 p.m.
11 **Sutton M.E.S.** 16 mm. Film Night — details will be announced.
12 **Kinver & W. Midlands S.M.E.** "Making a Working Model of a London Tube Train" — John Reaveley. Club House, Marsh Playing Fields, Kinver. 7.20 p.m.
12 **Dublin S.M.E.E.** Visit to Dunsink Observatory.
13 **Bristol Historical Model Railway Society.** Talk by Rev. W. Awdry on "J. E. McConnell and the Birmingham & Gloucester Railway". Venue Royal Commonwealth Society, 14 Whiteladies Road (opposite the B.B.C.). 2.30 p.m.
15 **City of Leeds S.M.E.E.** Don Ashton slide show and lecture arranged by Mr. R. Jeffrey. Salem Chapel, Leeds. 7.30 p.m.
15 **Leicester S.M.E.** "Scale Model Ships" by Mr. S. Wigham. Royce Institute, Crane Street, Leicester. 7.30 p.m.
17 **Birmingham S.M.E.** Illshaw Heath. 9.55 mm. Film Evening of the '30s. Unique old films presented by John Walker.
17 **Cannock Chase M.E.S.** Meeting. "Valve gears" — W. Childs. Lea Hall Club. 7.30 p.m.
17 **Bromsgrove Historical Model Railway Society.** Talk by N. R. Millar on "Early Standard Gauge Stock of the G.W.R." Venue The Golden Lion Hotel, Worcester Road. 7.30 p.m.
17 **Guildford M.E.S.** Bits and Pieces Competition. HQ Stoke Park. 7.45 p.m.
18 **Rugby M.E.S.** "Building a Torquay Manor Boiler" — illustrated talk by Alec Farmer. 7 p.m. prompt. Limited space so please come early.
18 **Sutton M.E.S.** "Bert Sandys" — more stories from the Festiniog Railway.

WHAT'S IN STORE

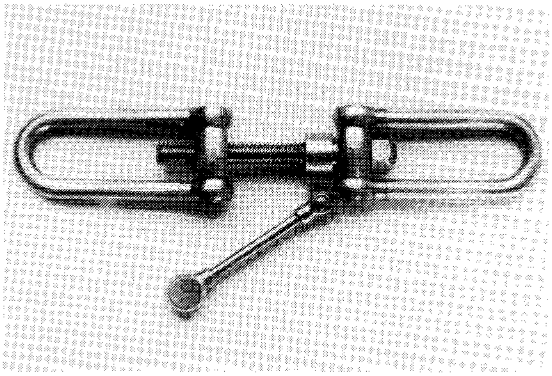
Where possible, the items reviewed are seen and tested by "M.E." staff. However, where this is not possible reviews are given solely on the information received from the manufacturers and we cannot accept responsibility for products which do not measure up to the claims made for them.

Sweet Pea anyone?
We know there are many other designers of locos and suppliers of drawings and castings than ourselves — and please note that we do not supply castings — but unless you have all the catalogues or read all the ads. you may not be aware of them. People like Don Young, A. J. Reeves, Ron Bray etc. all have their own designs. Hopefully we will be able to include in these pages short reviews of some of these designs with photos of completed locos where possible. This is possible in the case of Sweet Pea, a design for narrow gauge by Jack Buckler. Drawings and castings are at present available from Blackgates Engineering, 209 Wakefield Road, Drighlington, Bradford, W. Yorks who have sent us a couple of the drawings for our appraisal. The standard is high, imperial dimensions are used and all lettering is professionally done with stencils making them easy to read. We won't include a photo of the loco here as an article by Jack Buckler appears on page 24.

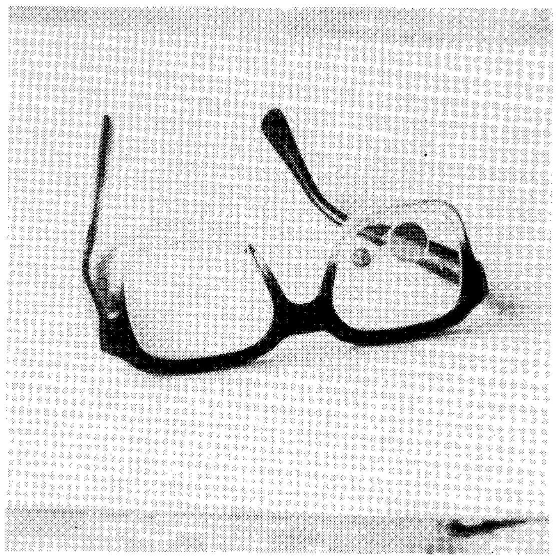
No licence required
If you feel like a change from locos or traction engines and the wife keeps on about covering that bare patch on the wallpaper, you might like to try your hand at making an antique gun. The kit we have just examined is about the nearest thing we have seen to the real thing except that the barrel is not bored right through so that firing is impossible. We might add that if you convert the gun to a working replica you are required by law to have a gun licence. One particular kit is of a Kentucky pistol but there are also kits for a Derringer pistol, Colonial, and a Kentucky Rifle. Prices respectively are £32.50, £22.50, £28.50 and £51.00. If that seems rather a lot, then the contents of the kit will put your minds at rest. The constructional metalwork is already complete and even has that slightly worn, used look about it, the operation of the hammer and trigger is authentic but a few holes must be drilled and the stock requires finishing. Made up it would take an expert in antique guns to recognise a modern work of art. For further information, contact Mr. J. R. Fawcett at The Mid Suffolk Gun Store, High Street, Laxfield, Suffolk.

Heat where you want it
The products of Rhodes Flamefast Ltd. were mentioned in Club Chat a couple of issues back when it was stated that a review would follow. Well as far as can be obtained from the brochures and watching the apparatus at work, here it is. Perhaps the most fascinating is the Safety Tilt crucible furnace, the CM 250, because it brings the ability to make castings within reach of any club or some individuals if work load dictates. The cost is £120 and comprises a refractory and insulation, single burner with spark ignition, A 10 capacity crucible, and lifting and tilting handles. Spare crucibles are £9.50. This quite small furnace looks ideal for casting the type of components most used by the model engineer. There are larger versions of course, but this one should fit most requirements. Other items are Ceramic Chip Forges — again just the job for the budding blacksmith — jewellery benches complete with gas manifolds etc., Bunsen burners, kilns, brazing hearths and all associated equipment. Club secretaries would do well to write to Rhodes Flamefast at Pendlebury Industrial Estate, Bridge St., Swinton, Manchester.

Simplex
We have heard a bit more from Moreton Precision Models Ltd., Grays Lane, Moreton-in-Marsh, Glos. about the availability of parts for their Simplex bolt together kit. There are nine groups which may be purchased separately or together as demand and cash dictates but the whole lot will cost £1250 plus VAT and carriage extra. The groups are as follows: Main Frames; Buffers; Wheel assemblies; Cylinder assemblies; Feed Pump; Motion Bracket assembly; Valve Gear Set and coupling rods; Boiler, smoke box, regulator, superheater; and Platework and fittings. If you wish to buy separately, the prices per group are respectively: £125; £30; £115; £175; £35; £70; £200; £300; and £200. The complete kit includes the construction booklet. As an added extra you may like to buy a set of screw couplings as seen here. The pair costs £9.00 plus the usual extra.



Close up work
Here is an idea that really works, small magnifying glasses that adhere by suction to normal spectacles so that with both hands free you can concentrate on the close up detail. Called the Mini-Loupe, these little lenses come in four magnifications, 1.2X, 1.6X, 2.5X and 4X. At present they are only available from Mec Lab Inc., 2770 East Walnut Street, Pasadena, California 91107, U.S.A. The only price we have is $14.00 but Mec Lab are looking for an agency in the U.K. so the prices will be affected.



'ENTERPRISE'

A three-cylinder L.N.E.R. 2-6-2 tank locomotive for 5 inch gauge

by Martin Evans

Part IV

From page 1404

THE MAIN AXLEBOXES were illustrated in my last article. They are of the usual split type, machined from gunmetal castings. However, with the present high price of gunmetal, there is no reason at all why mild steel should not be used, provided that this metal is bushed. The bushes can be quite thin, 1/32 in. wall thickness being adequate. Another idea is to use mild steel but to bush with "oilite" bushes; but from reports that I have received, it seems that the life of oilite bushes used in locomotive axleboxes is not as long as it might be, further, the fitting of these to split axleboxes would be a bit of a problem.

Another suggestion for a long wearing axlebox is to follow full-size practice and provide a thin layer of white metal on the upper surface of the axlebox. An easy way of doing this would be to machine the bore of the axlebox very slightly oversize, then "tin" the surface, using ordinary tinman's solder. I have done this in the past, but have not been able to test such an axlebox in service so far.

As the axles are drilled at their ends for lubrication purposes, the oilbox shown on my drawing is not essential, but as it is easily put in, being a matter of drilling a few holes, may be worth while for the benefit of getting oil between the sides of the axlebox and the bearing surfaces of the horns.

The next items to tackle are the driving and coupled wheels. The correct wheel should have 18 spokes, the spokes being laid out as shown in my drawing. The spokes of Gresley wheels were much flatter than, say, Swindon type wheels, where the spokes were swept out towards the boss. Some readers may query the shape of the balance weights. It seems, however, that most of Gresley's driving wheels had crescent shaped weights, the inner radius being quite large; I estimate this radius at about 9 in. for 5 in. gauge. As the castings that will be on the market shortly will not have the balance weights included (for economy purposes on pattern-making) these will have to be added, and they could be made from 1/16 in. thick brass sheet. If a piece is fitted to both front and back, held together by a few brass screws put into tapped holes in the front and filed off flush, a little lead or even soft solder could be run in to build up the weight, but this should not be overdone.

In machining the wheels, it is important to bore them for axles, to say 5 thou below 5/8 in. dia., then ream to size. If drills only are used, the hole is sure to run out. For drilling for crankpins, the usual simple jig will be required, to ensure that all wheels have exactly the same "throw".

Two "plain" axles come next; these are machined from 3/4 in. dia. ground mild steel. Don't be tempted to use silver-steel; this is more expensive, harder to machine, and has no advantage over mild steel for axles. True centres must be left in both ends, to facilitate "quartering" later on.

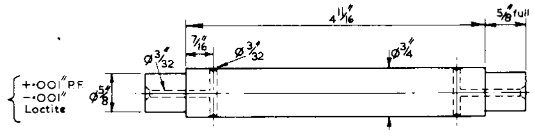
On many lathes, the bore of the spindle will be too small to allow the axle material to pass through, so the axles may have to be turned between centres. If 3/4 in. steel is used, it may be difficult to centre this dead true, even by the usual method — using a steady — so a good alternative is to use 13/16 in. or 7/8 in. dia. ordinary mild steel, and turn this down, giving the axlebox bearing area a good polish.

Crank-axle

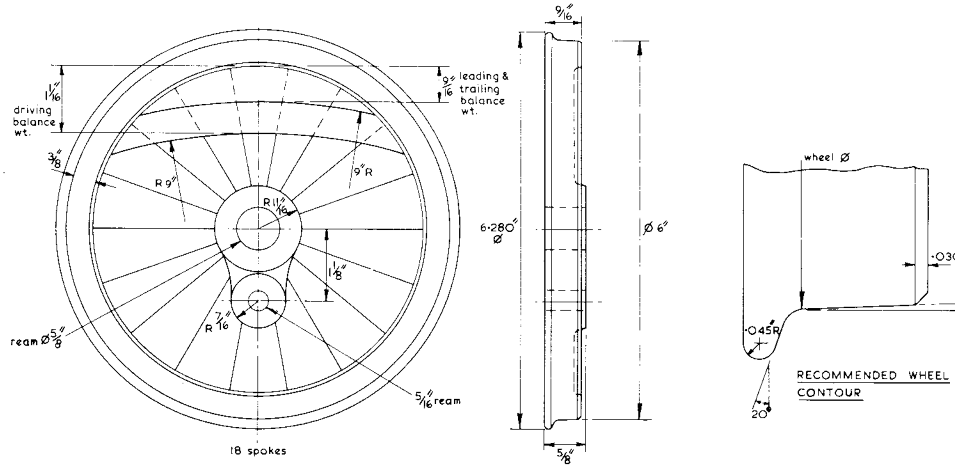
A single throw crank-axle without eccentrics should not present any difficulties. My own method is to start by making a normal axle, fitting the "webs" to this, and afterwards cutting the excess away. This does at least ensure that the whole crank-axle is really true; whereas using separate "stub axles" calls for very accurate turning.

The two webs are cut from 1/2 in. thick mild steel plate; they should of course be bored out together, on the faceplate, and if Loctite is to be used, rather than press fits, the webs should be bored out 1 to 1½ thou over the nominal size.

The point which now arises is how to set the three cranks at the required angles to one another. The difference between the angle of the outside



COUPLED AXLE: 2 off ground m.s.



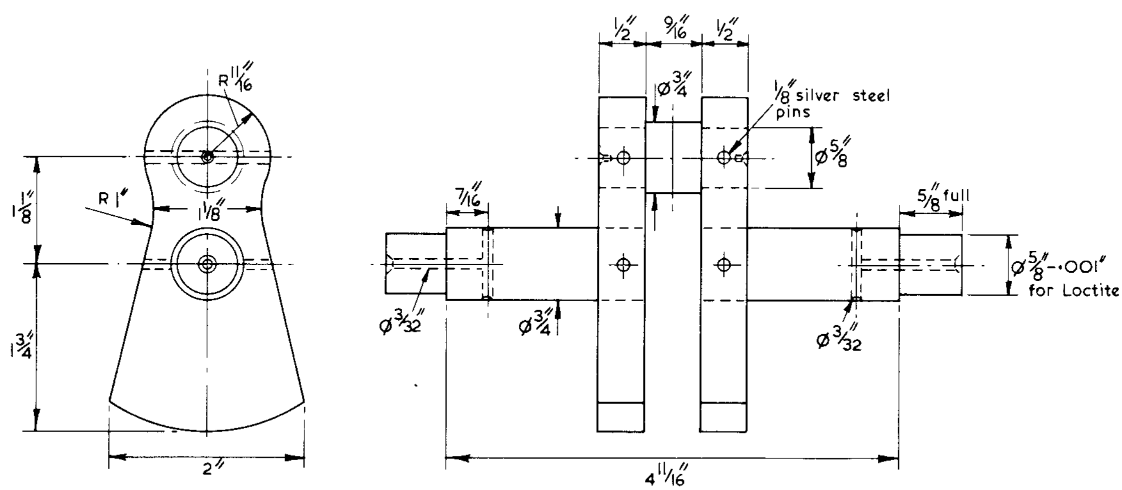
DRIVING & COUPLED WHEELS

cylinders and the inside cylinder amounts to 5 deg. 14 minutes, thus the angles between the right-hand and the left-hand outside cranks will be exactly 120 deg., but the angle between the L.H. crank and the inside crank will be 120 deg. plus 5 deg. 14, or 125 deg. 14. The angle between the inside crank and the R.H. outside crank will then be 114 deg. 46 minutes.

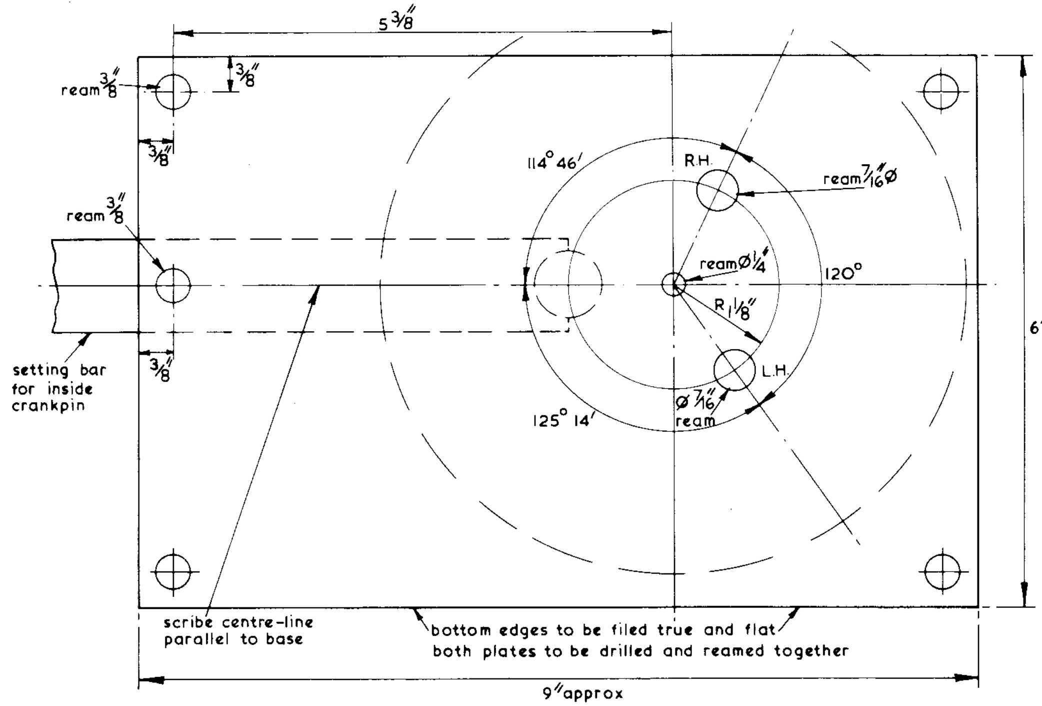
I have given a good deal of thought to the best way of getting these crank angles correct, and equally important, that the leading and trailing wheels should also be at the same angles corresponding to the crank-axle. I remember that the late LBSC, in describing how to build a three-cylinder "Green Arrow" locomotive for 2½ in. gauge, suggested that the motion and valve gear could be made and assembled, and the crank set from the valve gear. He claimed that this method was used by some locomotive building firms who built locomotives with Gresley's "two-to-one" gear. How they managed this I cannot say, as in full-size practice, wheels are put on their axles by hydraulic presses. I think it would be very difficult to use this method on a model.

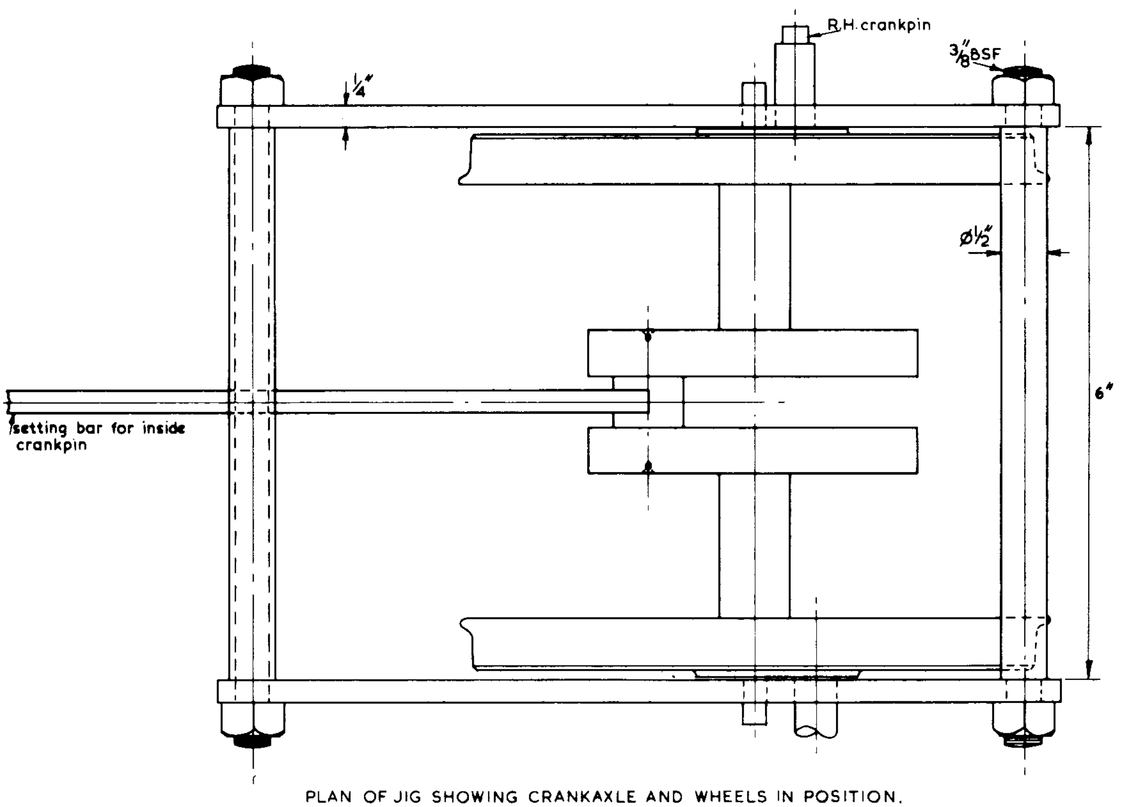
Once again, I have come to the conclusion that it pays to make a proper jig for wheel quartering. Several readers have expressed interest in the type of jig I use for this job, so I have included drawings of a substantial jig that will deal with the unusual angles involved with the Gresley cylinder arrangement, while at the same time coming in very useful for other locomotives which have their cranks at the more usual 90 deg.

As can be seen from the drawing, two stout mild steel plates are required, of section 6 in. x 1/4 in. Their length is not critical, but I would suggest



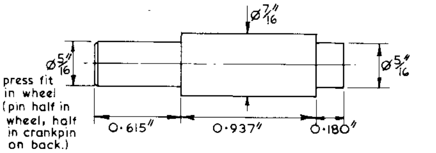
CRANKAXLE: ground m.s. & b.m.s.



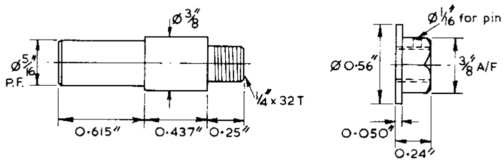


PLAN OF JIG SHOWING CRANKAXLE AND WHEELS IN POSITION.

about 9 in. to give good stability. The bottom edges of the plates must first be filed or machined quite true, after which one plate is marked out as shown, the distance between the central (axle) hole and the 3/8 in. reamed hole on the left-hand side (5⅜ in.) being important. The two plates are now clamped together and all the holes drilled and reamed as accurately as possible.

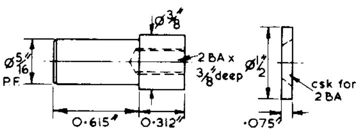


DRIVING CRANKPIN: 2 off silver steel (X2)



TRAILING CRANKPIN 2 off silver steel (X2)

RETAINING NUT 2 off b.m.s.

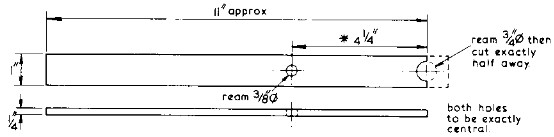


LEADING CRANKPIN & WASHER: 2 off silver steel (X2)

Four stretchers are next required, these being turned from 1/2 in. dia. mild or silver steel, their ends being turned to a really good fit in the 3/8 in. reamed holes in the corners. The stretchers are further extended to take a thread, say 3/8 in. BSF, to save having to make special nuts. When bolted together, washers should be used under the nuts, though I have not shown these in the drawing. A length of 3/8 in. dia. silver steel is now required, which, when the jig is in use, is placed through the 3/8 in. reamed hole at left centre. This rod forms the pivot for the "setting-bar" for the inside crank.

The "setting-bar" is now made. While mild steel could be used if true, a length of gauge plate would be better. A piece one foot long is used, and a 3/8 in. reamed hole is formed exactly on the longitudinal centre line and about 5¼ in. from the right-hand end. Then a hole 3/4 in. dia. is drilled (or bored) and reamed exactly 4¼ in. from the 3/8 in. hole, as shown. A saw cut is now made across the 3/4 in. hole, so as to leave exactly half of it.

Having satisfactorily finished the wheels and the crank-axle, and made sure that the axle wheel seats and the holes in the wheels are quite clean, high-strength Loctite is now applied to the wheel seats and the whole assembled in the jig. Incidentally, it will be found convenient if the four stretchers

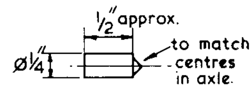


* This dimension must match holes in jig exactly

SETTING BAR: gauge plate

"QUARTERING" JIG

are permanently bolted to one side plate, the other plate being removed while assembly is taking place. It will be noticed that the holes reamed in the side plates to receive the main crankpins are 7/16 in. dia. These are of course for the driving crankpins only. When assembling and "quartering" the leading and trailing pairs of wheels, bushes are used, good fits in the 7/16 in. holes and accurately reamed 3/8 in. dia. to take the smaller diameter crankpins.



CENTRES FOR JIG: 2 off silver steel

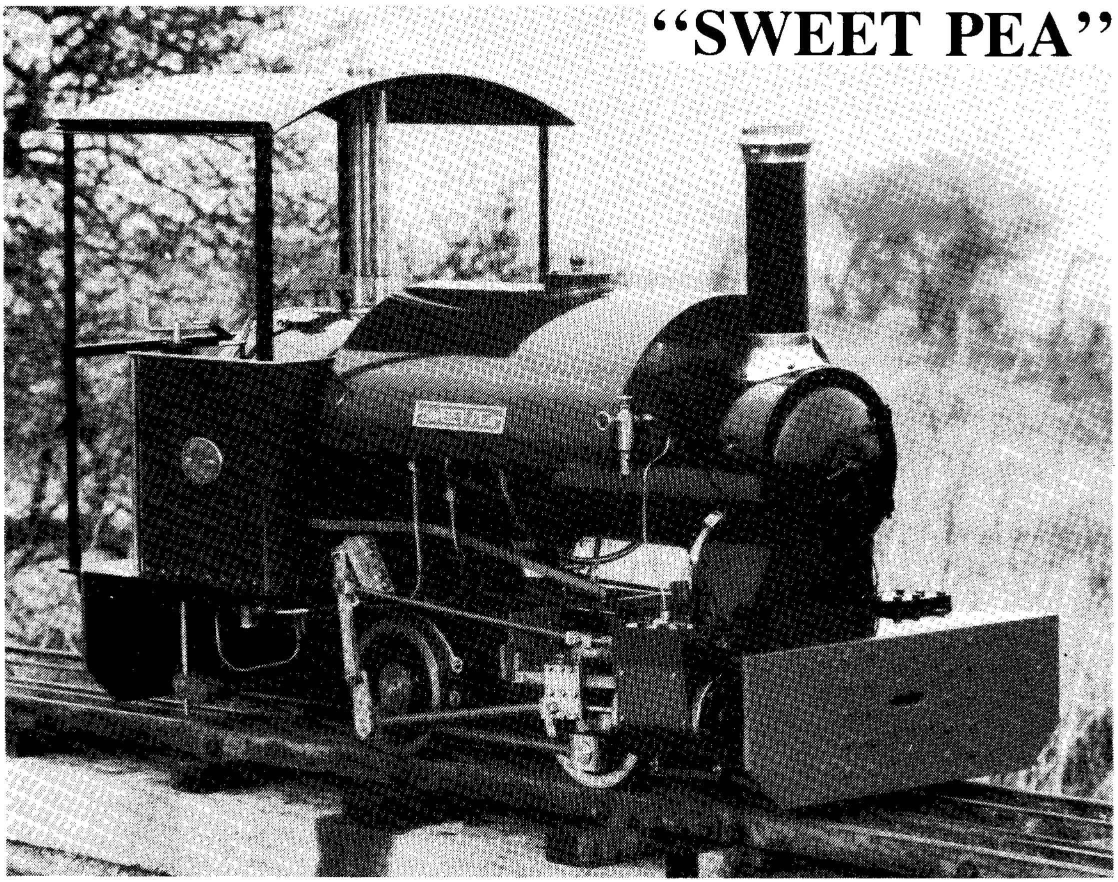
But to return to the "quartering" process, having inserted the crank-axle with its driving wheels in position, with the 1/4 in. dia. "centres" inserted into the ends of the axle, and with the crankpins through their holes in the side plates, the "setting-bar" is put into position as shown, with the "half-3/4 in. dia." registering against the inside crankpin. All we now have to do is to set the setting-bar parallel to the base, when the inside crank will be at the desired angle. A surface plate should be used if available, if not, a piece of thick plate glass, or even the lathe bed. A surface gauge will quickly check when the "setting-bar" is parallel, and it would be a good idea to clamp this bar in position while the Loctite is "setting". What I generally do, is to leave the wheels in the jig overnight, while getting on with some other job; then the jig is dismantled and made ready for the other two pairs of wheels.

It may be asked how the angles are marked out on the side plates in the first place. I use nothing other than a large draughtsman's celluloid protractor. If care is taken, and the job done in a good light, it is possible to get quite close to the desired angles, certainly close enough for our purpose; but the advantage of the jig is that all three pairs of wheels will come out at the same angles, to quite close limits if the jig has been made with care.

The crankpins are straightforward turning jobs, so I don't think I need say anything about them, except that the driving crankpin must be pinned on the back of the wheel, using a pin half in the wheel and half in the crankpin. Incidentally, it also pays to pin or key the driving and coupled wheels on their axles; though this is not necessary on carrying wheels.

To be continued

"SWEET PEA"



A Freelance Narrow Gauge Design

by Jack Buckler

MY INTEREST IN steam locomotion dates back to childhood, but during the last 20 years it has focused on narrow gauge. It culminated in the restoration, together with a colleague of our own 2 ft. gauge Quarry Hunslet, of 1894 vintage, and the building of a 1/4 mile line at my home. So when it came to a design for a live steam model, narrow gauge was a foregone conclusion.

Apart from my own interest, I consider that narrow gauge prototypes have a lot to offer the model engineer. So many smaller locos were designed for quarry or contracting work, and could perhaps be described as "basic locomotives". They were sturdy, strong, required minimum maintenance and above all were of simple straightforward design. Also, by using narrow gauge prototypes, the owner of the average 3½ in. lathe can build a very "beefy" loco indeed.

I have attempted to combine these qualities in *Sweet Pea*, a model of a 2 ft. gauge 0-4-0 contractor's loco. In style it is very reminiscent of the smaller Bagnall locos, although the frames and chimney are very "Hunslet".

As an example of the simple approach, I considered separate steam chests a must. Cutting a set of accurate ports is sufficiently nerve-racking without the added trauma of doing the job at the bottom of a little cast iron box. The boiler is simplicity itself, being of the marine type. Before all you Standard Gauge types look down your collective noses, I can say that after some initial modifications to get the grate and fire door positions right it makes steam faster than the engine can use it. The saddle tank brings its own usual penalty — water too warm for an injector to handle, but a generous axle pump plus hand pump are well on top of the job.

Valve gear is Hackworth — an example of elegant simplicity — but like many such mechanisms, there is more to its working than meets the eye! The well-known drawback to this gear, i.e. the effect of vertical suspension travel on valve events has been virtually eliminated by using rubber block suspension on the driving axle — a leaf from Sir Arthur Heywood's book. The leading axle is on coil springs with plenty of travel, thus giving ample equalization.

The frames are very rigid, being of 4 in. x 3/16 in. plate with full depth buffer beams, and vertical and horizontal stretchers. The horns have separate cheeks of T-section carrying cast iron axle boxes. Faithful to some full size practice, my original model was correctly (and tediously) assembled using fitted bolts. For those not in the know, these are bolts (4 BA in this case) with a short length of thread and the rest of the body left plain, of an accurate diameter. These are made a drive fit in reamed holes, and serve the purpose of both bolt and dowel. The bolt heads, as in the prototype, are circular. I suspect that this was to ensure that the bolt was correctly fitted, otherwise the nut could not be tightened. All this is very well for the perfectionist or the masochist (there are over 100 such bolts in the frames) but 4 BA bolts in 9/64 in. holes give a completely adequate fixing for a rigid frame. Coupling and connecting rods are of circular cross section with marine type big ends. The centre dimensions of these can be adjusted on assembly to match the wheel centres — another job simplified.

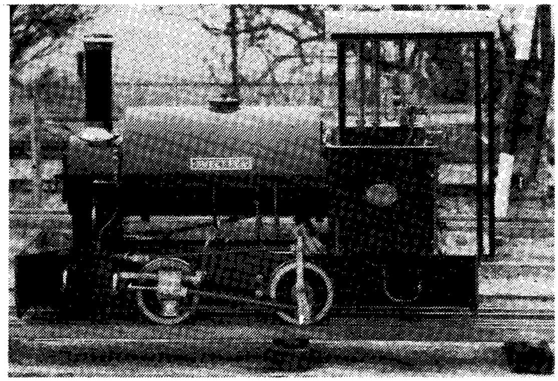
The marine boiler is easily constructed, all flanges are circular, so the blocks and the plates can be turned, whilst the only stays are six longitudinal. The boiler is domeless, the raised top of the circular firebox acting as steam space, and containing a slotted steam collector. The regulator is external, a common narrow gauge practice, and thus readily accessible for maintenance. Because of this type of boiler construction, with its circular inner firebox, the grate assembly is self-contained with its ashpan, firedoor plate, etc. The whole of this assembly can be readily removed for fire dumping and ashpan cleaning, not to mention the advantages of laying and lighting the fire before refitting to the boiler.

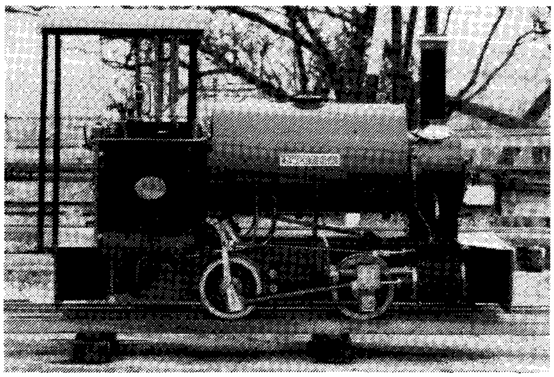
Displacement lubricators of scale size are fitted, and though tiny, they do work. At least, they start the run full of oil and end up full of water, so the oil has gone somewhere!

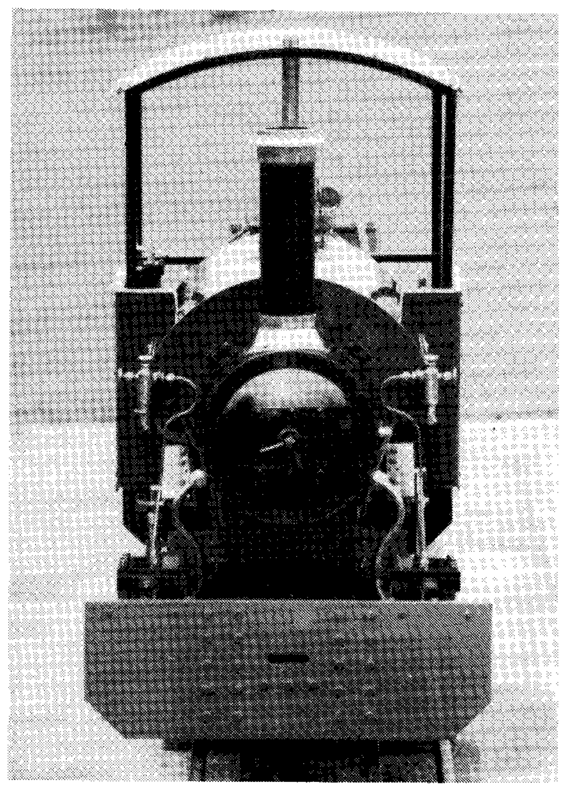
Perhaps due to some of the advantages I have mentioned, the popularity of narrow gauge seems to be on the increase among model engineers. One word of caution when selecting a scale. A design for 5 in. gauge based on a 2 ft. gauge prototype is to a scale of 2½ in. equals 1 ft., and is likely to be quite sizeable. As a rough guide, 3½ in. narrow gauge locos are of a similar size to the more usual 5 in. gauge, 5 in. narrow gauge similar to the average 7¼ in. and so on.

Sweet Pea has proved a good hauler and ready steamer, the expected speed penalty of small wheels has not materialised, to judge from the blurred motion as it hurries round the track. All in all I have found the design exercise fascinating and the construction relatively simple.

So all you model engineers, why not "narrow your outlook" and try narrow gauge!







"COUNTRYMAN'S STEAM"

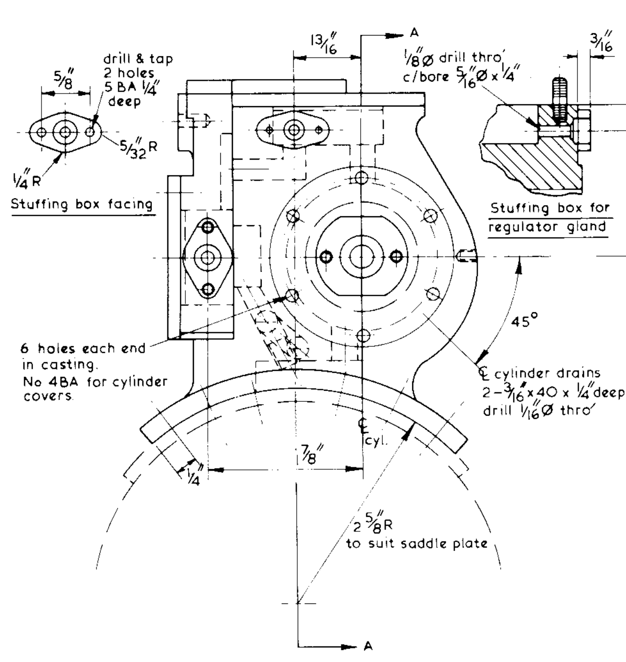
Single-cylinder Agricultural T.E. in 2 in. scale

by John Haining

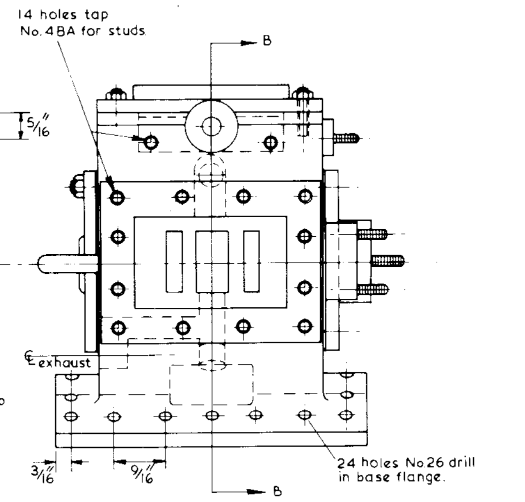
Part IV *From page 1412*

THE CYLINDER casting on the full-size engine was neat and well proportioned, rather more handsome than those fitted to many contemporary engines probably because the casting continued well up above the area of the cylinder bore to form a high rectangular steam cavity or dome surmounted by a tap cover which, when removed, gave direct access to the stop and governor valves. Many makers of the period still used a cylinder arrangement in which the cylinder and valve chest were incorporated in one casting with a circular steam dome, and in fact the four-wheel drive engine built by the North Bridge Works was depicted in a contemporary illustration with this type of cylinder casting tapped by a single Salter spring-balance safety valve set in a rather ugly shallow domed casting.

The cylinder on the 6 n.h.p. engine, the prototype of the model, followed the usual practice in as much



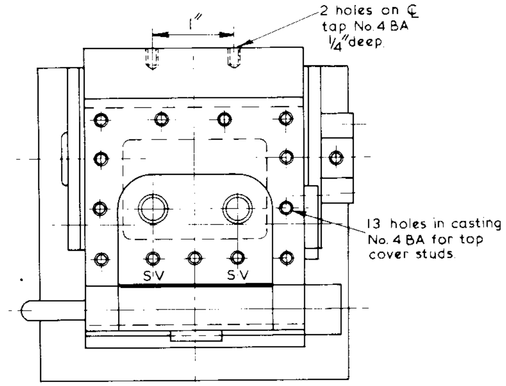
VIEW OF CYLINDER LOOKING ON BACK (crankshaft end)



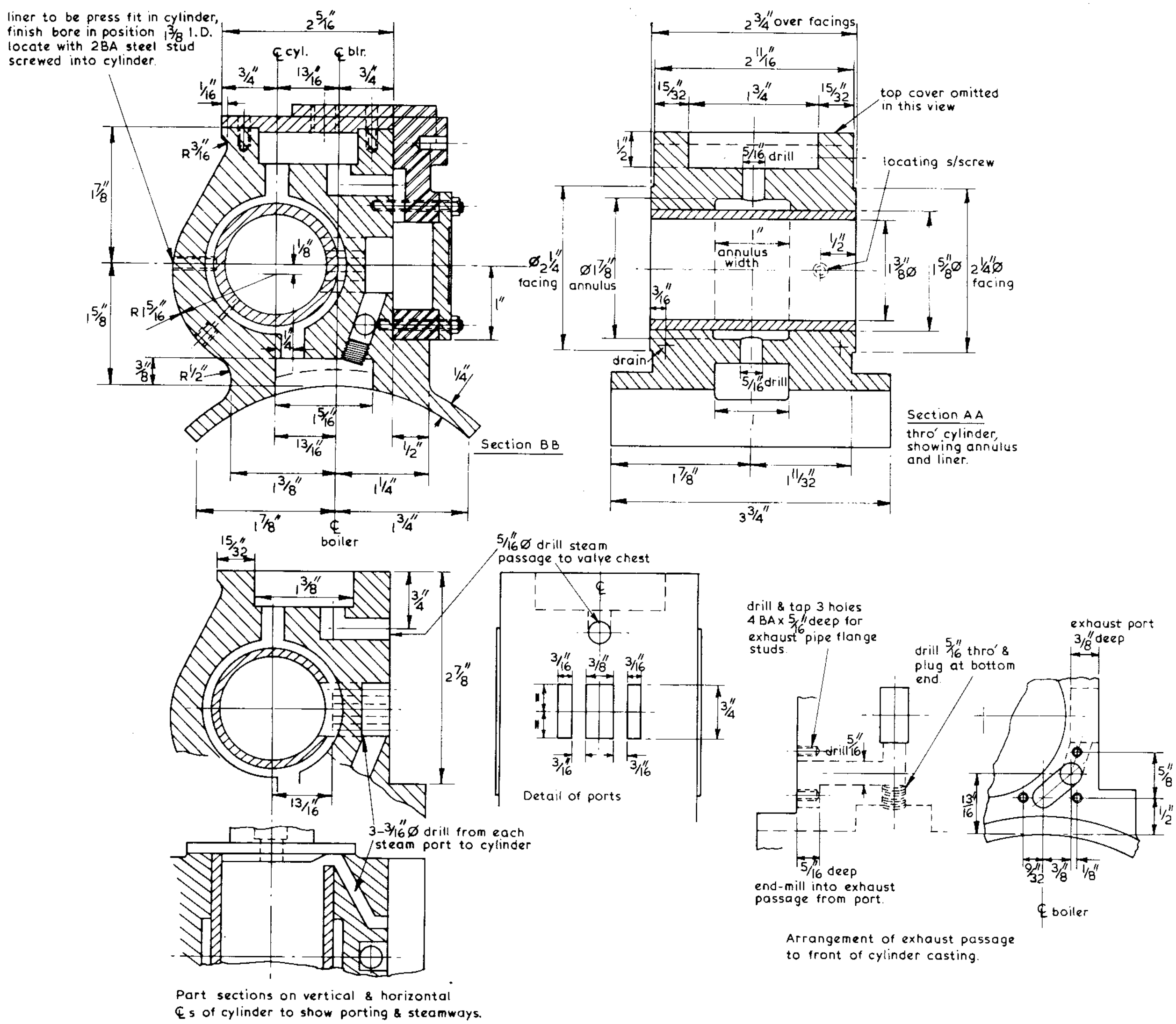
NEARSIDE ELEVATION OF CYLINDER & VALVE CHEST
(with valve chest cover removed.)

Cylinder	1 off	c.i.
Valve chest	1 off	g.m. or c.i.
Cylinder front & back covers	1 off each	g.m. or c.i.
Top cover	1 off	g.m. or c.i.
Valve chest cover	1 off	g.m. or c.i.
Cylinder liner	1 off	mild steel or c.i.

All studs for top cover, cylinder end covers, & valve chest are steel No. 4BA. Cylinder casting to be marked off drilled & tapped from these items.



PLAN

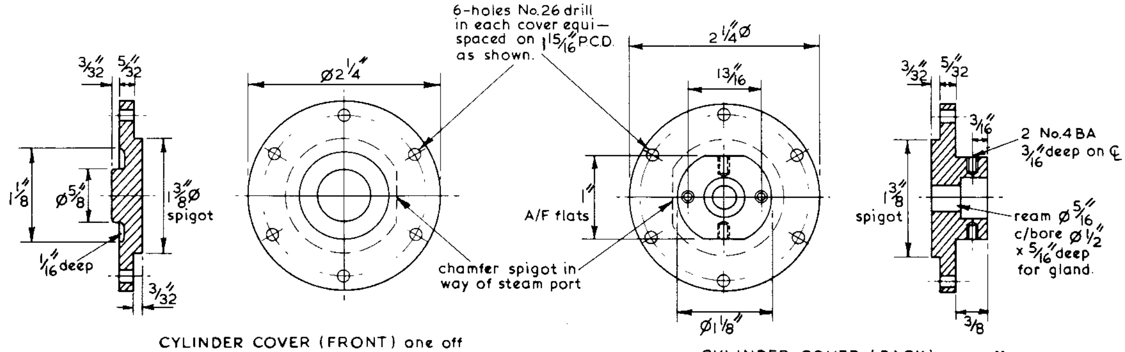


as the valve chest was an integral part of the casting with the valve spindle supported in an extended boss and gland instead of running through a valve spindle guide bracket mounted on the boiler top, at the chimney end, being supported in a short forward-extending housing, a layout followed on quite a number of early engines, and eliminating the need for a cast valve spindle bracket.

A more unusual feature was the use of a hardened cylinder liner which allowed steam to pass from the boiler up through the cylinder casting, past the liner and up into the top dome cavity, an arrangement which lends itself particularly well to reproduction in small scale and does away with the job of drilling rising steamways up through the casting, and past the bore.

The top of the cylinder casting was finished off each side with a shallow lip and presented a flat surface to which was bolted a cast cover plate, thickened up to provide seatings for the two safety valves and a mounting for the governor and governor-valve operating arms and rods.

While keeping to the external appearance of the prototype it has obviously been necessary to make some concessions to scale inside the cylinder, particularly regarding the valve chest, which is a sepa-



CYLINDER COVER (FRONT) one off
g.m. or c.i.

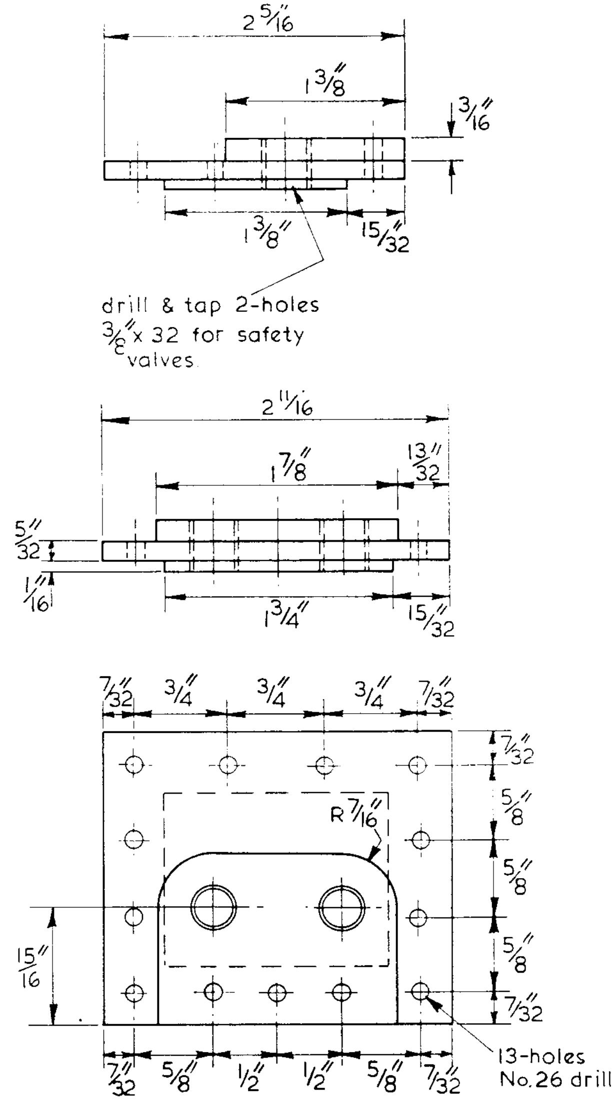
CYLINDER COVER (BACK): one off
g.m. or c.i.

rate casting attached to the main body of the cylinder block in a manner which, hopefully, when assembled will appear as an integral part.

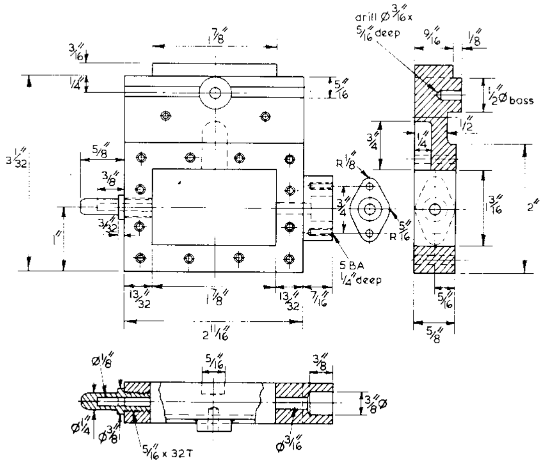
Looking first at the view on the back of the cylinder and valve chest (the crankshaft end), on my drawing, the top cover plate is shown bolted in position over the cylinder casting, with the small external lip clearly shown on the latter where the outer radius runs into the top on the right-hand side. Looking now at the valve chest in the same view, a matching lip equal in thickness to the cylinder lip just referred to, plus the thickness of the top cover plate is apparent on the outer edge of the top of the valve chest casting, with the governor mounting boss in the centre.

Because the valve chest is a separate body and must if possible not appear to be so, a shallow simulated joint line should be cut along this deep lip — a 1/32 in. x 1/32 in. sawcut will be enough to make this side match the true joint face on the opposite side, and in plan view the thickened-up part of the top cover with the safety-valve holes in it must match-up exactly with the same part cast on the top of the valve chest; in other words the top cover must look as though it is in fact one complete length as on the full size engine, and not one shorter cover matching up with a dummy short length over the valve chest. If care is taken that all mating faces are flush with each other all should be well. Sorry to appear to labour the point regarding the business of making both sides of the top lip and facing appear the same, but with a separate valve chest care has to be taken not to lose characteristic details like this.

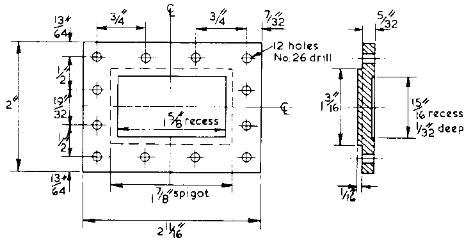
The governor fits over the valve chest, with the governor drive stub-spindle sitting in the 3/16 in. dia. blind hole in the centre of the dia. boss, and reluctantly I have had to leave some work on this assembly until later as the actual governor valve and operating rod and arms details are not available and will have to be worked out to suit two-inch scale. The governor bevel gear drive and pulley are drawn ready for making.



TOP STEAM DOME COVER: one off
g.m. or c.i.



VALVE CHEST: one off g.m. or c.i.



VALVE CHEST COVER: one off g.m. or c.i.

A glance at sections "A-A" and "B-B" will show the pretty straightforward method of getting live steam up to the dome cavity and then down to where we want it, the valve chest. Steam enters the annulus around the cylinder liner from the bottom cavity and thence to the valve chest via the drilled passage covered by the flat regulator valve meeting up with a milled recess in the back face of the valve chest. Twelve No. 4 BA studs serve both to attach the valve chest to the cylinder body and the coverplate to the valve chest, and the studs screwing into the two tapped holes running into the exhaust passage should be a tight fit and touched with a drop of Loctite before being screwed home. As the live steam passage extends up into the top part of the valve chest casting I have shown a couple of No. 4 BA studs just under the central boss (see the nearside elevation) to make sure this important face is kept steamtight. These are additional to the 12 already mentioned. Exhaust steam is taken from the exhaust port by 5/16 in. diameter, drilled, passages and because the blastpipe to the chimney base is on boiler centreline and it is not possible to maintain this line all the way from the port because of running into the bottom steam cavity, a 5/16 in. drilled hole is run upwards from the bottom steam cavity straight into the exhaust port with another drilled passage running parallel to the cylinder bore from the front face of the cylinder casting to connect with it, a screwed plug sealing off the drilled hole running up from the lower steam cavity. (See Section "B-B").

The steam ports connect with each end of the cylinder via three 3/16 in. dia. drilled holes, and each end of the liner plus each cylinder cover spigot must be chamfered to allow steam free movement to and from these drilled steamways.

The annulus around the cylinder liner is shown as 1 7/8 in. dia. x 1 in. wide, these being minimal dimensions and with care can even be increased slightly if anyone is particularly adventurous — but do be careful not to break into either those drilled steam ways I've just mentioned — or the exhaust port which must NOT exceed 3/8 in. in depth.

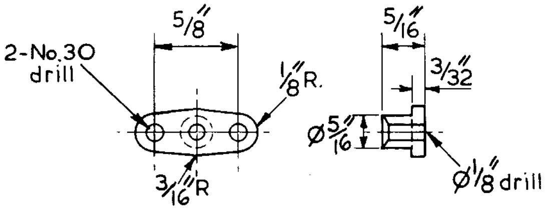
Years ago I fitted the gunmetal cylinder casting of an engine with a steel liner which caused some raised eyebrows and predictions of all sorts of trouble ranging from a cracked casting to steam leaking past the liner, none of which, luckily ever came to pass, so I have a mind to try a steel liner again, on this engine, observing the same precautions against rust as before. Cast iron is specified on the drawing as an alternative for those builders who don't like the idea of a steel sleeve press fitting into a cast-iron bore.

The first job to be done on the cylinder casting is to clean it up externally so that it can be mounted on an angle plate on the vertical slide for machining along the port face and the adjacent step in the casting at right angles to it, using these two faces as the datum for the subsequent marking-out of vertical and horizontal centrelines, the boring of the cylinder and annulus and machining of both end facings.

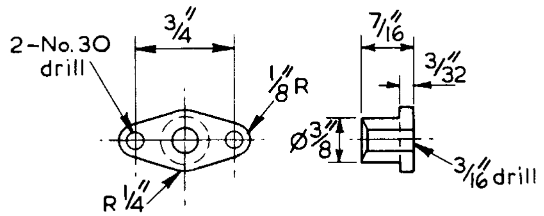
As an alternative to this more usually accepted sequence of operations, and given a casting which cleans up well and is reasonably square on all faces, a start can be made by first of all flycutting the 2⅝ in. radius on the underside of the curved bottom flange and then steel pipe machined to the radius of the cylinder mounting pad on top of the boiler and sliced through exactly along the centreline to correspond with the boiler horizontal centreline, as shown in my sketch.

A flat plate, drilled for holding-down bolts, should be tack-welded inside the half-section of steel tube and cleaned up on the underside by grinding to match the boiler centreline. Both edges should be machined back to form parallel flat surfaces — and of course all machining on the baseplate or sides should be done after welding is completed.

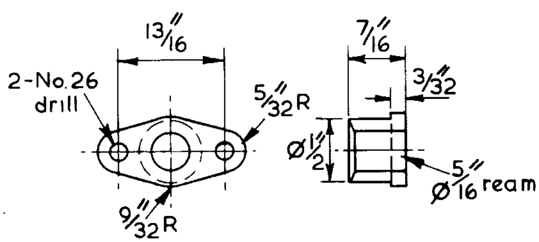
If this method is used, all marking out and machining operations can be carried out with the



REGULATOR GLAND: one off g.m.



VALVE CHEST GLAND: one off g.m.



CYLINDER GLAND: 2 off g.m.

cylinder attached by two end-clamps and 4 dowels to the half-round fixture, which in turn is bolted to an angle plate on the vertical slide, it being only necessary to swing the whole fixture through 90 deg. to bore the cylinder, annulus, and both end facings and then end mill the port face and lower step, and the ports themselves. This method meets the basic requirement of ensuring a cylinder bore parallel to the boiler centreline and square with both end and port faces, without having to remove and remount (and re-check) the casting for the sequence of machining operations, and the same fixture can be used, if it is left a bit longer than the base flange plus clamping length each end, for machining the slide bar bracket in its correct relative position to the cylinder centreline; the steam chest can also be bored in situ for its gland and valve rod and even the top face of the cylinder casting will be certain to be parallel to the centreline. I first used this method a fair time ago when machining one of the Every gunmetal traction engine cylinder castings which was so accurately produced and clean that cleaning up and scraping was all that was necessary to ensure that the cylinder saddle bolted without rocking to the curved fixture — a lucky break for me as I did not have facilities for flycutting a casting of this shape.

The steel tube used to make the curved fixture is a short length of heavy hydraulic steel tube 5½ in. O.D. x 4⅜ in. I.D.; machined down to 5¼ in. O.D. before slitting along below the centreline to produce one *complete* half. Unfortunately standard steel tube of the nearest size is 5⅛ in. I.D. x 5½ in. O.D. which of course is far too thin when reduced to 5¼ in. O.D.; and the next size down, 4½ in. O.D. would need building-up to the correct radius by means of longitudinal strips of steel ⅜ in. thick.

Heavy duty hydraulic steel tube to British Standard 778 can sometimes be found in short lengths or offcuts and is well worth acquiring as it machines excellently and is highly suitable for such things as wheel tee rings, and in the smaller sizes is so accurate in the bore as to need very little cleaning up for use as cylinders or liners.

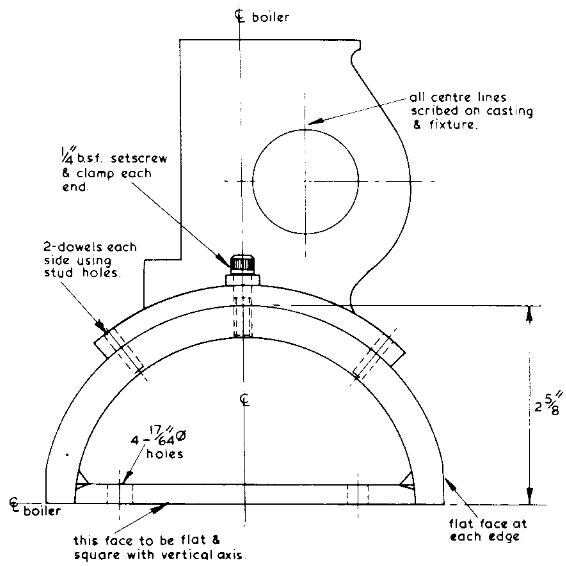
In Part 5 I hope to deal with the rest of the engine parts plus some advance information on the wheels for readers who like to plan ahead.

For those building the Ransomes Steerage Plough for which I was unable to obtain scale square headed bolts I have good news in the form of a letter from Model Components (Norwich), 30 Cromer Road, Stratton Strawless, Norwich NR10 5LU, which contained several excellent examples of the type of square headed bolts on these implements.

I have sent this firm a list of all the bolts used on the 2 in. scale model, and they have offered to supply readers, who should order direct from the address given.

I have no connection with the firm in any way other than being able to recommend their products.

To be continued



MOUNTING FIXTURE FOR CYLINDER

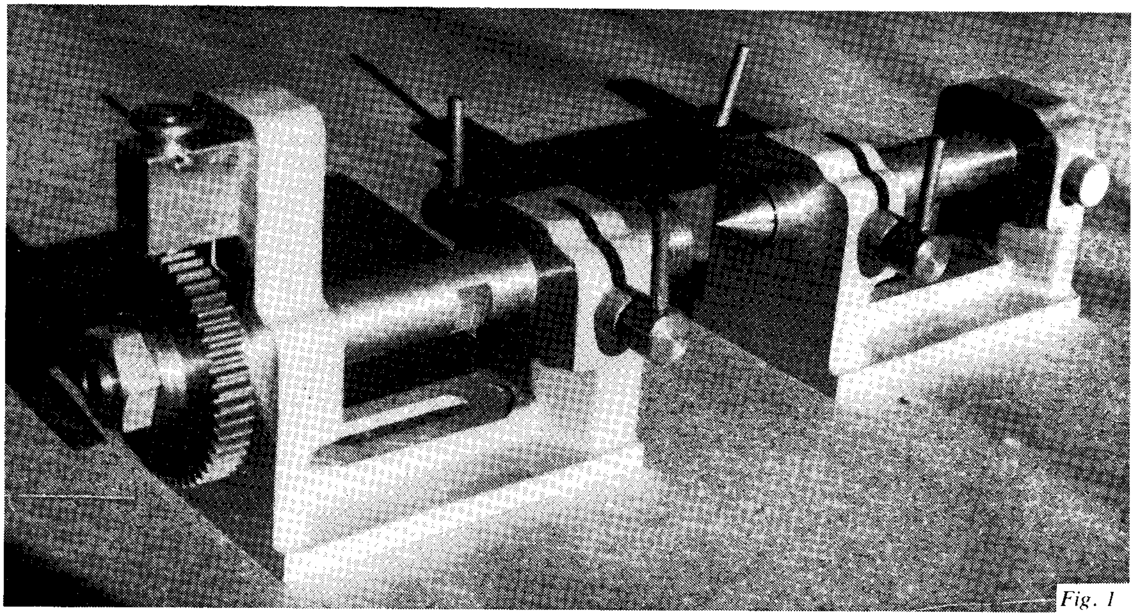


Fig. 1

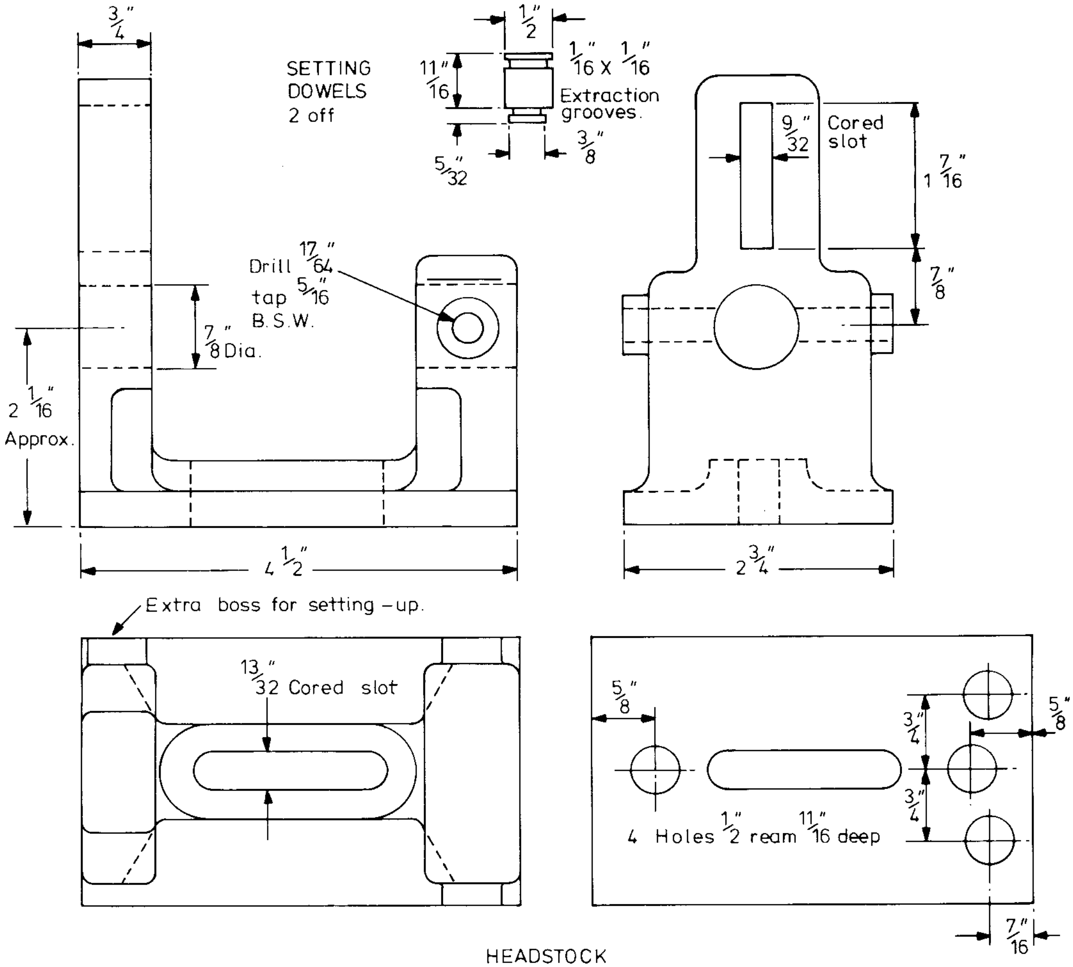
A SIMPLE DIVIDING HEAD FOR THE LATHE AND MILLER

By Arnold Throp

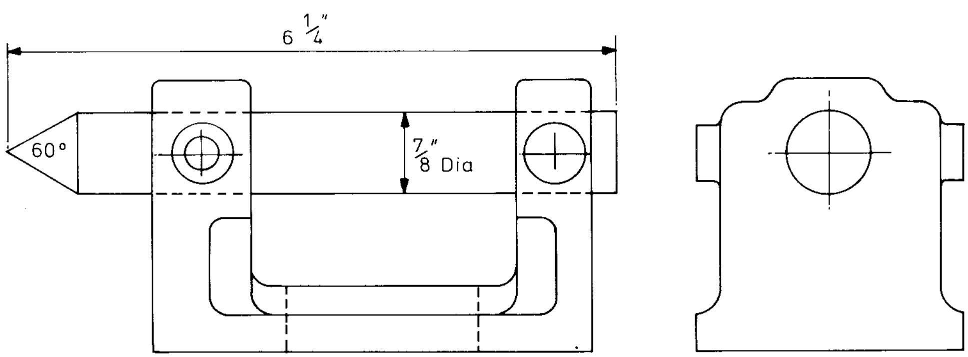
THERE ARE SEVERAL illustrations of the use of a simple dividing head in my book "Vertical Milling in the Home Workshop" (Argus Books, Ltd. 1977) and readers of that may well ask where they can obtain a head of the type shown. The one I was using was made by a man now dead many years, and there has not since been a source of supply for a low-cost fixture of this type. To remedy this position I have made drawings and patterns, and hope that materials in the form of a part-machined kit of components will be marketed by one of the *Model Engineer* advertisers.

The original head did not have a tailstock to go with it, a rather unfortunate omission which is now remedied. The spindle was solid, so that neither Morse taper arbors nor Myford collets could be used until I had made a new spindle with No. 2 Morse taper and a nose like the Myford lathes. The new heads are shown complete in Fig. 1 and the headstock is shown in the arrangement drawing Fig. 2. It will be seen that the casting is similar to a small lathe headstock, but has an upward extension at one end to carry a plunger that engages with the teeth of a standard 20 d.p. lathe change wheel used as a division plate. The casting is in light alloy which is plenty durable enough for this purpose, and is easy to machine with home workshop facilities. The spindle bearings are bored on the lathe, so they are bound to be at the same centre height, a great convenience when using the head on the lathe as will be shown later. The spindle is drilled through for a drawbar and bored No. 2 Morse taper (this should be done by the suppliers) and if screwed etc. like the Myford lathes, then the chucks and collets sold by Myfords can be used with it, a quite important facility. The block which carries the indexing plunger is guided in a slot cored in the casting, and held by a 1/4 in. stud and nut, so it can be adjusted up and down to suit a range of sizes of change wheels, selected according to the number of divisions required.

A 60 tooth change wheel is a good one, since it will provide division of 2, 3, 4, 5, 6, 10, 12, 15, 20, 30 and 60. But it cannot give 8, and a study of the kind of jobs that may have to be done in model engineering suggests that 8 is probably as important as 5 or multiples of 5. So a wheel with 48 teeth will give 2, 3, 4, 6, 8, 12, 16, 24 and 48. This is not included in the list of Myford standard gears, but it is hoped that the suppliers of the kit will include a ready-to-use wheel of 48 teeth as part of the set. If anyone needs a division with a factor of 5 it will be necessary to buy another wheel, and in the Myford range there are several that will serve.

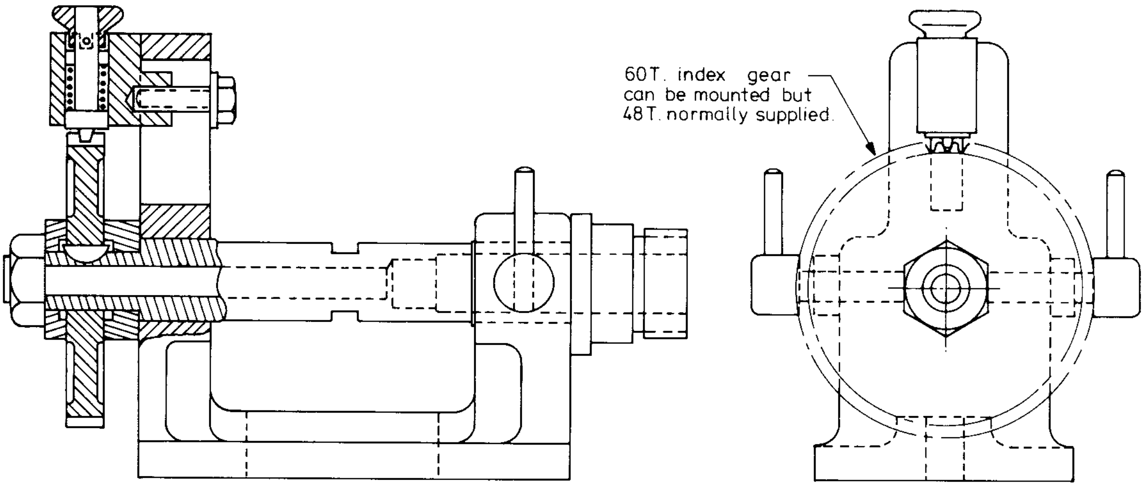


HEADSTOCK
Light Alloy



TAILSTOCK
Light Alloy

FIG. 3



GENERAL ARRANGEMENT

FIG. 2

The conical tipped plunger fits snugly into the space between two teeth, and is spring loaded down into position. When lifted it can be turned through 90 deg. and a cross pin holds it out of contact with the wheel so that free rotation is feasible. In the base of each casting a slot is cored for a holding down bolt. While a plain drilled hole would serve, as on my old head, sometimes it is needed a bit away from the place it is drilled, because of the position of table slots, so the cored slot is more convenient.

The inside edges of the verticals of the castings are chamfered away to make more spanner clearance, a feature noticeably absent from my original unit. Holes are provided for setting plugs to align the head with the table slots on the lathe boring table and milling machine table. These must be drilled and reamed before the spindle 'bearings are bored, so that the spindle axis will be in just the right relation to them. The plugs shown on the drawing are stepped from 1/2 in. to 3/8 inch. Placed one way in the holes they fit the boring table slots of the Myford lathes, and the other way they fit those examples of the Dore-Westbury miller which have a 1/2 in. slot along the centre of the table. For other millers with different table slots the plugs can be made to suit. Two screws are provided for locking the spindle when milling or drilling operations are in progress, to avoid torque coming on the pointed plunger in the toothed wheel.

The tailstock is very similar to the headstock, in fact all measurements are the same exept that the upstanding bracket part for carrying the plunger is omitted. There is no need for a screw feed for the tailstock spindle. When it is used one simply pushes it up into engagement and locks it with the screws.

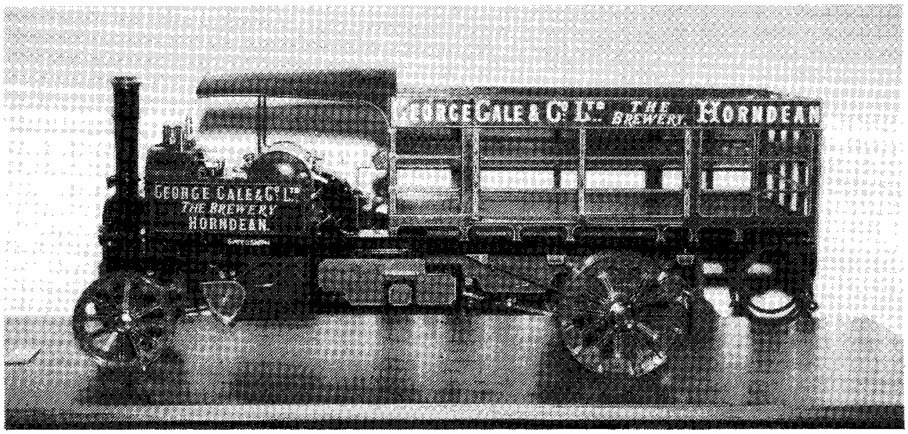
Instructions for machining

Taking the headstock and tailstock castings (detailed in Fig. 3) for a beginning, they should be inspected for lumps left on by the foundry, and any such should be filed down, so that when bolting down or clamping against an angle plate the contact will be on areas of reasonable extent and not on sharp pimples which might crush under pressure. On one side of these castings there are two bosses, one of which is a dummy provided only to facilitate setting for machining. When the work is finished it can be cut off or just left in place. These two bosses and the edge of the casting should be filed where necessary so that when placed on, say, a drilling machine table, there is no rocking. Only a few light strokes of the file will be needed, and not much more than the roughness of the metal should be removed. The casting will rest with a three-point support on these faces when the first operation of facing the bottom is being done.

To encourage those who as yet only have a lathe and not a milling machine, all the operations have been planned to be done on the lathe and all the photographs show the work on a Super 7. Those who do have a vertical miller may find some operations can be done more conveniently on it, so they can at their discretion depart from this script as it suits them. On the Super 7 there is enough boring table area and enough slide travel to permit mounting the castings so that with one exception the tool for flycutting will cover the entire length while traversing in one direction. Unhappily on the standard ML7 this is not possible. But this need not deter anybody from making the heads.

A boring head to carry a flycutter is practically essential.

To be continued



1½ in. FODEN STEAM WAGON

by G. D. McLeman

A description of the building of a model of this popular overtype wagon

I WAS RECENTLY ASKED to build a 1½ in. scale model of a Foden steam wagon with all details as close to prototype as possible, whilst making it a working engine. The wagon chosen was that built in 1912 for George Gale & Co. Ltd., of Horndean, being a 4-tonner, frequently called a 5-tonner. As can be seen from the photographs it has traction engine type wheels, chain steering and brewer's bodywork.

Through the kindness of Mr. Bill Briggs, I was able to measure and photograph a full-size wagon of the period and together with drawings and spare parts lists, etc. supplied by Fodens I had enough information to build an accurate model.

Working from a works drawing of the boiler, I built this main item from copper, following the dimensions as closely as possible whilst allowing for safety. The complete boiler is riveted and silver-soldered. I pitched the rivets from the drawing, using 5/64 in. dia. snap head with around 300 being used. Where possible the rivet tails were silver-soldered to avoid leaks.

The barrel diameter is 3 in. and the length 3½ in. Fifty-three 1/8 in. dia. copper fire tubes are fitted, with two 5/32 in. solid stays. There are 93 firebox stays in gun-metal, the box being approximately 2¼ in. square by 3½ in. high. The grate is built up from 3/4 in. by 1/8 in. steel bars on edge, and the ashpan from sheet steel and angle.

Riveted onto the firebox end are 3/8 in. by 3/8 in. angles, to provide attachment of the mainframes and steering gear. Four mud lids are situated at the bottom of the firebox. A pair of brackets riveted to the boiler barrel give attachment to the front end of the mainframes.

A ring is riveted to the front end plate, the back-head on locomotives, and the firedoor is bolted to this, being 1 in. wide by 1½ in. deep. The front end plate is dished at the firedoor.

Lagging on the boiler is made from narrow strips of wood, as the prototype, and finally cladded with .008 in. steel sheet, this being held in place with two brass bands 1/4 in. wide.

On test the boiler proved to steam successfully and stood the hydraulic and steam test well, apart from a couple of small leaks around the mud lids, these being quickly dealt with.

The smokebox is built up from thin sheet brass and two rings. The near ring is a spacer and the smokebox is riveted to the boiler through this ring, the front ring taking the hinges and crossbar for the smokebox door. There are various cut-outs on the smokebox to take the chimney, exhaust pipe and forecarriage saddle bracket, this detail being formed from 1/16 in. sheet and bolted by 10 BAs. The front pulljaws are bolted to this bracket.

Before leaving the smokebox I will mention the silencer which is a 1/2 in. dia. tube 1¾ in. long, one end is blanked off, the other being connected with an oval flange to the exhaust pipe. The blast nozzle is a 1/4 in. dia. boss having a simple drilled hole 5/32 in. diameter.

The chimney is bent from sheet brass, formed around a wooden former with a riveted seam, a ring riveted to the bottom for bolting to the chimney base, and the familiar copper cap is spun from thin copper in two parts. The base is built up from brass and riveted to the smokebox with 1/16 in. rivets.

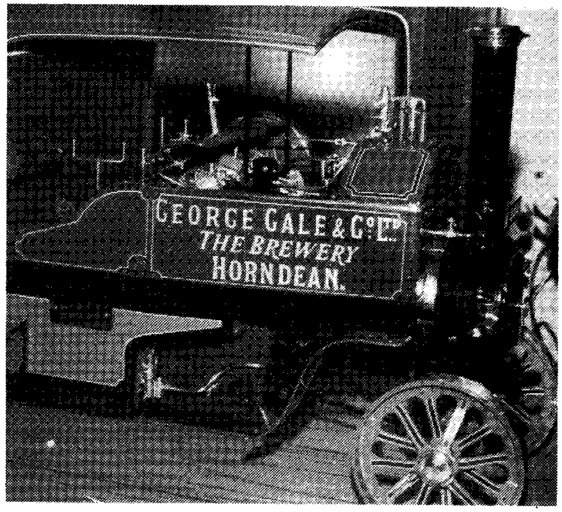
I turned the door from brass with a baffle riveted onto it with six 3/64 in. rivets. The hinge is formed from brass, and the crossbar is 1/8 in. thick steel. The clamping handle and wheel are of polished brass. The usual range of boiler fittings are used, a single water gauge, pressure gauge, injector, water lifter, boiler filler plug, and test cock.

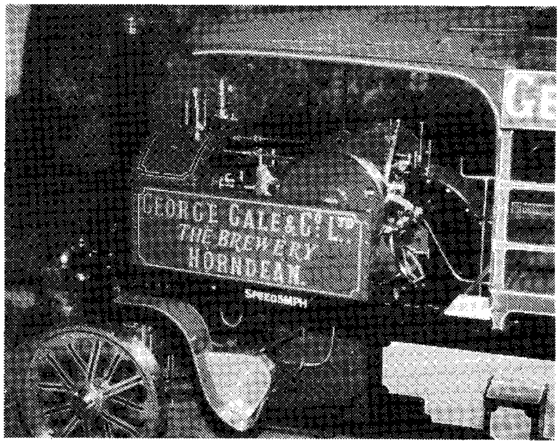
The turret valves control the steam to water lifter, pressure gauge and injector. Steam is taken from the rear of the cylinder block. A water heater is fitted, this being a thin-walled copper tube 1/8 in. dia., coiled inside a 5/8 in. dia. tube. In action, the water flows inside the copper tube, and hot exhaust gases flow around the coil within the outer tube. This is fitted between the mechanical feed pump and boiler check valve which is on the boiler barrel, near side.

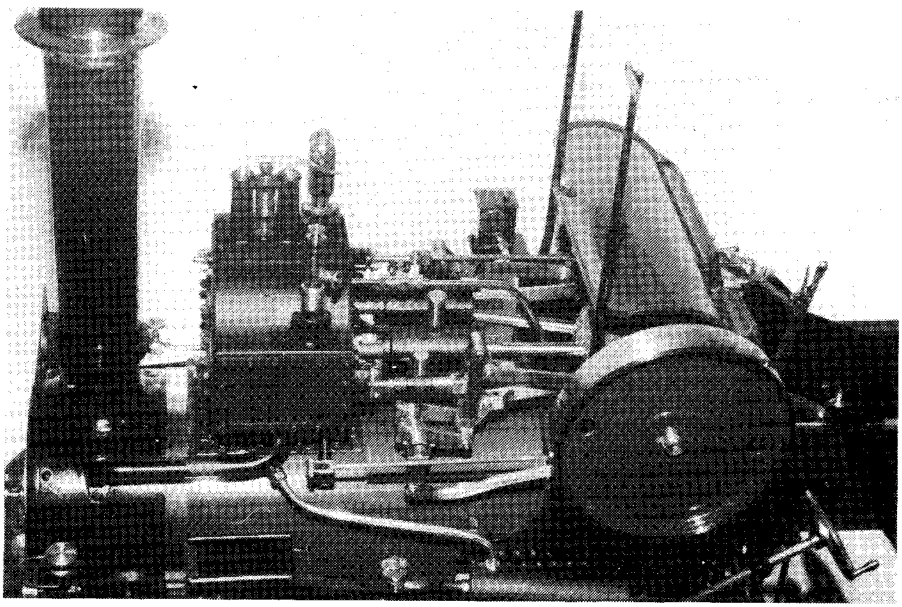
The exhaust is taken from the exhaust pipe and a drain is fitted at the rear of the heater. This complete unit is bolted to the mainframes under the flywheel.

The feed pump is fitted on the offside and is driven from an eccentric on the second motion shaft.

The pump only works when the wagon is moving. Some engines had this pump driven from the crankshaft on the near side, through a friction







Three views of the front end of the Foden.

block. I built the pump from various pieces of brass, the inlet and outlet valves use 1/8 in. dia. balls and the plunger is 3/16 in. diameter.

The cylinder block is built up from brass details preshaped and silver-soldered together. The block is then cleaned up and machined. As the various passageways are built into the block, the main machining is the bores and steam and dome chests. The bores are high pressure 1/2 in. dia. and low pressure 7/8 in. dia. These were bored out on the faceplate. The faces of the chests were hand scraped to get them perfectly flat. Quite a long job, but it had to be right, so I simply tickled away until I was satisfied.

I fitted 'O' rings to the pistons, but used graphited packing on the piston and valve glands. These are oval and have 12 BA studs. 10 BA studs are used on the various covers. The block being studded to the boiler barrel with 8 BA stainless studs.

The engine can be run in three separate ways, using the steam control lever and a 3-way cock. It can be run on the high-pressure cylinder alone. On compound, by supplying live steam to the high-pressure cylinder the exhaust being directed via the 3-way cock to the low-pressure cylinder and finally by supplying live steam to both high-pressure and low-pressure cylinders. This is called 'Double High' and gives extra power for hills, etc. but takes a great deal of steam and can only be used for short periods.

Slide valves are fitted, operated by Stephenson's valve gear. The two crankshaft shows are set at 90 deg. to each other. The valve links eccentric rods, etc. are machined from the solid and finished by drawfiling. The eccentrics are 3/4 in. dia. steel and the straps are phosphor bronze. The connecting rods are turned and milled from the solid and have separate brasses with correct cotters, locking bolts and oilers. The trunk guides are built up from brass and are machined after silver-soldering.

I had to build these items on a jig to get the centres of the piston and valve spindles correct. Any error here could only lead to friction and loss of power.

The reversing lever is pivoted on a bracket on the boiler and the quadrant is bolted to the spectacle plate, there are three positions in forward gear and one in reversing and mid gear.

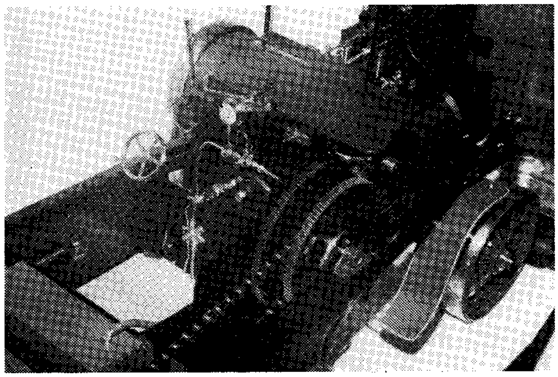
The 3-way cock control knob is fitted below the reversing lever and the steam control lever at the top of the spectacle plate.

Twin safety valves and a displacement lubricator are fitted on the dome cover, and oilers are fitted to the trunk guides. The gear change lever operates in a box on the offside of the spectacle plate being locked by a pin. There are two speeds, having the pinions sliding on four splines on the crankshaft end, and the large gears rotating on a stub shaft, bolted to the hornplate and supported by a bracket on the mainframes. Both the stub shaft and pinion change speed control have oilers.

On the near side of the crankshaft is fitted the flywheel. This is 3 in. dia. steel and has a width of 1/2 in. being keyed to the crankshaft with a 1/16 in. wide key.

The crankshaft is supported by the two main bearings, split and held in two housings bolted to the hornplates by 8 BA bolts. The caps have 8 BA studs and a 12 BA adjusting bolt. The balance weights are held by straps around the webs and the nuts are inside counterbores in the weights and flushed over with solder.

The front wheels are 4⅛ in. dia. and 3/4 in. wide, having 12 spokes 1/4 in. by 1/16 in. and 5/8 in. wide at rims. The rims are steel plated and the hubs are relieved between the spokes. Brass hub caps are fitted, held by three 12 BA studs. The spokes are riveted using 1/16 in. rivets. The front axle is milled from the solid, and has the ends turned to 9/32 in. dia., the wheels being retained by collars, pinned with 1/16 in. dia. pins. The axle pivots on a square-headed pin, 3/16 in. dia., 1/4 in. square



A "cab" view.

head, and the front spring has 11 leaves, 3/8 in. wide.

I built up the front swivel jaw from brass, and this has a turned pin top and bottom, the top pin going through the front forecarriage bracket and split pinned, the bottom pin attaching to the stay rod from the front end of the firebox.

As mentioned earlier the steering is by chains and these are shackled to the front axle. I had to make this chain, as commercial chain of the correct links was too thin. The shackles are bent, as is the chain, from 1/16 in. dia. steel, and the correct springs are fitted to the chain adjusters.

The steering roller rotates on bearing brackets which are bolted to angles on the front of the firebox. I cut the steering worm from steel on the lathe, and the steering worm wheel was cut on the mill using a home-made cutter of silver-steel. The steering wheel has a rim 1/8 in. dia., five-spoked, and 1½ in. dia.; the steering rod is also 1/8 in. dia.

The steering worm and wheel have a cover on the outside only and this is riveted to the near side mudguard.

Two 10 BA bolts attach the mudguards at the front to the mainframes, and at the back they are supported by brackets attached to the steering brackets. The mudguards are made of steel and have half-round beading on the edges.

Before leaving the front of the model I will mention the motion and cylinder covers. These are made from thin sheet steel, the side covers being strengthened by steel uprights which are riveted to the covers and these in turn are bolted to the mainframes. There is a 1/8 in. angle riveted along the top to strengthen them further. The side covers are 2⅜ in. high and have a 1/8 in. half round brass strip along the top edge.

The cylinder covers are screwed to a curved length of 3/16 in. by 3/16 in. angle, the ends being bolted to the side covers. A cover of 1/8 in. thick wood at the front has a cut-out to allow adjustment of the tail rod gland of the steam control valve or regulator.

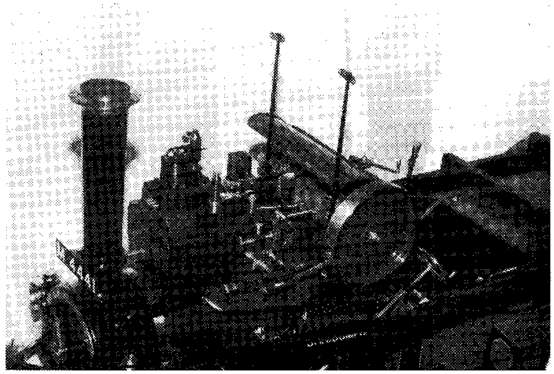
Coming on to the mainframes of the model, these are 3/4 in. by 3/8 in. channel section 1/16 in. thick, and are cranked inwards at the front to bolt onto brackets on the boiler barrel. Along the rear of the wagon they are 6 in. apart and their total length is 29 in.

The driver's compartment is built up from sheet steel and angle, the whole unit being riveted together using 1/16 in. and 3/64 in. snap heads. There is a coal space at the rear and a wooden platform for the driver's benefit. On either side of this unit there is a sandbox with a hinged lid. The near side only has a footstep. Also on this unit are the covers for the chain drive to the rear wheels.

The brake controls are a footbrake to operate the flywheel brake, a horizontal handle by the driver's seat to the band brake on the rear axle, and a vertical handle working the wooden blocks on the rear wheel rims.

As no commercial roller chain was near enough to scale for me, I had to build this myself, and this is 5/16 in. pitch and has 108 links. The driving sprocket is fitted between the two second motion gears, and has 12 teeth whilst the large driven sprocket has 32 teeth and is part of the differential which is working, the levels being housed in an oil bath.

The rear axle is 9/16 in. dia. and has split bearings, with an oil pipe at the rear for lubrication and the springs are bolted onto these. The springs have 14 leaves 1/16 in. thick and their movement is controlled by brackets bolted to the mainframes. Oilers are fitted here. The axle bearings have torsion bars pinned to them, the other end being fixed to brackets on the mainframes.



Another close-up of the motion.

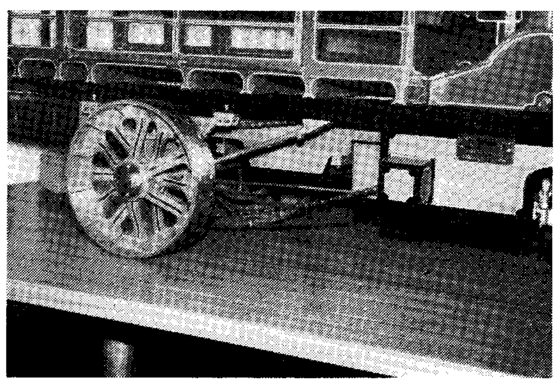
The nearside rear wheel is fixed to the axle, whilst the offside is fitted to a sleeve; this is fixed to the differential and the differential lock is on this wheel.

The rear wheels are 5¼ in. dia. by 1¼ in. wide on the rims, which are steel plated. The rims are reinforced with webs, and the spokes are 7/16 in. wide, 1/16 in. thick, widening to 13/16 in. on the rims. Three 5/64 in. snap head rivets secure them to the rim. As with the front wheels the hubs are cut away either side of the spokes. The brass hub caps again are secured by 12 BA studs and nuts, this time four off. An oil pipe is fitted to the offside hub only.

Suspended from the mainframes at the rear is the water tank, and this was built up from thin brass sheet, riveted with brass angles inside. The whole lot being soldered. A water gauge is fitted at the rear with a filler at the front on the inspection hatch on the nearside and the delivery is taken from a well at the bottom. The tank is held in place with six long studs, three each side fixed into wooden bearers at the top and through wooden bearers slung across the tank at the bottom.

Going back to the mainframes, there is a cross member at the rear and this has the rear pulljaws bolted to it, this member being bolted to the frames and a pair of stiffeners from frames to cross-member. There are wooden blocks fitted into the

The rear wheel and chain drive.



rear of the frames at the side, and onto the near side is bolted the bracket for stowing the water hose. The brass strainer was quite a job, as it was in the form of a hollow ball with holes, and ribbed, the ball diameter being 7/16 in.

Being a brewer's wagon the amount of woodwork was considerable and took quite a long time to make. I used ramin as this has a good straight grain and no knots.

There are eight cross members 5/8 in. by 7/16 in. and onto these are bolted the floorboards, 1 in. by 1/4 in., with the side frames fixed to the floorboards and crossmembers. The sideframes are built up from various sizes of stripwood 7/16 in. by 3/16 in., 5/16 in. by 3/16 in. and 3/16 in. by 1/8 in. I used the correct joints and glued with .050 in. dia. bamboo dowels, the resulting assemblies being quite strong.

At each side there is a drop-down hinged door, and the complete rear also drops. The steel hinges were bent up from 1/4 in. wide material and bolted to the doors. The long hinge bolts being 3/32 in. diameter. There are nameplate boards, bolted to the top, these being 1⅛ in. by 1/8 in. wood.

One of the longest jobs was the chamfering of the various pieces of wood, and this was achieved with a home-made cutter of silver-steel, run at high speed.

The hinged side doors and rear door or gate are locked by a pin and a chain exactly as used on a lot of modern lorries.

The wooden cab was a nice exercise in wood, being built from miniature tongued and grooved boarding. Again I used a cutter made from silver-steel to machine the boards. The back of the cab has 22 boards with stiffeners across these, the top two being grooved to take the sliding hatch. There is a small toolbox fixed here on the offside. The roof of the cab was also made from the tongued and grooved boarding with curved crossmembers, the whole lot being held together with glue and bamboo dowels. The roof has stiffeners and rainstrip fitted and a hinged hatch.

The back of the cab is bolted to the woodframing and the front is supported by two steel uprights bolted to the hornplates.

A motion cover is hinged between the two cab supports and this is built up from thin sheet steel and half-round beading.

After the model was test run and adjusted to get the various controls set correctly it was stripped down for painting. I use cellulose paint and a small paint spray gun.

All the metalwork was degreased using cellulose thinners, the steelwork was rustproofed and the brass to be painted was sprayed with etch primer. These are available from a well-known advertiser in *Model Engineer*.

The woodwork was trimmed and the various non-painted parts were taped over. Using thin coats of paint the colour was built up rubbing down in between coats with very fine Wet and Dry.

When the paint was completely hard the lining was then started. I use Humbrol enamels for this as any mistakes can be wiped off with enamel thinners without affecting the cellulose. For applying the lining I use a draughtsman's pen and thinned down enamel paint. The end of the pen should be well rounded off and highly polished. I use templates made from a thin plastic. The lettering was hand painted using various templates and Sellotape.

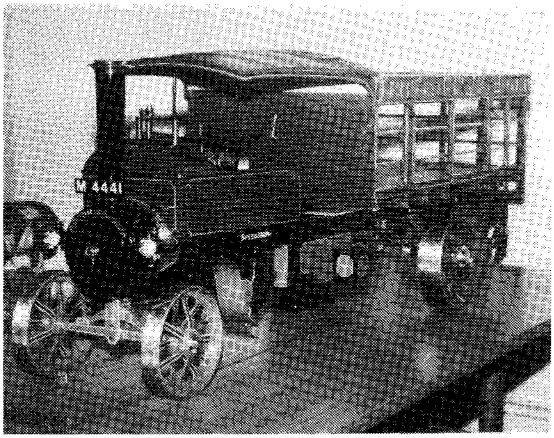
Quite a colourful wagon this one, below the mainframes it is painted red lined out in yellow with various edgings and panels of black. Above the frames the colour is dark green. This is again lined in yellow. The smokebox and chimney are gloss black and the boiler firebox and backhead, etc., in dull black. The steering gear and chains in gloss black and inside the motion cover and flywheel red, as also are the crankshaft webs and balance weights.

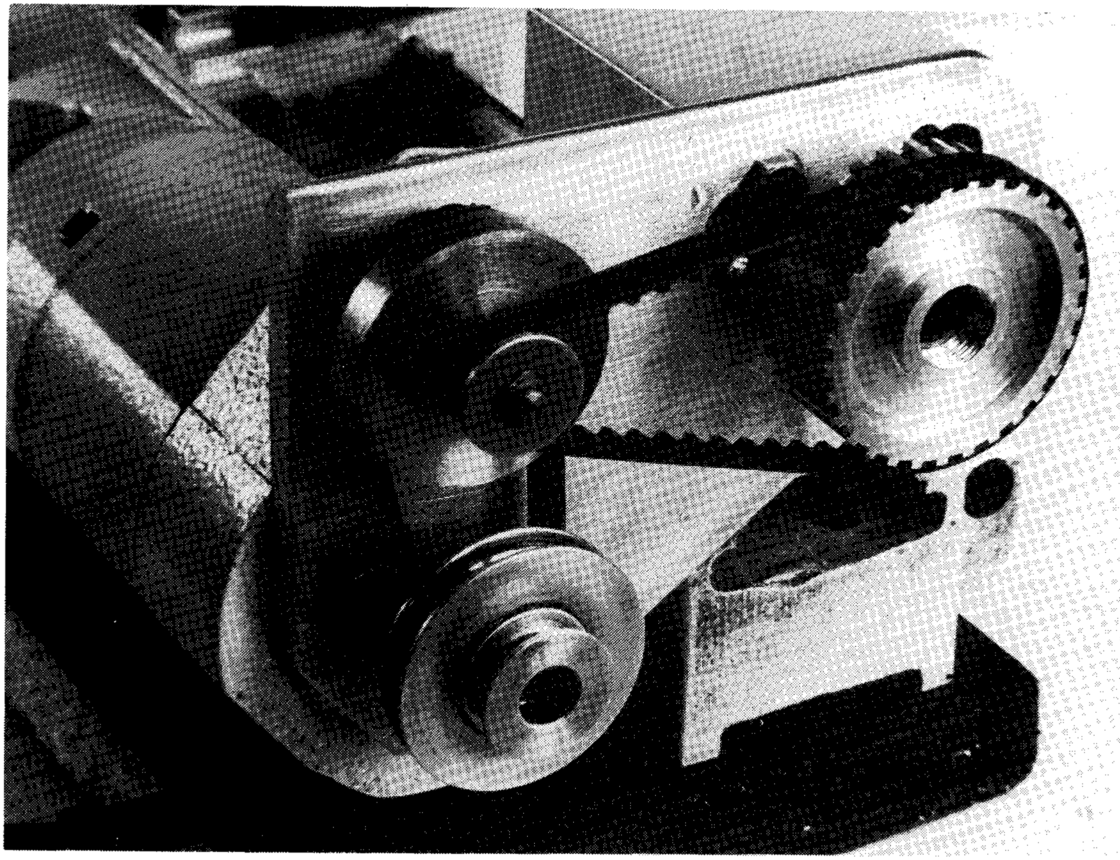
The various polished brass details are wheel hubcaps, various oilers and lubricators, boiler fittings, smokebox hand wheel and engraved plates. There are two legend plates on the engine. The familiar curved one on the smokebox, and a rectangular plate on the driver's compartment offside. The copper chimney cap is of course polished! I use a lacquer called 'Ercalone' to protect the polished details; this is easy to use and is very tough. The lettering is in gold with the lettering on the rear woodwork shadowed in red. The cab roof and platform are matt black.

This has proved to be a very interesting model to build, as on top of the usual engineering one has the woodwork to contend with and the finished engine is very attractive to look at.

In closing I would like to thank Ken Woodham for his help in the final details, Fodens for supplying me with information and Bill Briggs for allowing me to measure up his wagon.

Another view of the wagon.





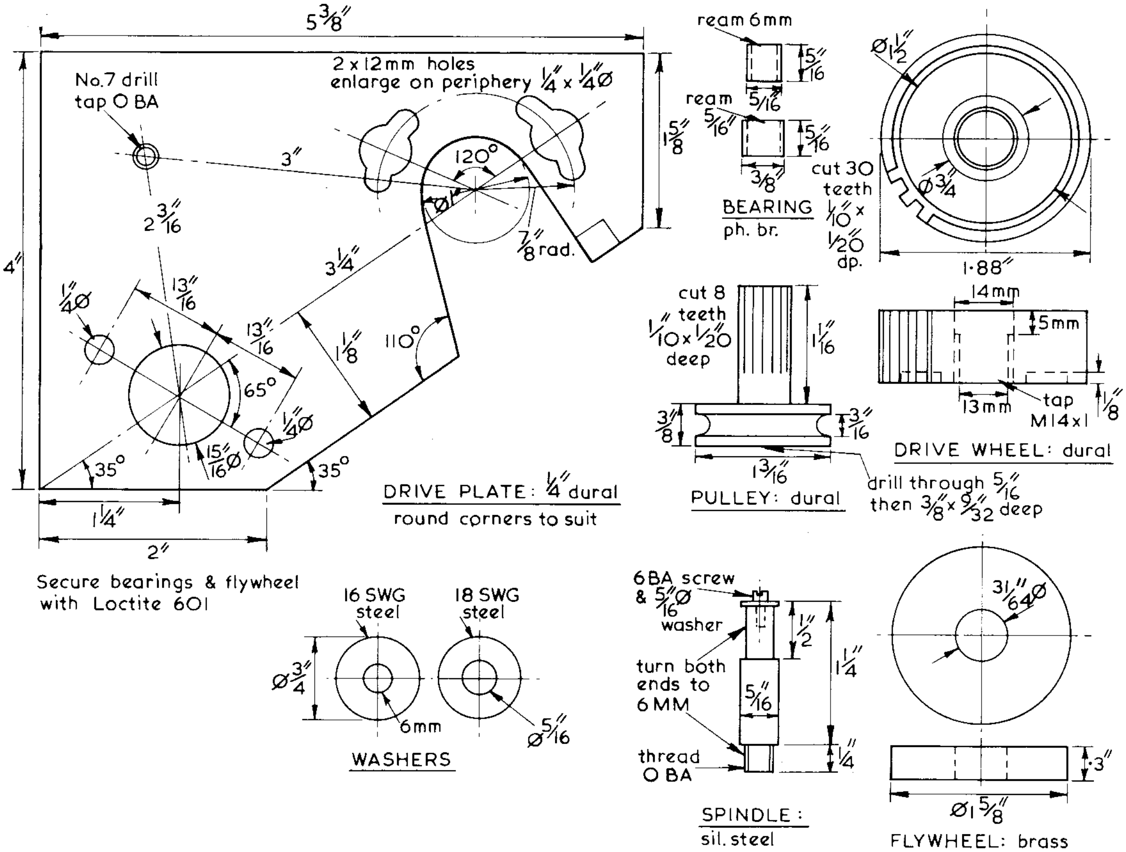
IMPROVED DRIVE FOR THE UNIMAT 3

by Rex L. Tingey

THE BIG LATHE in the machine workshop can be driven by a large, heavy-duty, three-phase electric motor providing unstoppable power through belts and a gear system to the main spindle. With the small precision lathe the power drive is a matter of compromise. The motor has to be quite small yet still provide enough power, and so the brushless induction motor, as used on the large machines, is abandoned for the smaller brush motor which runs at a high speed off load, but provides more power on load, although at a reduced running speed.

The ability of the brush motor to sort out its own power/speed ratio gives the operator of the precision lathe less requirement for various motor to spindle speed ratio changes, particularly as with this type of motor a simple electronic speed control can be fitted, usually a silicon controlled rectifier device, which can vary the alternating voltage without a significant loss of power. Then the provision of a belt changed ratio gives a higher speed for operations such as grinding, and a lower speed where greater power is required such as large diameter turning. The problem on the Unimat is that such changes of ratio for greater power places an excessive load on the single, round-section rubber, final drive belt causing it to break.

The rubber belt drive of the Unimat 3 is an improvement over that of the SL model, and yet in both the modes AC1 and BC1, which are the major useful modes for turning, milling and drilling, the belt snaps with surprising ease under a sudden load, such as can easily occur when turning alloy or drilling phosphor bronze. Drive belts are not cheap or always readily obtainable. A simple answer is to use a Hoover drive belt, 3½ in. OD, which is oversize in section and more flexible than the Unimat



one, but it stretches and easily flies off, the guard case cannot be closed with it fitted, and the lubricants cause the belt to slightly melt to cover surfaces and hands with black, sticky rubber.

The real answer is to convert to a nylon toothed belt drive in a similar manner to that which I described in a previous article on the Unimat SL. With the Unimat 3 the drive components are mounted on a flat plate which, in turn, is mounted onto the headstock by two bolt heads holding against slotted holes. The motor is mounted on to the plate, all the plate itself carries is the intermediate drive component, so all that need be made is the plate with a new intermediate drive component, this time for a toothed belt drive, and a new toothed gear for the main spindle in place of the pulley, as fitted.

In use the new plate can permanently take the place of the old and still give drives AC1 and AC2, with the main spindle pulley back in place, toothed wheel removed, leaving the new AB belt in place. With the toothed belt and gear the BC1 and BC2 become a single position giving 890 r.p.m. with no load, and on switch position I this becomes 530 r.p.m. If a variable electronic speed control is fitted, with the switch in position II and the control in the controlled position, speeds from 460 r.p.m. down to 1 r.p.m. with excellent power, are obtainable. In fact with the toothed belt fitted there will be few times when it will be necessary to revert to the original system; and the toothed belts, in use, last for months. When the teeth become worn after many hours of use a sudden jam or dig-in may cause the smaller toothed wheel to shear part of the toothed surface free from the pitch cords, but this has not happened to me, with the Unimat 3, yet.

The components are easy to make and assemble, with guidance from my previous articles on gear cutting and the improved drive making. The only snag with this machine is that the drive spindle in the vertical mode has an M12 × 1 thread, with its own smaller centre in the pulley, so that if the improved drive is required for milling and drilling then a separate toothed drive gear wheel has to be made for the smaller thread diameter as well as the M14 × 1 for the main drive spindle.

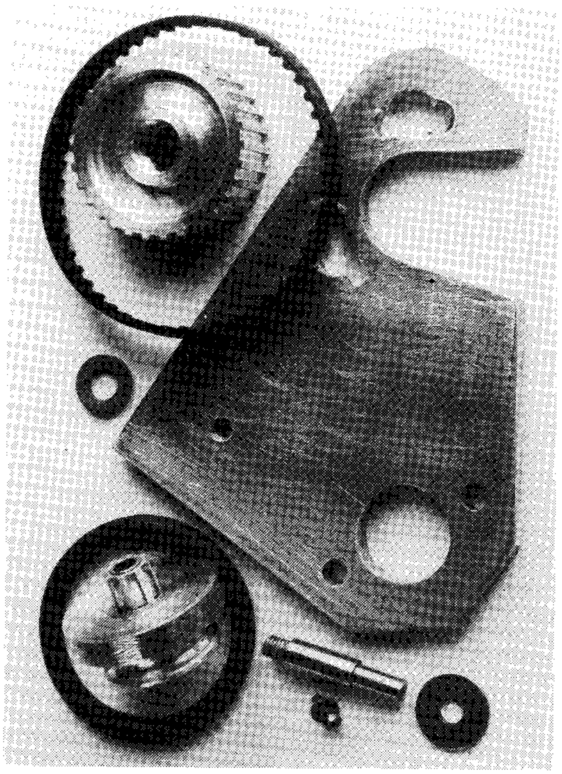
An alteration to my design drawings is to make the plate from 3/16 in. BMS flatstock instead of from ¼ in. thick alloy. To match, turn and thread the bottom of the intermediate drive spindle only 3/16 in., leaving the extra 1/16 in. on the spindle itself, and fit a thicker washer on the bottom of the spindle to keep the levels right. The steel plate would be stronger, easier to fit on the screw heads, and less likely to tear under these same heads. It would require a little more effort and time in the making.

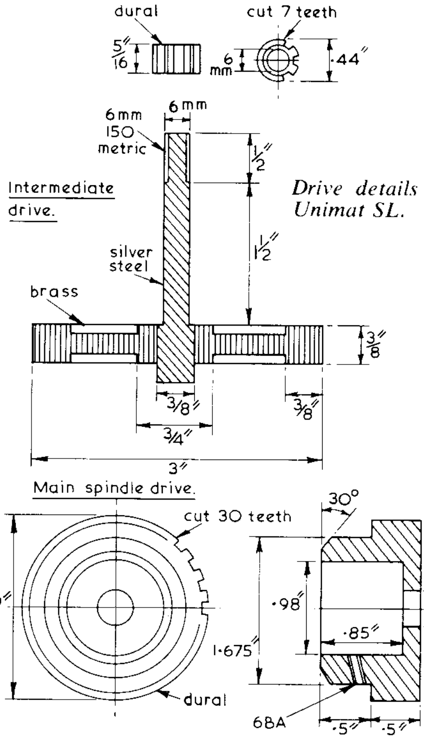
Main Spindle Wheel

The spindle gear wheel is turned from 2 in. diameter duralumin stock, first cutting then finishing both ends in the three-jaw chuck, jaws reversed, drill a ¼ in. hole through and bring up the tailstock with the live centre. Turn out the recess, 1/8 in. deep, the sole purpose of which is to provide something for the chuck to grip while tooth cutting, etc. Hold the recess and turn the outside down to size, drill through 13 mm and the first 5 mm to 14 mm. Set up the indexing attachment with the 30 tooth plate in place and, using the home-made cutter described previously, cut the 1/10 in. slots at one tooth intervals around the wheel carefully using the cross-slide wheel division setting and the carriage setting to cut to the correct depth and to avoid chopping bits from the chuck face.

Fit up the threading attachment and turn at a low speed, with the 1 mm leader in place, to make the M14 x 1 internal thread. Dismantle and screw the wheel onto the nose of the main spindle to carefully turn down the teeth until the belt fits perfectly.

Parts for the improved drive.





Drive details for the Unimat SL.

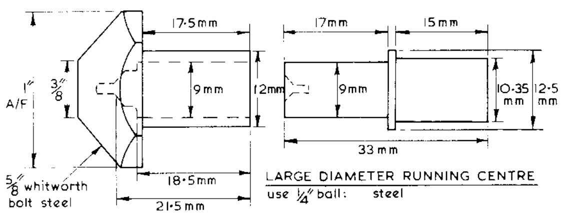
The belt used is designated 100 x LO31 and has 50 teeth 1/20 in. high and 1/10 in. long with 50 same size spaces between. It is .31 in. wide, and can be obtained from model shops as a spare for a radio-controlled stock car, or from Mardave R/C Racing, Rookery Lane, Groby, Leics. The 100 refers to the size of the pitch line — 10 in., and the L means a light duty belt.

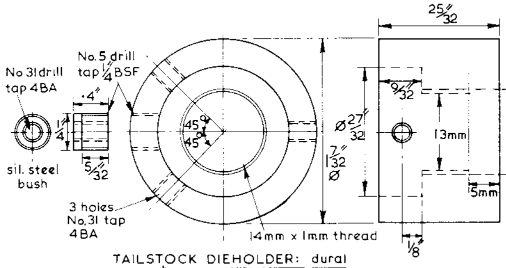
The Drive Plate

Mark and cut out the plate in outline first, before carefully marking out, with just the scriber in soft alloy, or with marking-out blue first on the steel. The first line to mark is the line between the centres of the two big circles, parallel to the angled side, as the other measurements are derived from this line. Mark the other two lines of the triangle which position the two circles and the hole for the intermediate spindle. When all is marked centre punch and drill out, finally cutting out the main spindle cutaway and filing the peripheral extensions to the 12 mm hole using a 1/4 in. round file. Tap the spindle hole with an 0 BA first taper in the drill chuck in the vertical mode, turning the pulley by hand to get a perfectly straight thread at 90 deg. to the plate, held flat on the cross-slide.

Intermediate Drive

For the intermediate drive first make the pulley by cutting the correct length of 1¼ in. diameter duralumin, drilling through 6 mm in the lathe, hold-





ing in the three-jaw chuck and centring in the tailstock with the running centre to make the pulley groove with a round tool in the toolpost. Reverse and hold by the pulley to turn the rest down to 1/64 in. under 1/2 in. Turn the end down clean, reverse and hold by the thinner part to turn the bottom end down and to drill 3/8 in. for the phosphor bronze bearing.

Reverse and hold by the pulley, with the indexing attachment in place fitted with a suitable plate to cut the eight teeth required (24, 36 or 40). Cut the teeth with the cutter made with slightly angled sides to allow for the compression of the belt teeth around the small diameter.

The size of this pulley to motor pulley gives an intermediate drive ratio of 1.5:1 approximately, and the toothed drive gear gives a final drive ratio of 3.75:1. The pulley needs a smaller belt than that provided: the small belt for the Unimat SL is ideal, otherwise the Hoover small drive belt is easily obtainable and cheap (O.D. 2⅜ in.).

Make the two bearings from 5/16 in. and 3/8 in. diameter phosphor bronze rod passed through the main spindle, drilled and parted off with a newly-sharpened parting-off tool. Loctite the bearings in place with 601. Cut a slice of brass for the flywheel, face both ends, drill through to fit a mandrel and turn the outside down true. Replace in the three-jaw chuck to drill through 31/64 in. before Loctiting onto the pulley assembly.

Turn the spindle from 5/16 in. dia. silver steel taking the top 1/2 in. down to 6 mm and then drilling the end and tapping 6 BA. Reverse to turn 1/4 in. of the other end down to 6 mm, then tap this 0 BA in the lathe. Grease the spindle with a motor grease before inserting into the pulley assembly to check for fit. Drill out two washers to size, as shown, cut the 6 BA cheesehead screw to size and, fitting the spindle into the plate, tightened well, assemble the parts of the intermediate drive. Fit the motor and belt to drive the pulley for ten minutes, to run it in.

Assembly

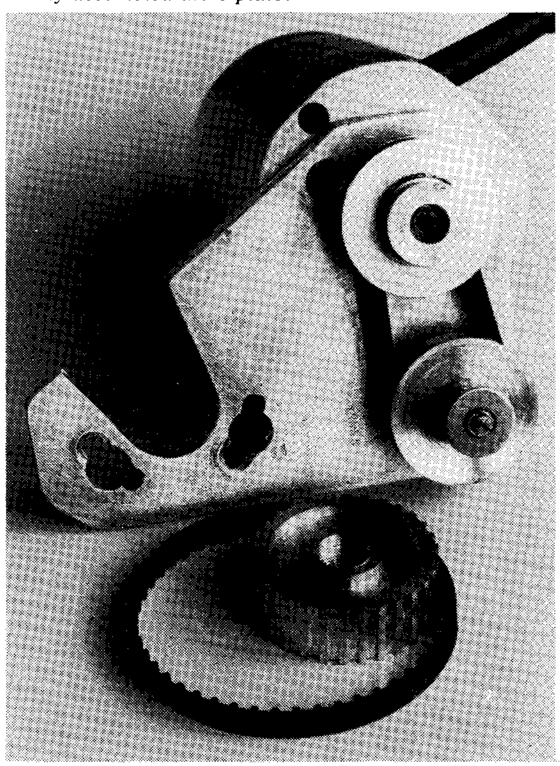
Fit the plate to the headstock, loosening the screws a little more than usual, screw the drive gear wheel onto the main spindle and lift the motor to fit the toothed belt. Lower the motor and push down to apply a little tension to the belt before tightening the two hexagon head bolts. The belt should feel tight but springy under the thumb; any inherent looseness at this stage will need adjustment by filing out the securing bolt positions to allow more movement to apply tension. If the drawing has been followed and the plate made correctly this will not be necessary.

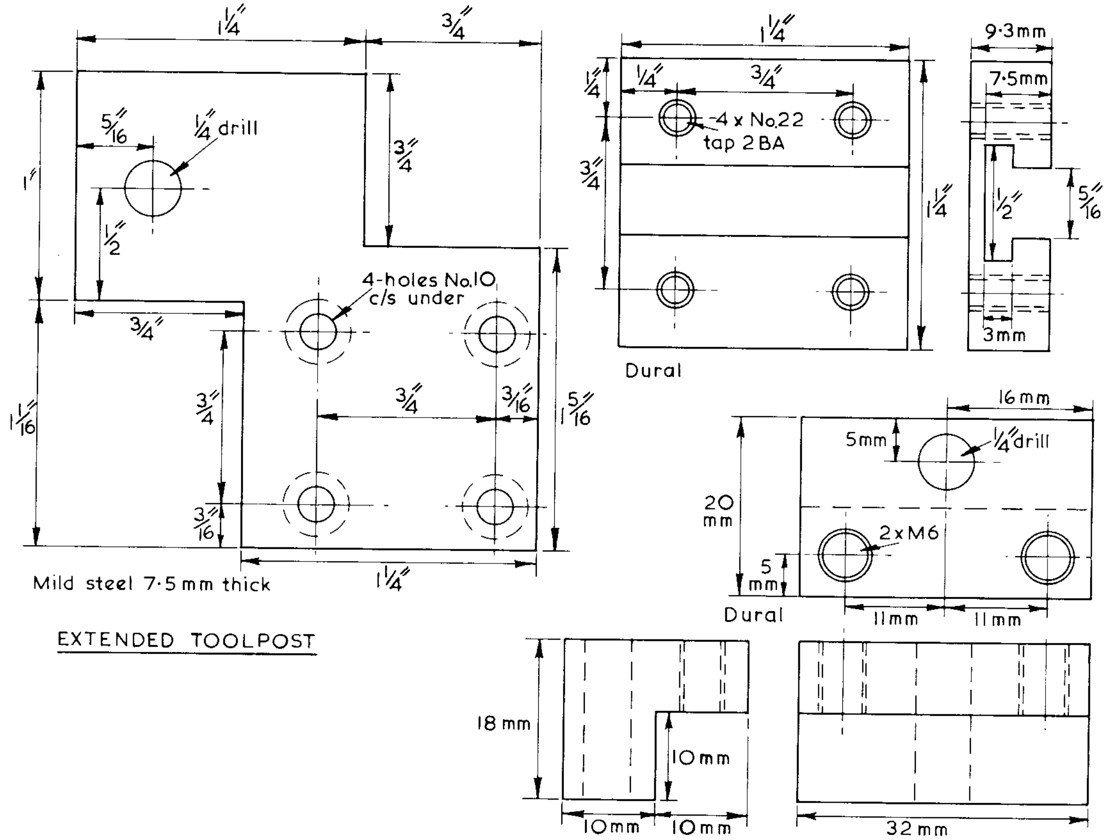
Running

A test that can now be carried out is to fit a piece of 3/4 in. alloy into the chuck, a knife tool into the toolpost, switch on the improved drive and bring the tool hard into the workpiece where it will cut away metal as never before.

In use it will be found that there is little need to revert to other modes with the lathe, using the toothed drive for all purposes. The speeds for various materials and diameters being varied either by the loads imposed on the motor, either by depth of

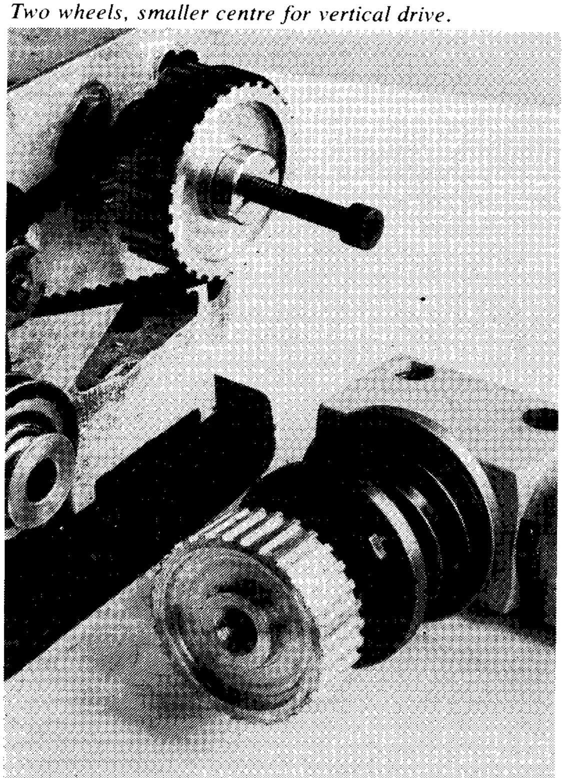
Partly assembled drive plate.



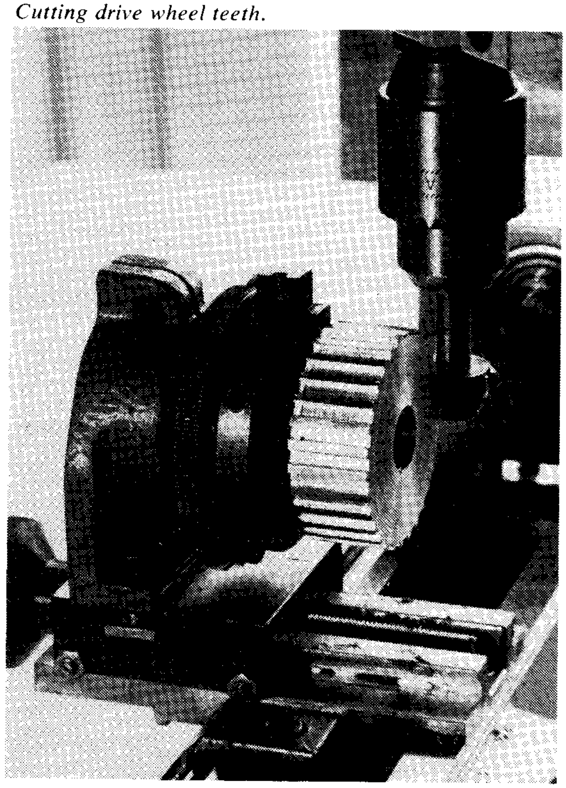


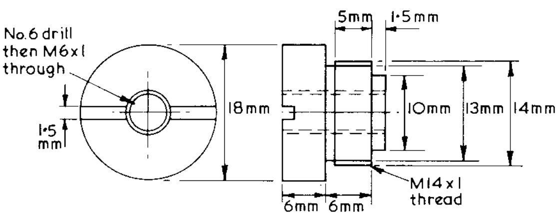
EXTENDED TOOLPOST

Two wheels, smaller centre for vertical drive.



Cutting drive wheel teeth.



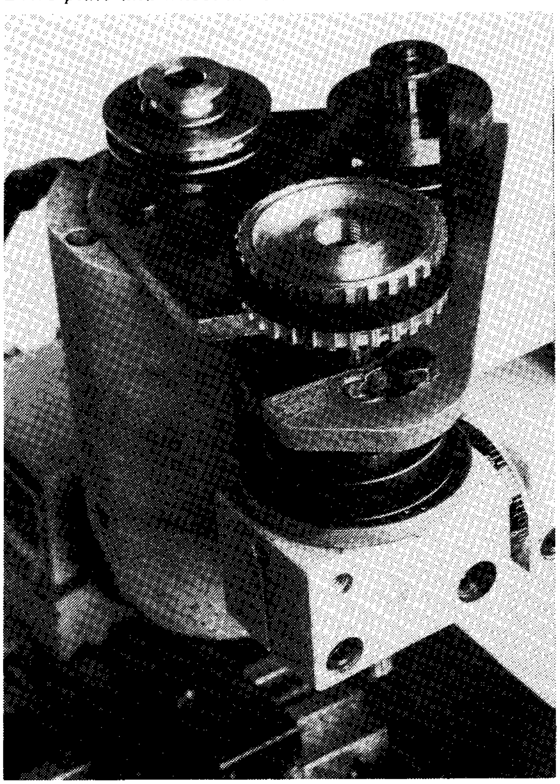


THREADING ADAPTOR:—brass

cut of speed of feed, or when circumstances dictate, the use of electronic control.

Practice will soon determine the depth of cut or speed of feed which is most suitable for a particular material and diameter. The positive drive is most pleasant to use, and it eliminates, to a great extent, the chatter patterns which occur with fine cuts, and the tool dig-in stoppages with less positive drives. A problem now can be overheating of the workpiece due to better cutting and lack of efficient cooling, so lubrication becomes very necessary, using the laboratory wash-bottle to provide this, as I have recommended previously. In particular, with soft alloys, chips of metal welding onto the tool tip can be a problem.

Drive plate and wheel in vertical mode.



To re-adapt the drive back to normal all that is necessary is to remove the toothed gear from the main spindle and fit the old pulley and the position between this and the motor pulley are again available for the rubber belt. In the vertical mode, if the toothed gear with an M12 x 1 centre has not been fitted then the rubber belt drive can be used as usual.

The flywheel is belt-driven by the motor in all circumstances as this gives a better torque to the drive, and it also, with the toothed belt system, prevents sudden shocks and stops from being transmitted fully back to the motor.

If, as I have previously suggested, a foot switch is used to control the motor there is no necessity to make the circular cut-outs on the drive plate for swivelling the motor when used in the vertical mode since there is no need for the switch to be available. The foot switch is a safety precaution, anyway, as it leaves both hands free in an emergency, and it was never a good idea to reach over a turning chuck to find a switch! If it is felt that the circular cut-outs are required then mill them before drilling the motor hole to size, moving the plate around a temporary axis for milling. Otherwise it is a simple matter to just make two more holes for the motor for this position. When fitting the motor to plain holes the two swivel plates can be temporarily discarded.

Tapping and Threading

When using the threading attachment with the Unimat there is no need to change the plate back and to fit the special pulley. Make the brass adaptor to screw into the end of the toothed drive wheel, which will take the leaders, and make a more positive drive at the available slower speeds and a better and easier task.

For tapping and threading with standard taps and dies a tailstock die-holder helps to thread true, and use the taps in the drill chuck for true tapping in the lathe, horizontal or vertical, both operations being eased by using the toothed drive wheel as a knob.

Tubal Cain's Boiler

The 5 in. test boiler which we published recently by Tubal Cain had a slight omission: the working pressure. This should have been added to the drawing and is 80 to 100 p.s.i. I would like to thank those readers who wrote to us about this, we have also been asked to quote a capacity. Well, Tubal Cain tells me that he hasn't seen any reference to capacity on a boiler drawing since 1937 and feels that it would not be right to quote figures which could not be maintained. However, he does say about 10 to 12 lb. of steam per hour should be available depending on how the boiler is fired but if you push it too hard the degree of superheat will fall.

JEYNES' CORNER

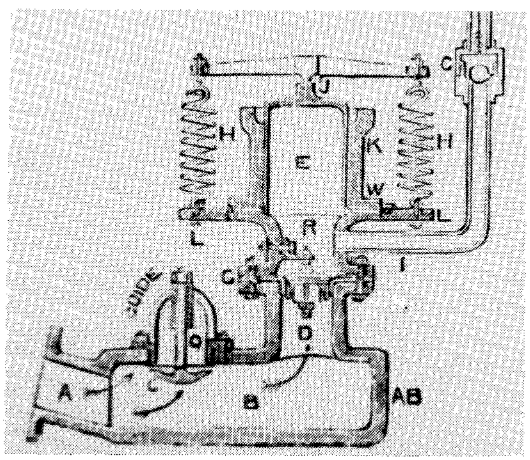
The hydraulic ram in perspective

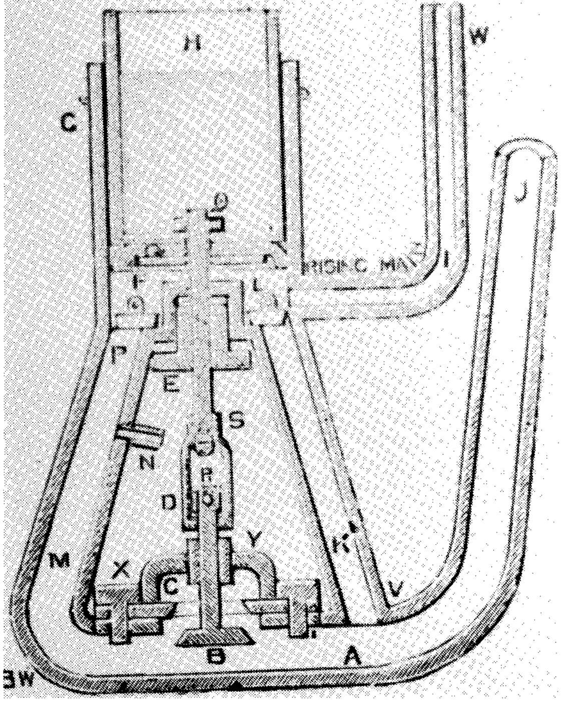
Part III *From page 1423*

Another idea to increase the efficiency of hydraulic rams was tried out by the famous firm of Hydraulic Engineers John Blake of Accrington (who still manufacture hydraulic rams) the original John Blake having been one of the pioneers in this field from practically the start). This was in the form of a spring-loaded piston working in a cylinder open to the atmosphere. When the water flowing into the body of the ram acquires sufficient velocity to close the beat valve, besides forcing water into the air chamber, it also forces the piston up into the cylinder, thus assisting to form the partial vacuum and making the closing of the beat valve more certain.

Blakes also produced a type of ram without the conventional air chamber, a plunger or piston being substituted in its stead, which was held down in its cylinder by two springs and a crossbar. When the ram started, as the water rose from the body of the ram, it raised the piston in its cylinder causing it to rise up with every stroke of the beat valve. This in effect was just an ordinary accumulator action, the springs forcing water up the delivery pipe, each time the incoming stream from the ram body stopped. This ram was more noisy than the conventional design, and it was difficult to keep the cylinder and piston tight against the high pressure within it. P. J. Davies had several patents which I would have thought would cover this principle, but possibly they had some agreement between them, although I think the Davies patent was for a dead weight accumulator.

Blake design to avoid air chamber. The piston rises and falls with each ram beat.





Davies self-starting and stopping ram.

Davies was a London manufacturer of hydraulic rams, and he invented the self-starting and self-stopping ram which also employed the dead weight accumulator principle I just mentioned. This type of ram was started and stopped by the rise and fall in pressure in the rising main. It was rather complicated in design and construction, and I believe more temperamental than the ordinary ram, which is saying something. Davies discontinued the ram production side of his business in 1876.

Hayward Tyler were another London firm manufacturing rams: these were fitted with a cover plate which could be removed to examine and service the delivery valve. They also made a ram having two beat valves, which I do not think was much advantage, as if one failed, the ram stopped, which was just the same result with the single beat valve.

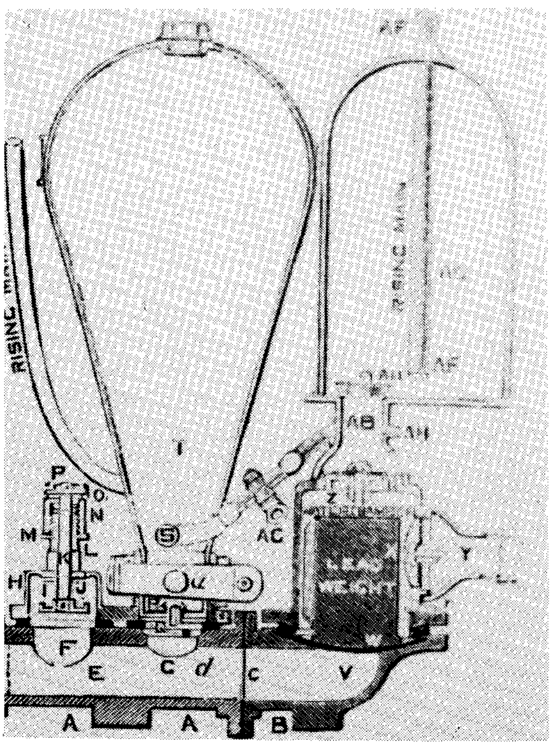
Those who have had the opportunity to study different types and makes of rams will have noticed that some makers fitted the beat or waste valve on the trunk side of the ram body, and some fitted it on the other side, incidentally, Blakes made rams of both designs. Also it is noticeable that many of the different makes of rams required the delivery pipe to be dismantled before access could be obtained to the delivery valve. One notable exception was the ram made by McDougals of Galt Ontario; here the body of the ram had two side passages into the air chamber base, beside the disc type and spring loaded delivery valve, thus the delivery could be taken from either side of the ram whichever was most convenient, a cap being provided to blank off the unused outlet.

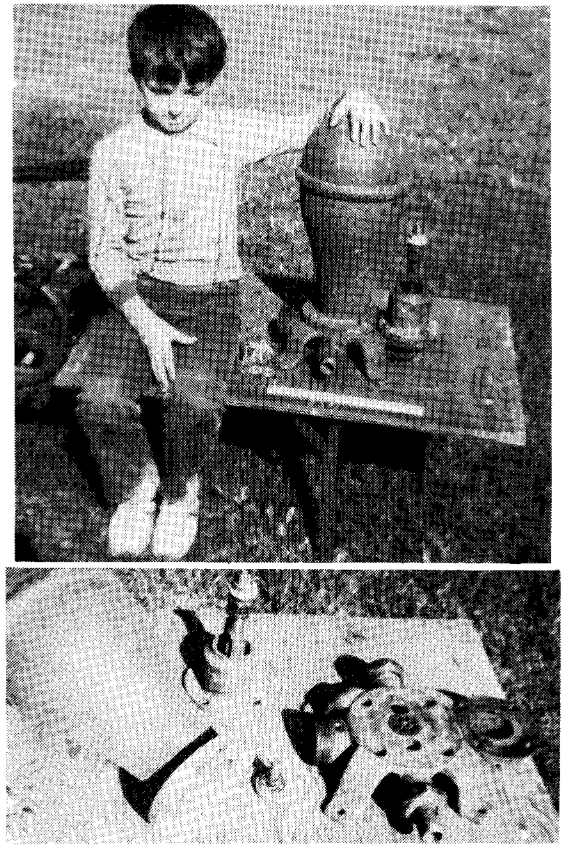
Fyfe and Co. built hydraulic rams, and their product was instantly recognisable by its tall thin tapering air chamber which was a direct contrast to some of the chubby ones. Their standard ram had a flange bolting face at each end of the body, one for the drive trunk, the other a flat cover plate; where their rams were required to pump dual supplies, i.e. one clean water, and one from the water working the ram, this cover was removed, and a diaphragm pump body fitted, either with or without an air chamber, according to the requirements.

Another type of ram which could be either single or dual purpose was the "injection ram". In some cases these rams only made one stroke, the action then being carried on by syphoning. This required that the suction lift was not more than about 15 or 16 feet, the ram, instead of having the usual waste valve, had an internal flap valve with adjustable balancing to suit conditions, and the water passing through the valve was taken through a pipe into which the suction pipe was branched.

Here is a case of the water being cut off by the closing of the valve when the water receding from it caused a vacuum sufficient to draw water up the suction pipe and the water mingled with the water used to start the syphoning. It was necessary to

Fyfe dual purpose ram with by-pass.





No. 5 Galt ram by McDougals. Note two exits.

have the outlet pipe of sufficient length to allow this action to work. Where the outlet pipe was short the ram would beat, as the vacuum was made and lost: it could also be fitted to raise some of the working water by provision of a delivery valve air chamber and delivery pipe.

These rams are also commonly called syphon rams, although there is another type which is rather complicated, especially if it is a dual purpose ram. The "safe" lift for these rams is about 15 feet; theoretically it is possible to get a much bigger lift, this is a conservative figure.

Getting back to the mechanics of installation, the drive pipe in any case should be as straight as possible, and have an inclination of about 10 degrees from the horizontal. Where it is not possible to have a straight drive pipe, and there are several curves. (these should be kept as wide as possible), the size of the pipe bore should be increased to offset the additional skin friction caused by the bends.

In some districts trouble is experienced with cast iron drive pipes, also with standard wrought iron pipes, by internal rusting, and means should be arranged for drain-rods and a rope having a bundle of steel wire pulled through.

To be continued

Club Chat... with the Editor

The October Newsletter of the **Gauge 1 Model Railway Association** has just arrived — all 40 pages of it. It is, as usual, full of reports on the Association's activities and letters from members. Some of the venues for the previous few months include Harrow in July, Bexley also in July, Whitesmith and Farnham in August, the North West Kent Group get together on 27 August and the Kettering & District M.R.C. Exhibition on 9 September. The latter function meant collecting the Association's track from London and erecting it in the Drill Hall for the Exhibition. The local club was supported by members far and wide and quite a few locos took to the track. Electric locos were also running on the inner circuit. So there was activity for the whole of the eight hours the show was open.

I see from the **Birmingham S.M.E. Ltd.** that one of the members, Mr. J. Godfrey, was awarded first prize in its class at the First Midlands Model Engineering Exhibition. His model is a Tip Cart which of course won the horse drawn vehicle class. I add my congratulations to those of the club and also my commiserations to the other three members of the same club who entered the Exhibition but were less fortunate.

I have had a little bit more information from Mr. N. Kay of **Worcester and District M.E.S.** about the track we featured in "Club Chat" of 17 November issue. We did not publish details then but here they are now. The old, raised track is 660 ft. round, nearly level. The new track at ground level is a double circuit of 1100 ft. with gradients of 1 in 62 and a tight radius in one spot of 30 ft. It is 3½/5/7¼ in. gauges and there are seven steaming bay roads in roundhouse fashion connected to the old track.

Another track being built is at **Gravesend M.E.S.** where one of the local sports centres, Thong Lane Sports Ground, has been offered by the local council — or rather, a piece between the car park and the rugby pitch has been offered. However it is big enough for an oval 540 ft. in length. Both straights are finished and one end in place. At the other end all is drilled awaiting track which by the time this is read, should have been laid. The track started on concrete supports but as they had some trouble with the moulding they went over to iron supports. Mr. J. C. Hale, who sent us the details, says he made 98 of these in three weeks.

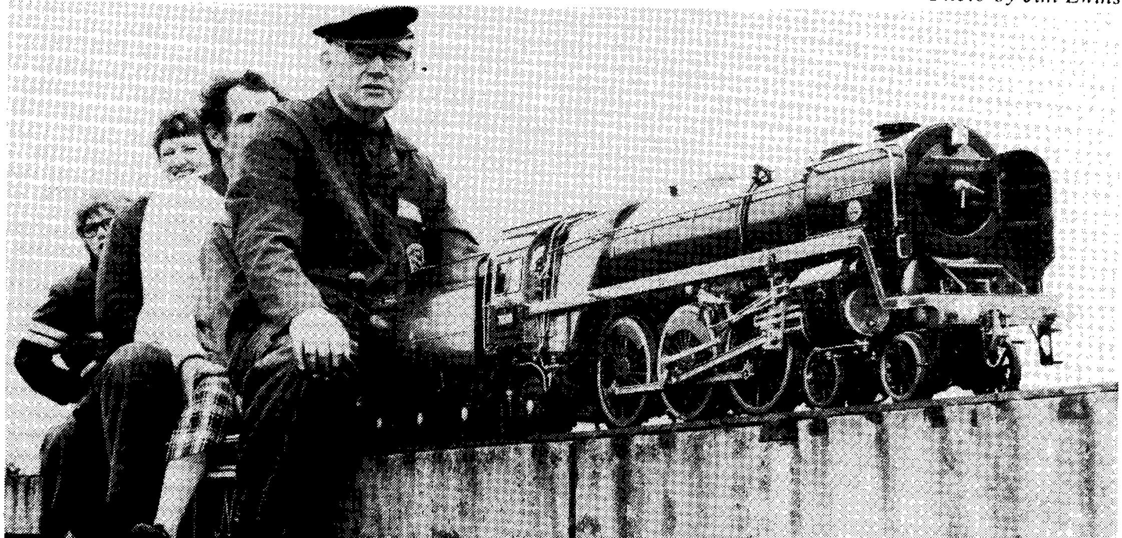
Down at **Auckland S.M.E.** they have started a scrapbook of the club's history and are asking for photos, etc. which can be included. I think this is a great idea. Many clubs we know have gone to the wall but what better way of retaining interest than through a compilation of all available history. Some of the clubs in the U.K. go back many years and must have a very fascinating past. How about any club, no matter where, letting me have the history with photos so we could perhaps have a regular historical spot?

We have mentioned from time to time the **Basingstoke & District M.E.S.** and the progress on the track. Mr. J. H. Jarvis, the P.R.O., has now told me that the last remaining arch of the bridge section has been completed — all this in the past two years. In about a year's time the track should be laid and the steaming bay and station completed. Landscaping has been started and — by coincidence — a history album is in progress.

Cultra is now a flourishing track due, no doubt, to those few regular stalwarts of the **Model Engineers Society N.I.** who have given of their time for the past two and a half years. There are now 1700 ft. of track awaiting the opening ceremony on Easter Monday and the locos.

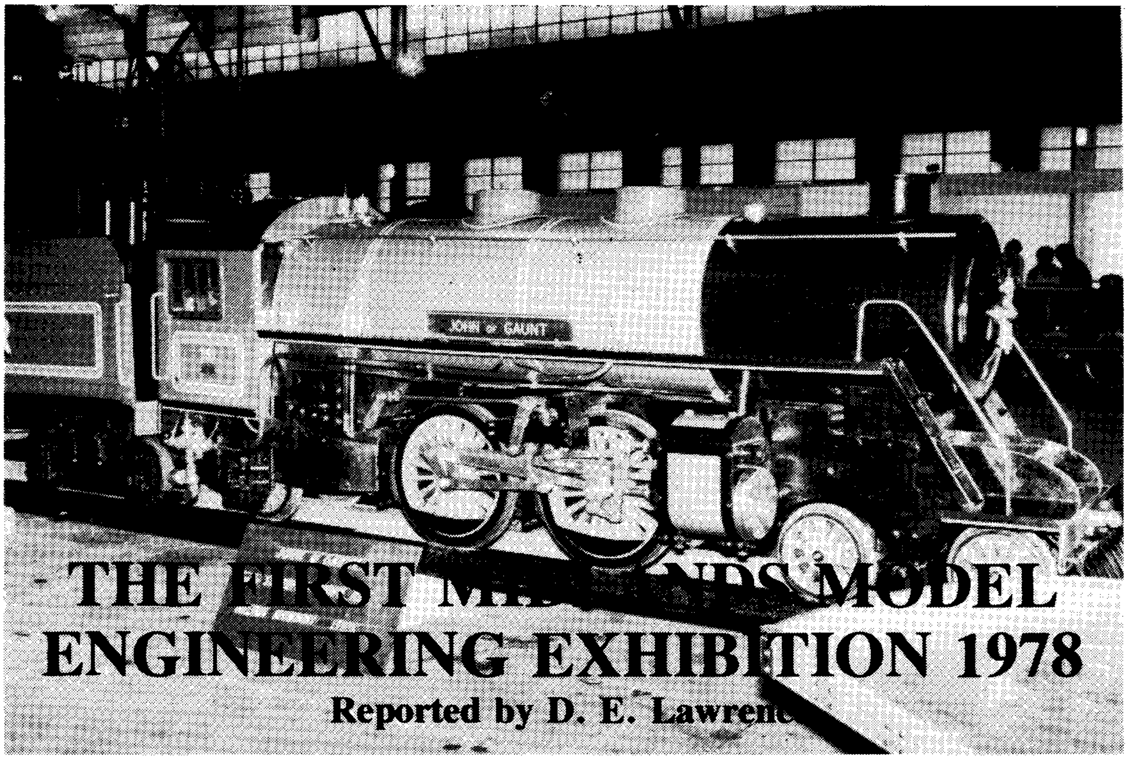
I'm pleased to see that Bert Kirby, Editor of *Big Wheel News* – journal of **The Steam Locomotive Society of Victoria** — has arrived safely back after his globe-trotting saga with Ken Tinkler, Colin Campbell and Sid McComb. The trip took in Japan and Britain (at least the first instalment does) and it was a pleasure talking to Bert at Guildford in July. From his notes in the journal the four travellers had a very interesting time and I hope it won't be long before we see them this way again. Don't forget IMLEC at Bristol in July!

Pontins 1978! T. H. Thomas of the Whitchurch club on his 5 in. "Britannia" at Bristol. *Photo by Jim Ewins.*



THE FIRST MIDLANDS MODEL ENGINEERING EXHIBITION 1978

Reported by D. E. Lawrence



Curwen Atlantic from the Stapleford miniature railway

THIS LARGE EXHIBITION was sponsored by Traction Engine Enterprises Ltd. and hosted by the Leicester Society of Model Engineers; in effect, this meant T.E.E. looked after the commercial side and the Society took care of the practical side of the Show. The Society had a very big job to do and, under the energetic direction of Dave McCullough their General Secretary acting as Assistant Exhibition Manager, they did their job very well. Some help came from other Clubs, such as the North West Leicester M.E.S. of which more later. Support also came from the trade who took stands, advertising space, donated cups and Messrs Dalton and Co. Ltd of Belper donated a supply of *Silkolene* oils for use in the models and locomotives in the Hall.

Because of the nature and value of the huge number of models there, security had received extra special consideration by the organisers; there was a constant surveillance by closed circuit t.v., 24-hour security guards with sharp fanged guard dogs in close attendance and all the models on show were wired through into an electronic alarm system. All this was very re-assuring to the many exhibitors.

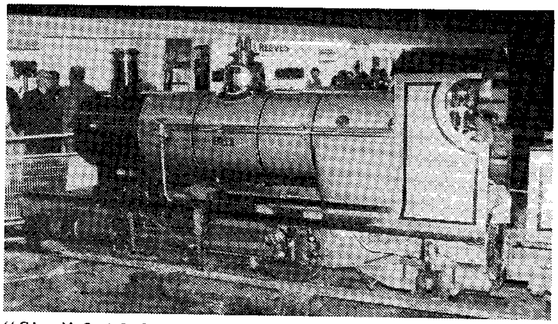
Professor D. H. Chaddock, well known to readers of this magazine, officiated at the informal opening ceremony and also acted as Chairman of the seven-man judging panel. They had the unenviable job of selecting the winners out of 180 models spread over 16 Competition Classes, some of which had over 20 entries in each class. As some Competition Classes had four cash prizes to be awarded, their judging had to be quite searching. Ayone who has done this sort of thing will know that frequently a winner stands out and is no bother to select, but the difference between say, 2nd and 3rd or 4th, may often present a great deal of careful scrutiny. I think the judges there did a very fine job.

I will not be able to give a comprehensive description of the whole Show and will confine this report to the winners, the Club stands, a sample of the trade and a brief look at some of the 230 odd display items. The huge hall had several very big double doors along one side and, of course, very large exhibits could be brought in on their own wheels, thus Len Crane's monster 22 ton *Fowler* crane engine with jib erected was on show and occupied pride of place in the main display area. It is still in first class working order in spite of being almost 50 years old and is well maintained. Bressingham Museum loaned a 15 in. gauge 4-6-2 *Rosenkavalier,* which had been built by Krupps based on a design by Henry Greenly and a near sister Pacific designed by Greenly, *Winston Churchill,* was loaned by the Romney, Hythe and Dymchurch Rly. These two large locomotives flanked the Fowler crane engine and made an impressive display. From the Leicester environs came two 10¼ in. gauge locomotives from the Stapleford Miniature Rly., one was loaned by John Gretton, the Curwen Atlantic *John O'Gaunt,* now 30 years old and rebuilt with some modifications in 1969; it is in regular use at Stapleford. The other locomotive was Mike Froggatt's L.M.S. three cylinder *Jubilee* 4-6-0 which was put into fairly regular service on the S.M.R. about three years ago. This is a handsome engine and was modified from the Greenly two cylinder design for a *Royal Scot* into a taper boiler *Jubilee* with the third cylinder added.

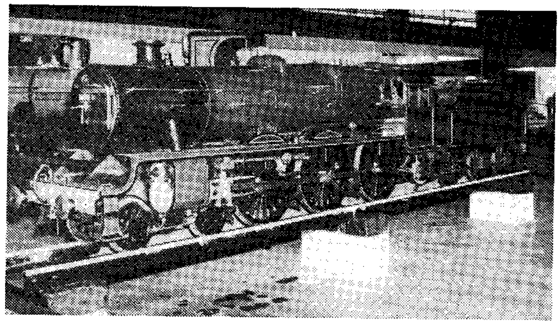
In another display area was the full size Hunslett 0-4-0ST *Pamela,* on each side of which was a brightly painted 7¼ in. gauge model Hunslett. *Pamela* is an ex-Penrhyn Quarry locomotive and is now owned by John Vernon. A similar display was adjacent to these items and comprised a full size Fowler BB1 ploughing engine of 19½ tons and two 2 in. scale models. The Fowler was immaculate and attracted a great deal of attention from the "instamatic" brigade; according to the Exhibition catalogue, it and its sister engine had lain derelict for 20 years and presented a mammoth task of restoration for their present owner Andrew Fisher. I will mention the models when I come to them later.

There were 104 locomotive models in the display section, i.e. not entered for Competition and it was here one noticed the widest variation in quality which ranged from the very ordinary to the very excellent. At the top end of the quality were two fine 5 in. gauge L.M.S. locomotives, a *Jubilee* 4-6-0 and a *Coronation* Pacific by B. Goodwin, both were coming along very nicely and were well detailed and finely finished. As yet they lacked boilers but will be excellent jobs when completed. The platework was clean and the builder had taken the trouble to protect the steel plate with Jenolite or something similar which gives a dull silvery grey finish to clean steel but which shows up any blemishes — as far as I could see, there were none.

Amongst the stationary engines there was plenty of variety and I was attracted to a type rarely modelled nowadays, this was R. Wallis's horizontal ½ h.p. gas engine, a solid looking job which could have been to any scale; (unfortunately the details given on cards accompanying the exhibits were sparse and left the observer to work things out for him or herself). Arnold Throp, one of the judges, had several examples of his work in the Tools and Workshop equipment section including a very useful stepped mandrel for setting fingers of 2, 3 or 4 point lathe steadies accurately and a nicely made new type of slotting attachment for various uses on a Myford lathe. I must admit to being intrigued by



"Sian" 2-4-2 from the Fairbourne 15 in. railway.



Mike Froggatt's 10¼ in. gauge "Jubilee".

Miscellaneous and ship models on display.

the 3 in. scale *Wallace* concrete mixer I saw in the Miscellaneous section, I could only conclude the builder had used it for demonstration purposes or perhaps the wife wanted a cake mixer and ------!!

Competition amongst the Award Classes was pretty fierce; there were some very good models indeed. In Class 1 for locomotives up to Gauge 1 the winner was Clarry Edwards with his M. & G.N.R. "0" gauge live steam 4-4-0 No. 44. He actually had two such models entered and there was not much to choose between them. They were both neat and tidy and although steamers, nothing was out of scale except perhaps the wheel flanges were a little on the deep side.

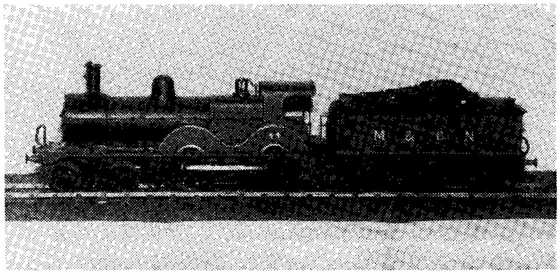
In Class 2 for 2½ in. and 3½ in. gauge locomotives, the winner was Peter Wardle's East Africa class 57 Beyer-Garratt 4-8-4 + 4-8-4. We have met Peter recently in these pages and his Garratt is now all in one piece and is a giant in 2½ in. gauge, all two hundredweight of it! The sheer quantity of work put into this job probably gave him a head start over the other competitors; perhaps the only criticisms one could make about this engine was that the piping and paintwork could have been a little better. The Clarkson cup for a model built to their drawings or with their castings went to A. J. Bodily's *Stirling Single*.

There was some really lovely work in Class 3 for 5 in. gauge locomotives and Roy Amsbury's *Caledonian* 2-4-0 of 1870 emerged as the winner, taking the A. J. Reeves Ltd. Trophy. This model has been seen at the M.E. Exhibition a few years ago, where it collected a premier award and certainly it deserved the prize here. A G.W.R. King class tender in a glass case was a fine well detailed job but I thought it had rivets a little oversize and rather thick beading.

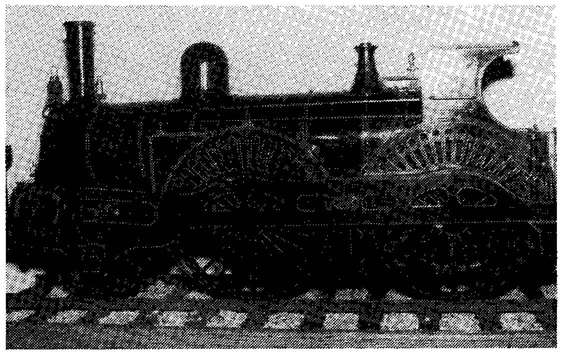
In Class 4, locomotives 7¼ in. gauge and over, the winner of the Burton Model Imports Ltd. cup was R. Kay with his 0-4-0ST *Alice* class Hunslett, a nice solid job, plain but well finished in a red livery, the kind of colour which stands out in slides beautifully and complements any polished brass around.

Class 5 was for rolling stock of any gauge and the winner here was D. Spooner's 5 in. gauge coal wagon; well detailed and neatly finished in private owner style, there was very little to fault in this model. The exhibit also had a section of track and ballast filled buffer stop, both of which looked quite realistic.

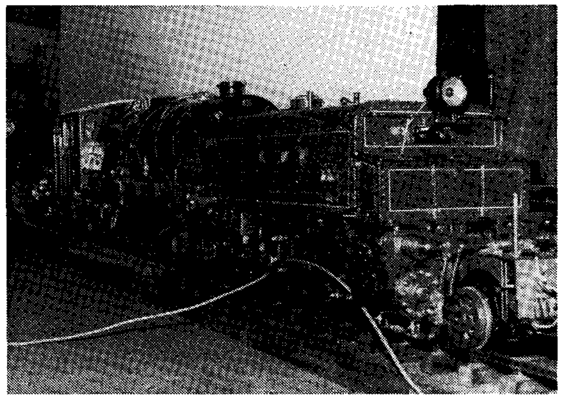
Class 6 was for stationary engines and T. Smith's horizontal cross compound condensing mill engine with Corliss valve gear won the Modelcraft cup. This model was another which had received a premier award at an M.E. Exhibition not long ago and the experts tell me there is little of detail to fault; I'm told there should be more and smaller rope



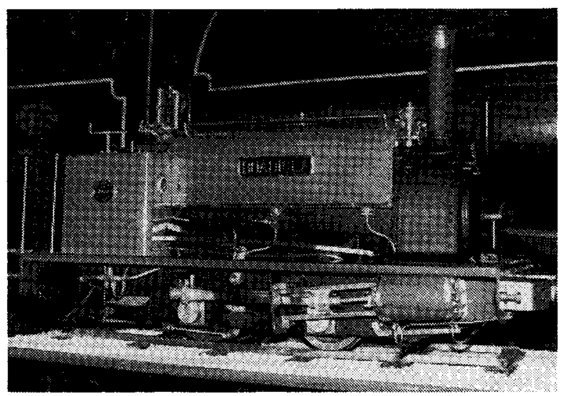
Clarry Edwards' "O" gauge steam loco.



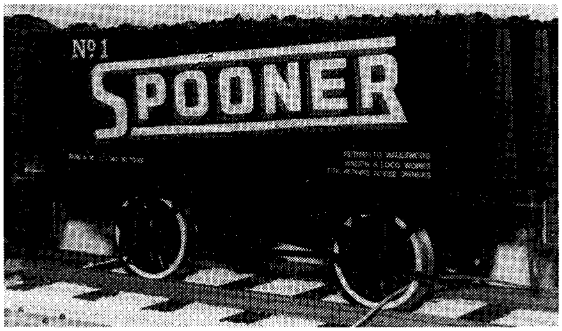
Roy Amsbury's "Caley" 2-4-0.



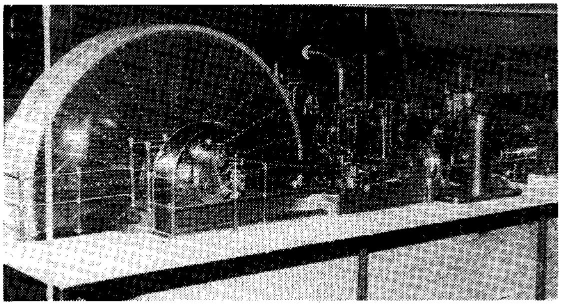
Peter Wardle's 2½ in. gauge Garratt.

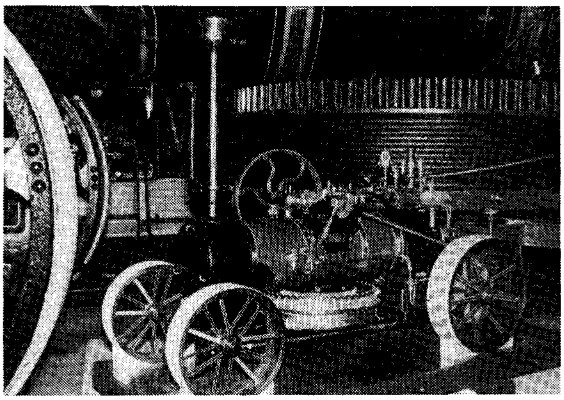


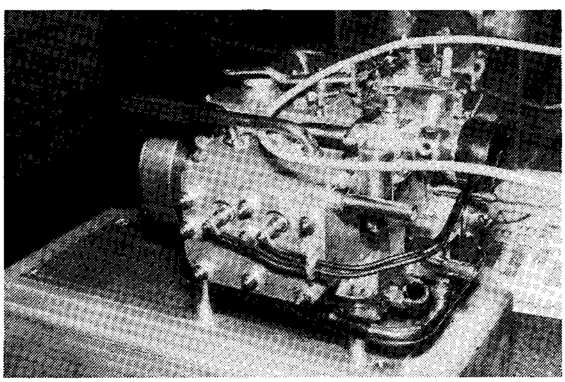
Hunslett saddle tank by R. Kay.

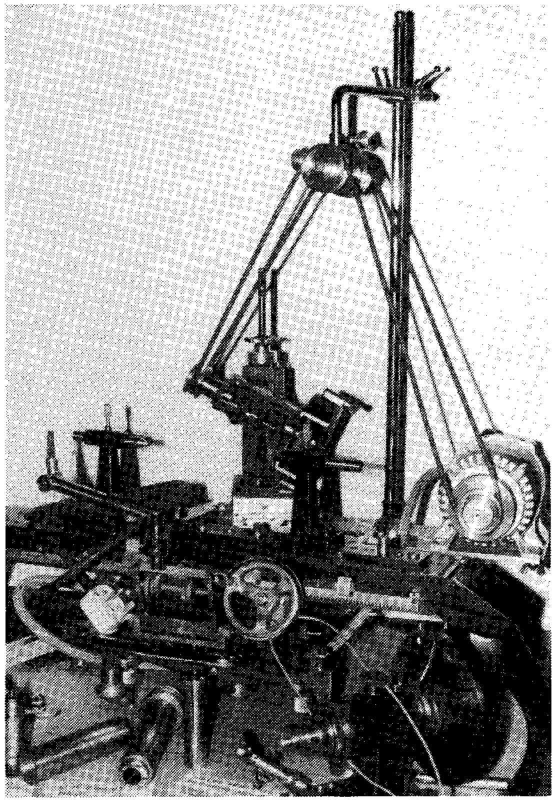


5 in. gauge coal wagon by J. Spooner.


Cross compound mill engine by T. Smith.


Dr. A. Braddock's ploughing engine.


J. Dempster's flat four petrol engine.


P. Spenlove-Spenlove's tool and cutter grinder.

grooves and an aluminium flywheel isn't quite the thing, but for all that, the model is excellent and most impressive. The glass case surrounding it precluded any chance of a decent photograph but I hope the one here will give some idea of the model.

Steam road vehicles were in Class 7 and the winner of the Staffordshire Joinery cup was Dr. A. Braddock's 2 in. scale Kitson & Hewitson slanting shaft ploughing engine. Standing alongside the full size Fowler made it possible to compare detail and, although from different stables, it could be seen that it looked right.

In Class 8, Machine Tools and Workshop Equipment, the winner was P. Spenlove-Spenlove with his own design Tool and Cutter Grinder which to me appeared a complicated machine and very versatile. A number of attachments were displayed with it. Dave McCullough kindly toted around a large (and heavy) white board to place behind the various winning exhibits for me to get reasonable photographs, but even so, the one of this T & C G does not do it justice.

Class 9 was for Petrol and Diesel i.c. engines and a 24 c.c. flat four petrol engine with opposed cylinders (it looked like L. C. Mason's Mastiff design) by J. Dempster was the winner. There were two of these engines placed together and it was surprising the difference that cleaning up and radiusing corners made to the style and appearance of the finished products.

To be concluded

THE PISTON DROP VALVE ENGINE

by A. Haworth

Part IX

From page 1475

NOW, THE STOP VALVE. Why a stop valve I confess to utter bafflement. Why not the start valve? It starts every time it stops. But there it is, it has to be one or t'other, so why not this one? If it was called a "start" valve we would undoubtedly ask, why not a "stop" valve? Aw, forget it, fill her up again.

There are many valve manufacturers in this country who make valves from 1/4 in. bore to many feet in diameter and moreover, the prices of these are most competitive. Why not use a standard commercially available valve? It performs as well if not better than a model. So why not use one? The problem is that of scale. A 1/4 in. bore commercial valve is as big as, or larger than the cylinder it is to serve. Then we must make one.

There are many arrangements of stop valve relative to the cylinders in cross compound engines. One of the best layouts, in my opinion, is that where the main steam pipe approaches the HP cylinder from below the engine room floor level. The valve is placed in the pipe midway between the cylinders and opposite them. The valve spindle is extended upwards, supported in a neat floor column on the engine room floor with a capstan type handwheel on the top. The engine man looks to his left and sees the HP valve gear, to his right and sees the LP valve gear. Immediately in front is the governor so he can see the instant of lift. Also at his front is the gauge board which will show boiler pressure, pressure at stop valve, vacuum gauge and possibly a rev. counter.

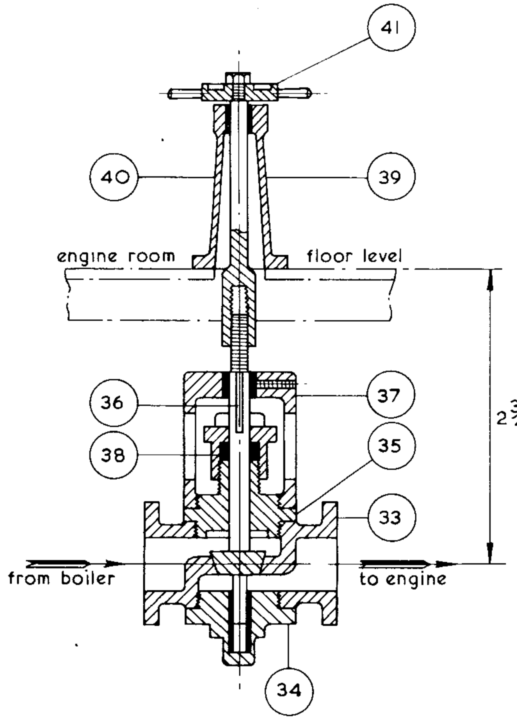
The valve itself is relatively simple to make and when assembled is an attractive device in its own right. It is neat and compact and will give, with care, satisfactory service. It is a nominal 1/2 in. bore valve and will handle all the steam necessary to the engine at 100 p.s.i. (dry saturated) from the Lancashire boiler or boilers. The spindle is guided above and below the valve which is good design practice in any valve. The conical valve which is integral with the spindle enters or leaves an identical conical seat machined in the valve body.

Initially grind in both valve and seat and ensure a perfect 'bed'. A valve and seat of this design is virtually a plug cock and a well maintained plug will remain steam tight for years. Another unusual feature is that the valve spindle is prevented from rotating. The reason lies in the screwed portions of the valve spindle and the coupling spindle which operates it. If these two parts were to stick together for any reason, then the valve would turn forever neither lifting nor falling. If the valve spindle cannot rotate, then it can *only* rise or fall.

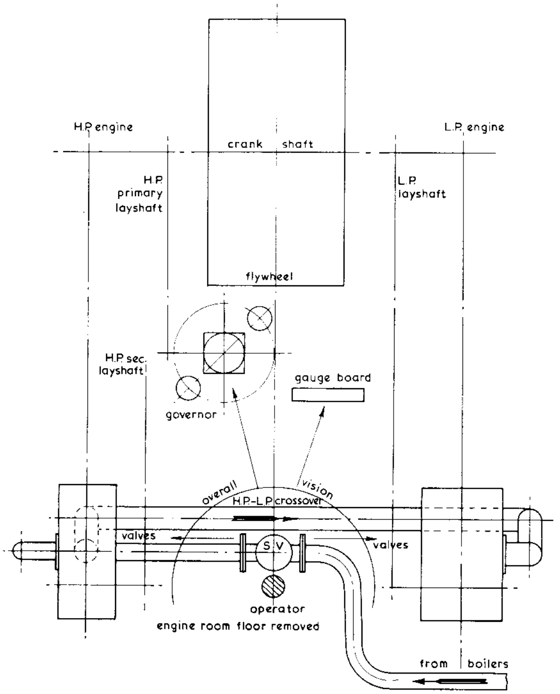
Please note that the coupling spindle is collared at the top by the handwheel and the spindle collar inside the floor column. Never apply any more torque than can be applied by the handwheel. No bars, tubes, wrenches or wheel spanners. Close it lightly by hand. If it leaks, force will not cure it, in fact you will add to your troubles with a fractured spindle. Repair the valve, re-grind it "in".

On the drawing, I have shown the operating screws as No. 4 BA left-hand thread. These taps and dies may be difficult to obtain. You are, therefore, free to choose your own thread. Fairly fine, about the same diameter, but it must be left-hand thread! Otherwise your handwheel will be opening to close, closing to open.

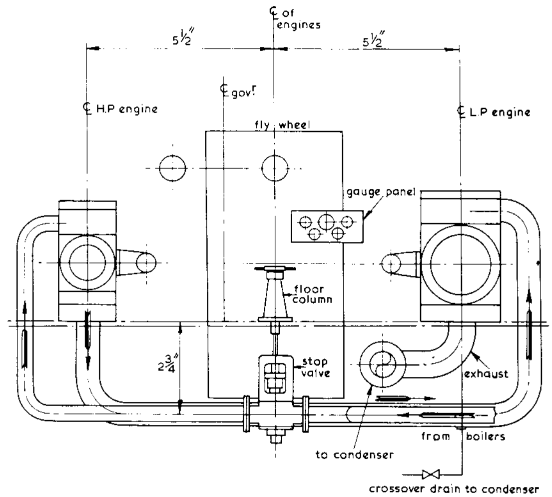
When in a panic to shut a valve one instinctively uses a clockwise motion. After the flywheel has



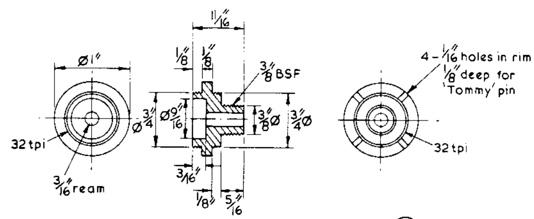
SUB-ASSEMBLY OF STOP VALVE & COLUMN



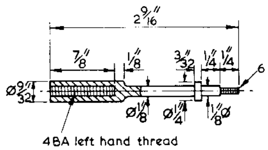
PLAN VIEW SHOWING LOCATION OF STOP VALVE & MAIN STEAM PIPEWORK



END ELEVATION OF STOP VALVE & MAIN STEAM PIPEWORK

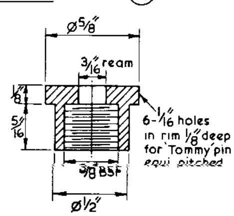


VALVE SPINDLE COVER: b.m.s. (35)

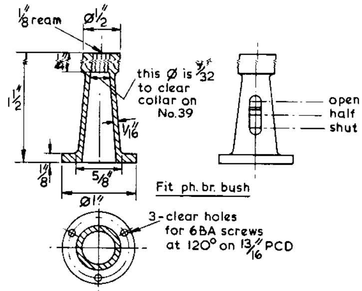


Note:— the length of this spindle determines distance valve is below engine room floor level.

EXTENSION COUPLING SPINDLE (39)
b.m.s.

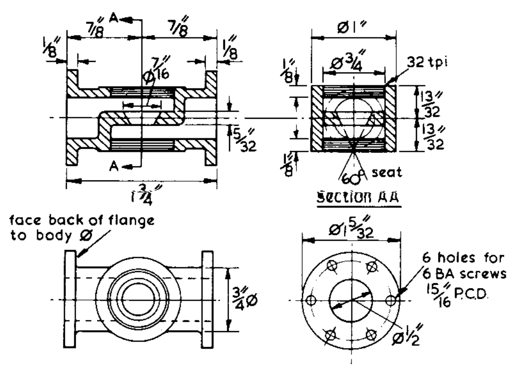


GLAND NUT (38)
g.m.

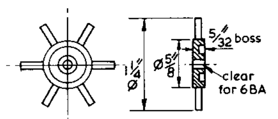


Optional
valve position indicator slot may be cut in column with mark or pointer on coupling spindle to indicate amount of valve opening.

VALVE OPERATING FLOOR COLUMN (40)

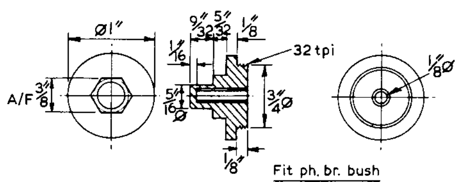


gunmetal casting working press 100 PSIG at 338°F
VALVE BODY (33)



screw 6-handles into boss, machine recess after fitting handles.

CAPSTAN TYPE HANDWHEEL (41)
b.m.s.



TAIL SPINDLE COVER b.m.s. (34)

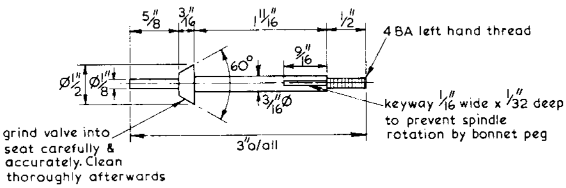
burst, one wonders why? You usually remember in the ambulance. Another odd feature concerns its appearance. Most valve bonnets are tapered, whereas this one is a cylinder. This is mainly due to the fact that I have deliberately been generous in the dimensions of the spindle and glad. I could have introduced a slight taper but I do not believe in machining for machining's sake.

Another odd one is the fact that I describe an optional arrangement on the valve operating floor column, item 40. It was always referred to in the trade as a 'valve position indicator'. In all my years concerned in the design, construction service and repair of these mill engines, it has never been satisfactorily explained to me as to what the purpose is of this device. Firstly a stationary steam engine which is governed will, or should have, its valve fully open if running, or fully shut if stopped. Any variable demand for steam is controlled by the governing system. Admitted, a valve may be 'cracked open' for the purpose of warming through. In certain industrial processes where the mixing of certain fluids takes place, the amount of opening of a valve may be a certain piece of valuable information.

It has to be admitted that the amount a valve is open is a function of the flow. My own philosophy is that if the valve is fully open the engine is running. If fully shut, the engine is stopped. It is possible that the valve is fully open with the engine stopped but the valves are 'tripped'. I will not have it that with a valve half open or half shut, the engine is half running or half stopped. Do not confuse the issue with a 'throttle valve' such as a loco regulator or a marine engine valve. This valve is not, or intended to be a throttle valve.

Yet many engines by various makers had these devices so fitted. Perhaps they are a so-called "throw back" to the days when engines were throttle governed. Even so, there seems to me to be little connection between the information imparted and throttle governing unless the actual valve was so calibrated. I would be grateful to anyone who knows the answer to contact me via the Editor of *M.E.* I promise anyone who builds this model and invites me to view it, my first question will be "What is the purpose of the slot and the markings on the column?" You will no doubt reply that it is "classified under the section headed useless information".

I have prepared drawings showing the location of the stop valve and operating column relative to the engine cylinders. It should be understood that, as detailed, the valve and column consist of a packaged unit, so to speak. The centreline of the column must be in line with the centreline valve within close limits and the centreline valve must be at a specified distance below the base of the column. You cannot say "I will have the valve here, and the column there". It can be done in full-size practice by using angled coupling spindles fitted with universal joints. These cannot, however, be made in model form.



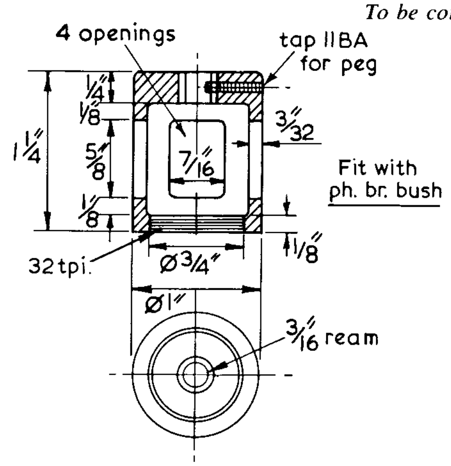
VALVE SPINDLE : stainless steel (36)

Regarding pipework, I have envisaged an arrangement of the boiler house being to the right when looking on the rear cylinder covers of the engine. There are they who will say, "But this puts the HP cylinder furthest from the boiler". I shall counter by replying "So it does, but it also places the feed tank and boiler feed pump near to the boilers where they belong" — "Yer pays yer money, and . . . ".

I do not intend to detail any pipework as such. It is my considered opinion that the fabrication of pipes prior to engine assembly is largely a waste of time and effort. As much trouble is caused by rectifying pipes already made as originally went into their making. My method is assemble the plant, measure up carefully and make accurate sketches. Then make your pipes.

Small bore piping is easily made and the piping runs are uncomplicated. This applies to all piping, that is main LP steam, condensate and feed. Standard copper tube is used mostly. If you insist on making it beforehand, all the information will be there to enable you to do so. I do not recommend it.

To be continued



The peg end is to engage keyway in No.36 to prevent rotation of spindle.

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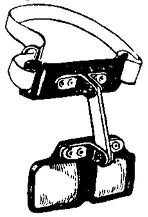

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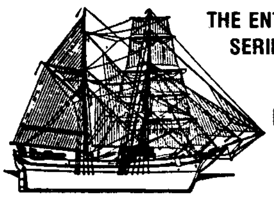

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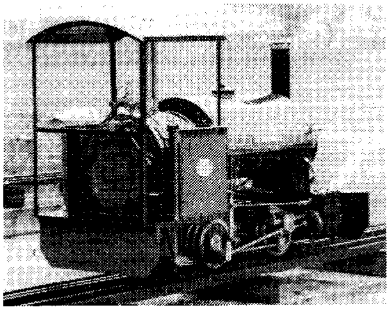

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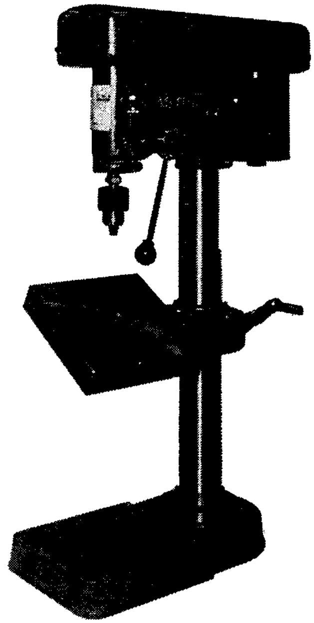

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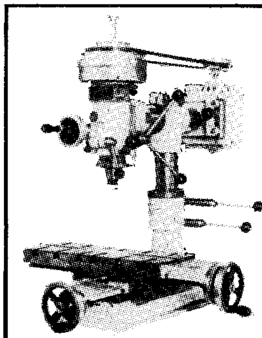

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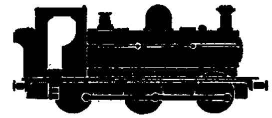

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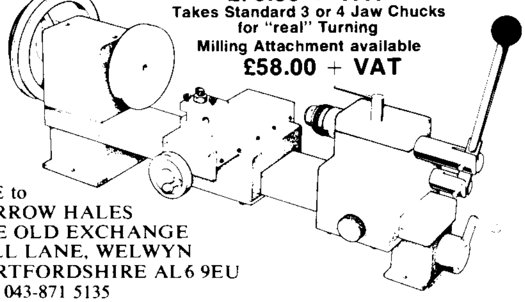

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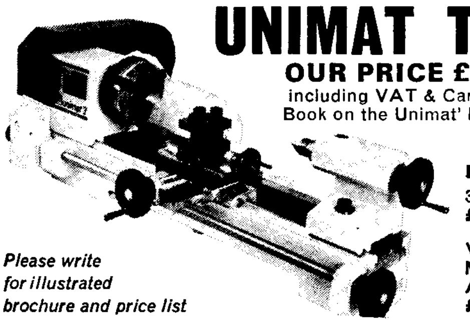

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The Editor welcomes letters for these columns. Pictures, especially of models, are also welcomed. Letters may be condensed or edited.

Drummond Round Bed Lathes

SIR,—I have recently acquired one of these excellent old machines, No. 3703. It is the type with separate head bearings, which I understand would date the machine about 1910.

I came across the lathe, in of all places, a Garden Centre, looking very forlorn, and heaped with all sorts of rubbish.

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The machine had been fitted with epicyclic back gear within the largest drive pulley, the tailstock is now ejector-type, and index's have been fitted to cross-feed and lead screw. These mods have been well made and fitted, and work very well indeed.

I was very interested in the letter by Mr. G. Crewe, who mentioned that he has in his possession an original booklet by Drummond Bros. on this machine, and I would like to ask you if it would be possible to have a copy taken of this. I would gladly pay any expenses involved.

I would like to mention in passing that I have taken the *Model Engineer* for the last 35 years and still can't get my hands on it quick enough, even though it is usually 6 to 8 weeks old when I receive it.

Elizabeth Field, South Australia — John K. Gallery

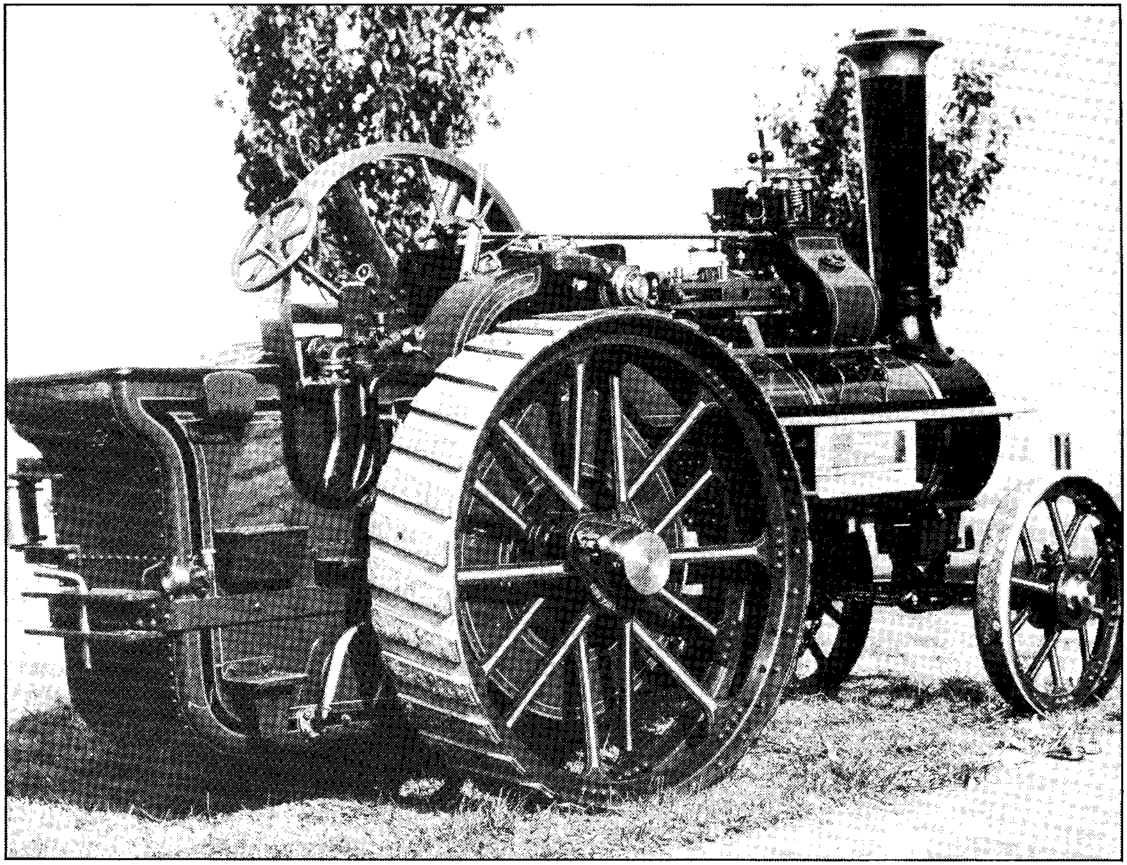
Die-ing Threads in the Lathe

SIR,—The following dodge has never been published in the *Model Engineer,* to the best of my knowledge.

When applying a threading die to a piece of material which requires to be threaded, hold the work in the lathe chuck. Place the drill chuck in the tailstock and position the latter so that the drill chuck face is touching the back side of the die stock as the die begins to cut the thread. Since the face of the drill chuck will be pretty nearly perfectly square with the lathe axis, the die will be started on the work about as squarely as possible. As the die advances onto the work, the right hand advances the drill chuck via the tailstock handwheel to maintain the die square with the work. (A helper to turn the countershaft pulley to and fro is a great help here, as the left hand will be busy with the die stock.)

I have used this procedure with good results on numerous occasions. I do not claim to have originated it, for it was shown to me by another member of our local S.M.E., and I have seen others here also doing the same thing.

West Vancouver, Canada — Guy Lautard



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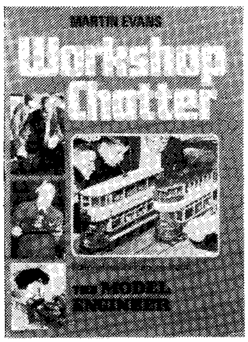

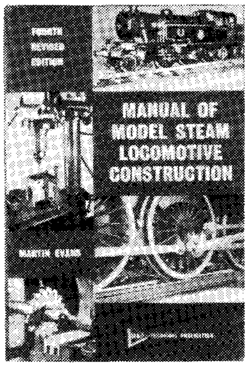

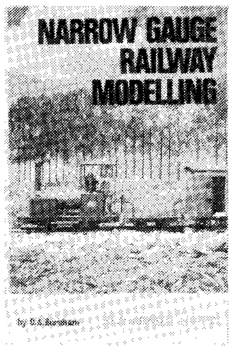

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