

MODEL ENGINEER

Vol. 189 No. 4176

23 August - 5 September 2002 £2.10

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A simple tool to help make a neat job
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Neville Evans takes a short break from
his current Highland Railway series to
look ahead to his next project for 5in.
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PETE'S PAGE T-SLOTS & CLAMPS

Written for the beginner, we start a
short series on these simple but vital
aids to work holding. Part I.
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On the cover ...

Among the many fine models on display
at Harrogate 2002, the National Model
Engineering & Modelling Exhibition, was
this 1:15 scale model of a steam driven
workshop of circa 1923.

Stephan Kästner of Eldagsen in Germany
spent 6,400 hours over a period of
10 years to build his masterpiece
which weighs in at some 80kg.
The miniature machine tools can cut metal
just like the prototypes on which
they are based.

As recorded in our previous report on
the Harrogate Show, Stephan Kästner was
awarded the coveted Best in Show Trophy
and the Precision Paints Trophy
for his outstanding model.

Turn to page 166 in this issue
for further information.

(Photograph by Mike Chrisp)

ROAD STEAM: SAVAGE'S LITTLE SAMSON in 3in., 4in. (and other) Scales

Placing the almost completed cylinder on
the boiler barrel and making a start on
the crosshead trunk guide. Part XXVIII.
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We begin a new series describing
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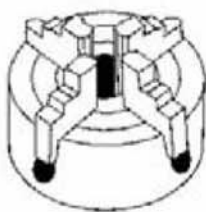
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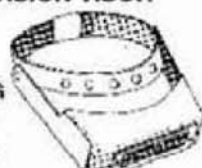
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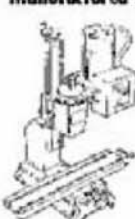
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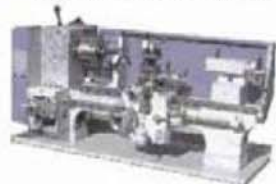
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SMOKE RINGS

With the Editors

Mick Beadle

Terry Baxter of Double B Designs writes:

"Mick Beadle, my good friend and business partner, died suddenly on Monday 29 July."

"This has left his family and many friends in the miniature traction engine and steam rally fields in a state of shock."

"He was a skilled engineer and his expertise and friendly banter will be sadly missed by all who knew him. I have known him for over 15 years and he was always willing to help and advise others in the model engineering world."

We are sure that readers would wish to join us in sending our condolences to Mick's family and friends at this sad time, and we are equally sure that Double B Designs customers will realise and understand that there is likely to be an interruption in supplies until Terry can find some way of dealing with the absence of his good friend and business partner.

Egg on face!

We must apologise to members of York City DSME, prospective entrants and visitors to the forthcoming LBSC Memorial Bowl Competition, and to our readers, for looking forward to the past! The event, as advertised in these columns in M.E. 4175, 9 August 2002 is to be held at the excellent York City DSME track beside the East Coast main line at Dringhouses, York on Sunday 15 September 2002. It caught your attention though, didn't it? An advertisement showing the correct date appears in this issue on page 180.

We hope that this blunder will not prevent readers from visiting or participating in this most enjoyable event. The York City DSME website at www.honsec@yorksmc.org.uk is both informative and interesting and shows the location of the club track. Readers wishing to contact York City DSME should call Ken Bateman on 01904-421455 or email him at kenbateman@ntlworld.com

Woodall's Wonderful World An exhibition in Bradford

Frank D. Woodall (1912-1999) was a regular contributor to these pages for some 55 years. An exhibition of 15 of his models, photographs and associated artefacts is currently on display at Bradford Industrial Museum, Moorside Mills, Moorside Road, Bradford, West Yorkshire BD2 3HP; www.bradford.gov.uk tel: 01274-435900; fax: 01274-636362; email: pat.kendal@bradford.gov.uk and will remain on view until 8 September 2002.

A unique event, this is the first and probably only occasion that so many of his models now held by Astley Green Colliery Museum, Earby Mining Museum, Killhope Lead Mining Centre, Tees Cottage Preservation Society, Windermere Steam Nautical Trust and in local private collections, will be displayed together at the same time.

Other exhibits include a reconstruction of part of the attic darkroom which Frank inherited from his uncle W. H. Wormsley ARPS, together with some of Wormsley's albums and enlarged prints from the 1904 Bradford Exhibition. Frank's tricycle which he built just before the end of WWII, assorted engineering tools, workshop manuals, Certificates and Tropies, his mineral collection and a video presentation of Frank himself steaming and describing some of his models just before his death, are also on view.

Frank's models will appeal to all with an interest in steam power, the photographs will intrigue visitors interested in the history of photography and indeed, the social history of family life, while children of all ages will be fascinated by Frank's models when they come to life under steam on Bank Holiday Monday 26 August 2002. Model engineers will be interested in a representative selection of Frank's correspondence and articles published in this magazine during the period 1933-1988. A leaflet describing Frank's life and achievements has been prepared by Dr. Gary Firth and is available free of charge at the exhibition.



Kingsley Rickard, Vice President of the Trevithick Society, admires the 1798 working model, one of only three built for Richard Trevithick to test his principles of using high pressure steam, currently on display at the Richard Trevithick Exhibition at Kew Bridge Steam Museum until 30 September.

Town & Country Festival

Enthusiasts from all over the UK will be at the Town & Country Festival 2002 to display a variety of steam traction engines dating from 1890 to the late 1940s and to use them to thrash corn, press apples for cider, mill corn into flour, bale straw and saw and load timber.

One of numerous attractions at this event, the engines will gather together each morning of the 24-26 August Bank Holiday weekend for the Grand Ring Steam Parade at the Town and Country Festival at Stoneleigh Park, Warwickshire www.townandcountryfestival.org.uk tel: 02476-696969; fax: 02476-696900.

Evening classes

It's that time of year again — we have just received information about three model engineering courses, as follows:

Model Engineering/Machine Shop Appreciation at Guildford College of Further & Higher Education, Stoke Park, Guildford, Surrey GU1 1EZ. Contact Steve Scanlon, tel: 01483-448500 Ext: 8358; fax: 01483-448603; email: info@guildford.ac.uk The course will run for 30 weeks on Wednesdays 1.30-4.30pm or 6-9pm commencing September.

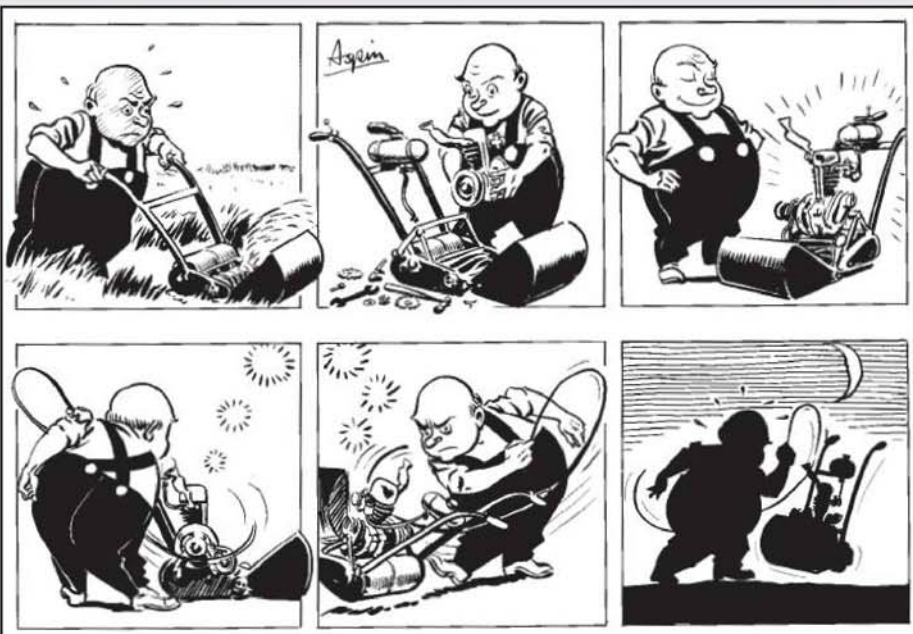
Model Engineers Club at Gorseinon College, Belgrave Road, Gorseinon Road, Swansea SA4 6RD. Contact Michael Wildin; tel: 01792-890804/890754; fax: 01792-898729; email admin@gorseinon.ac.uk The course meets on Thursdays 7-9pm commencing September, under the auspices of the City & County of Cardiff.

Welding for Beginners at Gorseinon College, Belgrave Road, Gorseinon Road, Swansea SA4 6RD. Contact Michael Wildin; tel: 01792-890804/890754; fax: 01792-898729; email admin@gorseinon.ac.uk The course meets on Wednesdays 6-9pm commencing September.

If you are responsible for a similar course or have the necessary information and care to let us know about it, we will be happy to bring it to readers' attention in these columns. There is no charge for this service; we are pleased to have the opportunity to promote and support those prepared to give of their time for the benefit of fellow readers, model engineers and enthusiasts.

CHUCK the MUDDLE ENGINEER

by B. TERRY ASPIN



POST BAG

Dividing attachment

Sirs, - When I inherited a workshop from my father, a long standing member of Lancaster & Morecambe MES, the two items shown in the enclosed photograph (right) were discovered. One of the components obviously fits in the mandrel of a Myford ML7 lathe, and the other is equally obviously used to index on a change wheel.

I do not think father would have designed this device, and I should be grateful if you, your team, or any readers could shed some light on it. There are probably missing components and it would be very useful to source, or obtain a copy of the original design if possible.

Richard Stevenson, Somerset.

Titanium sheet

SIRS, - In a recent instalment of the construction of the Ferris Wheel clock I read that there may be a problem in obtaining titanium sheet for the escapement wheel.

Following deep excavations in my CIUSOL (Come in Useful Sooner or Later) box, I find I still have a few offcuts of titanium sheet. Each piece is about 60 x 35mm or a little larger, enough for a couple of escape wheels, but the thickness is 0.9mm instead of the 1mm called for. However, I think this would serve, especially as an off-cut is available free of charge to any clock maker who cares to send me a stamped addressed envelope. I must point out that the number of offcuts is limited so supply must be a case of 'first come, first served'.

V. R. Bowden, Buckinghamshire.
(Readers who wish to take advantage of Mr. Bowden's kind offer should send their S.A.E. via the Editor at the normal address for Post Bag letters as given in the panel on the facing page - Ed.)

A word of warning!

SIRS, - As Honorary Secretary of the Northern Association of Model Engineers, I would pass on the following information received from one of our member clubs regarding the purchase, via the internet, of a commercially made locomotive.

It appears that a member of the club concerned unwisely purchased a locomotive from the maker's advertisement site without seeking help and advice. To make matters worse he had borrowed the money, purchased the locomotive sight unseen, and sent a friend to collect it for him.

Mr. Stevenson's lathe accessories which he seeks to identify.



He was given the manufacturer's boiler test certificate, duly signed by them, but any history of previous tests by any clubs or recognised official bodies was conspicuous by its absence. On behalf of the member, the manufacturers were contacted to determine any further information; however they showed little interest, saying their test was adequate proof of the integrity of the boiler.

Our insurer's advice was sought; they agreed with the club that the manufacturers' certificate was not valid under the policy and would not be covered by the club's insurance, they being interested parties.

The manufacturers were again contacted and the position explained to them; they were not amused about the situation and cursed the legislation which, they said, was: "...all a load of rubbish; why do we bother when the rest of Europe didn't care and don't impose the rules."

The club concerned was aghast at this reaction. They informed their member as to what had transpired and that it was therefore necessary to remove the boiler from the frames and the lagging from the boiler for proper scrutiny by the club's boiler inspectors. Having little model engineering experience he was none too pleased with this news. Having also tried unsuccessfully to steam the loco which wouldn't run because the valves and cylinders were so far out of adjustment, he was beginning to realise that all he had managed to purchase was a heap of trouble.

When he presented the boiler for test it was immediately obvious that it was beyond its useful life. Bulges in the firebox and outer wrapper indicated an insufficient number of stays. A previous owner had tried to beef up the staying by fitting extra nutted and bolted stays caulked with soft-solder.

In view of its condition, the club's boiler inspector refused to test it, and their member went back to the manufacturer to try to retrieve his money. The matter is not yet resolved.

It appears that this manufacturer

has done this kind of thing before, i.e. issuing their certificate on a dud boiler. Manufacturers' certification for their own products in which they have a vested interest cannot therefore be recognised.

As an officer of the Northern Association, I therefore suggest to all members that as a condition of purchase they should *always insist that any sale is subject to an examination by the prospective purchaser's club boiler inspectors.* Any objection to this would imply that there is a problem, under which circumstances *don't buy!*

Nigel Thompson, Nottinghamshire.

Training

SIRS, - When I was a small boy my mother took me to the Model Engineer Exhibition which I believe was then at the Westminster Hall.

Upon entry, I was overwhelmed by the sight of all the exhibits and my first impressions never left me. It became my ambition to build a model steam locomotive. Many years later I bought myself a small lathe. Then came the problem of how to use it properly. I contacted my local college about engineering courses and in particular, model engineering. The choice was narrowed down to the NVQ course or the model engineering course. I decided on the first which I thought would be broader based. The course ran on one night a week over a year, and my fellow students were mostly from industry. The course was based on practical work and covered lathe work, milling and fitting.

Our first task was to machine a shaft with a shoulder and to centre drill the ends. To the experienced this might sound too simple, but I had to be shown how to control the lathe — after all I was there to learn. The next task was to run the shaft between centres and to turn several shoulders on it.

As the course progressed, the tolerances became closer and each exercise presented a different discipline to master, i.e. boring, reaming, knurling, etc. In all, there were about 15 different exercises and

some of the previously turned shafts were used again for the milling exercises which involved machining flats, hexagon ends or slots on or in them. Later on we made a V-block which we subsequently hardened and ground to a finish.

We eventually moved on to the hand fitting work including riveting and filing and sharpening tools and drills, and we eventually had to make and fit a U-shape over a T-shape, not unlike a horn block. It had to hold together by friction but pull apart by hand! We were all rather apprehensive of this task until we were told how to approach it, then of course it was easy.

The course included a certain amount of technical drawing work which involved learning the difference between first angle and third angle projection and all the other views — and some writing. I thought that having acquired a lathe, I would be able to build a model locomotive, but on reflection I doubt that I could. That said, nearly all the machining tasks on my loco were covered in one form or another on the course.

As for the locomotive, there were some teething problems but it works. The valve timing was wrong, the gaps between the firebars had to be enlarged and the blower needed modification. Help from the more experienced members of my local society was greatly appreciated and a great deal of encouragement given. I now have the cab and cladding to complete before painting it.

I got my NVQ and I would recommend such a course to anyone who might be in need some help.

Nigel Jaques, Berkshire.

Shay query, vices and treacle

SIRS, - Is anyone able to help me with details of the legend on the diamond shaped Shay logging locomotive works nameplates? I am aware that it bears the works number and year of manufacture, but what other information does it carry, how is it arranged and what, please are the overall dimensions?

Can someone please tell me why bench vices are not made with easily detachable hardened jaws that extend 30 to 40mm either one or both sides beyond the main body and the movable jaw of the vice? I have made a pair in mild steel to prove their worth and find them very useful indeed. They are ideal for holding lengths of material that may reach the floor. They can, if necessary, be manipulated around the jaws. I intend to make a pair

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from gauge plate and heat treat them to ensure durability.

I read with great interest the letters by John Hill with information about the treacle mine in Dunchideock (*M.E.* 4166 and 4172, 5 April and 28 June 2002 respectively). Tadley in north Hampshire also has a treacle mine. It was a clay pit that contained very sticky red clay. It was situated off Mount Pleasant in the village which is now a town and the area is all residential properties.

About half a mile from the old site is a hostelry which changed its name to the *Treacle Mine* some years ago. Everyone in the area knows of the Tadley treacle mine ... and it's a long-standing joke.

Graham Perry, North Devon.

Spring clips and guns

SIRS, - In *M.E.* 4173, 12 July 2002, Mr. R. G. Marden of North London asked for help in obtaining a spring clip. I am fairly certain that this is almost the same as the clip that Duccelier Ltd. used in their distributors to hold the moving contact in place on its pivot when resetting the ignition points gap. It was advisable to hold this clip with fine pliers or you risked losing it. I suggest Mr. Marden visits a motor accessory firm or garage. Renault and Peugeot used the clip in their engines a few years ago.

I would also like to comment on the model 7in. rifled Armstrong breech loading gun featured in *M.E.* 4168 and 4170, 3 and 31 May 2002 respectively. In no way do I wish to disparage Mr. Wilcox's model as I think he has made a very attractive job, but in my opinion there are a few slight errors.

Surely, there would have been 'cap squares' on the upper parts of the trunnions, as the Navy also used these guns. It would be essential for the gun barrel, etc. to be held to the mounting in case of a rough sea. Also, surely some form of breeching would be needed, even in a fortress, to control recoil, and in order to run the gun to firing position, tackles would be needed. It weighed four tons and the two levers at the back of the slide are not going to do much, even with the 5deg. slope, at least not in a seaway.

Finally, this was not a very successful gun. The Navy suffered excessive blow back and, I believe, on two occasions the vent piece was blown out of the gun. I would imagine that the first two or three shots would have been okay, but then the black powder residue would have built up in the breech area and the vent piece to prevent a good seal.

Black powder is a very dirty propellant or explosive and, had the smokeless type been around at that time, things may have been different. There were some of these guns on *HMS Warrior* but after the 'leaks' the Navy withdrew them and went back to 68-pounder, muzzle-loaders for nearly 30 years.

My sources of reference were:

- 1: *A History of Artillery* by Ian V. Hogg.
- 2: *Guns at Sea* by Peter Padfield.
- 3: *Guns: Illustrated History of Artillery* edited by Joseph Jobé.

At the time of this weapon the Navy did not have complete authority over their armaments. It was controlled by the Major (or Master) General of the Ordnance, i.e. an Army General. The Navy got their own way later in Victorian times. This was before my time (1928) but not before my mother's who was born in 1887.

T. J. D. Rees, West Midlands.

Transport Statistics

SIRS, - I deplore aggressive correspondence, so I will try to respond positively to the points raised by Mr. Wilson in what reads like a pro-car, anti-railway tirade. I shall also do my best to apply some of the problem-analysis skills that my training as a mathematician would encourage.

There are a number of valid ways of comparing the safety of different modes of travel, some easier to calculate than others, some more meaningful to a particular individual than others.

To an individual traveller setting out on a journey, the probability of arriving undamaged at the destination feels like a good measure of safety.

It has the severe disadvantage of being extremely difficult to calculate from the raw statistics available. Likewise, to the individual pedestrian (i.e. not using a car or any other vehicle at the time) the probability of being killed (or injured) by various types of vehicle is of major interest. Calculating such probabilities is also very hard.

To the guardians of the country's economy, a much cruder measure will do: what is the cost per annum of clearing up after the deaths and injuries from various modes of transport? Such a statistic is likely to be fairly easy to calculate, although it may be difficult to accurately apportion public services costs.

(Should one allocate a proportion of fixed costs or should only marginal costs be charged?) A further economic measure is the cost of preventing a fatality, not easy to determine with any accuracy.

A slightly more humane measure of safety, but still calculable, is the number of fatalities (or serious injuries, or whatever) per annum per thousand traveller-miles. This at least gives a traveller an average sense of the likelihood of safe arrival. It may be that Mr. Wilson has this data, but he fails to mention it, unless that is what he means by 'amount of traffic', a term he conspicuously fails to define.

I have the following hypotheses that he may care to support or refute by appeal to suitable data:

- 1: The probability of a pedestrian (going about with due care and attention) being killed by a road vehicle is very much greater than the probability of being killed by a train or other rail vehicle.
- 2: The number of suicides 'by rail' is easily determined, the number 'by road' is almost impossible to determine. My hunch is that few people deliberately attempt to kill themselves by use of a road vehicle (either their own or someone else's); this hunch is probably impossible to prove.
- 3: The fatality rate for road and rail (including the London and other underground systems) per 1000 traveller-miles is slightly better for rail than road.
- 4: The fatality rate per annum per 1000 workers is slightly higher for road than rail.
- 5: The global air network beats road or rail on any measure. The UK airlines do so by a large margin.

I expect politicians, newspaper editors and broadcast journalists to over-simplify complex issues, each for their own devices. I expect a higher standard of debate in these pages.

Bob Margolis, Hampshire.

Keith Wilson replies:

My thanks for your message. The main fact is that the transport group (it was Transport 2000) has lied mercilessly about the matter since its formation, for reasons of personal gain. Other pressure groups have been, and are being equally dishonest. I agree with you about positively examining the facts on a mathematical basis, 99% do not accept such a view, preferring not to think.

For the passenger on a train, there is no doubt that this is the safest way, but why is it so needful for groups to distort the facts? The probability of a pedestrian being killed is reduced to very nearly zero *if only he/she would look both ways before crossing the road*. The number of pedestrians killed on the pavement is extremely small.

Yet when did you last hear of this practice being encouraged? Also, pedestrians do not usually perambulate on railway tracks. How many pedestrians do go about with due care and attention? Over 1000 per year die this way, and I find it very hard to believe that they all looked both ways, etc.

As you state, suicides are more likely on railways; but that could be taken to imply that railways are far more dangerous than roads where suicides are concerned.

The problem of clearing-up costs is I believe insurmountable for the difficulty of deciding how much is payable by insurance, and of course must be considered in proportion to traffics. I maintain that relative traffics must be considered. To illustrate, if 1 person per annum is killed jumping off the Blackpool Tower, and 10 per annum by jumping off the Eiffel tower, it 'proves' that it is 10 times more dangerous to jump off the Eiffel than the Blackpool. A silly argument, but it illustrates the point.

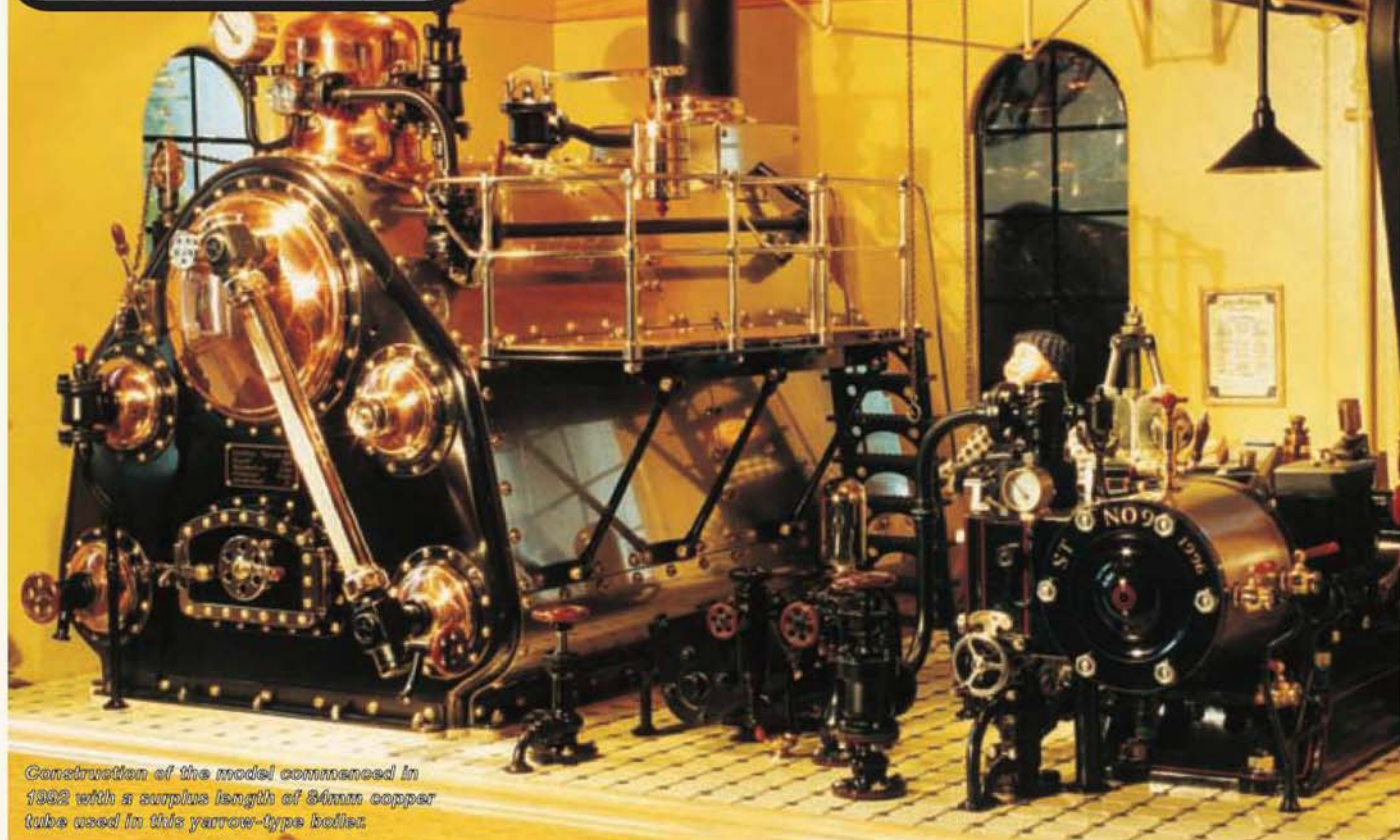
Your notes 3 and 4 do not give any actual figures. I am not accusing you of falsehood but, as we both agree, such figures are very difficult to verify.

As a matter of interest I have all the road death figures from 1920 onwards (*supplied - Ed*). The first thing that one notices is that from 1920 to 1930 the deaths rose by a remarkably steady 11.3% from about 2000 to 7323 (in 1930). During all this time there was a blanket speed limit of 20mph. In 1930 speed limits were abolished, with the frightening result (to anti-road pressure groups) of the only dramatic *fall* in roads deaths on record. In the first two years, the deaths fell by some 1,500.

While you may or may not agree with what I have written, it must at least arouse your curiosity. I would add that, despite my love of railways, it is mathematically impossible for them to replace or even seriously challenge road transport on virtually any grounds. The capacities, costs, travelling times door-to-door, overall safeties, pollutions, fuel usages, just do not bear comparison.

(Correspondence on this topic is now closed - Ed.)

COVER FEATURE



Construction of the model commenced in 1992 with a surplus length of 84mm copper tube used in this yarrow-type boiler.

A MINIATURE WORKSHOP

Stephan Kästner

in Germany presented his most impressive model to admiring visitors at the recent Harrogate Show where it amazed all who saw it and carried off the coveted 'Best in Show' award.

While my miniature workshop may not represent any particular original plant, it could just have very easily existed. I commenced its construction ten years ago, back in 1992, since when it has absorbed some 6400 hours of building time. Weighing in at about 80kg, it is about 1.3m long and represents a typical steam powered workshop circa 1923 to 1:15 scale.

Its construction began when I found myself with a length of 84mm copper tube left over from building my first vertical boiler. This boiler kept telling me that it wanted to get on with some powerful steam generating work, and two years later it did so as the main part of a yarrow type boiler.

Boiler

The boiler is made of copper tubing and is silver-soldered throughout. The front and back plates are made of 2mm copper sheet which I flanged on hardwood blocks. The boiler housing is fabricated from stainless steel assembled with screws so that it can be detached.

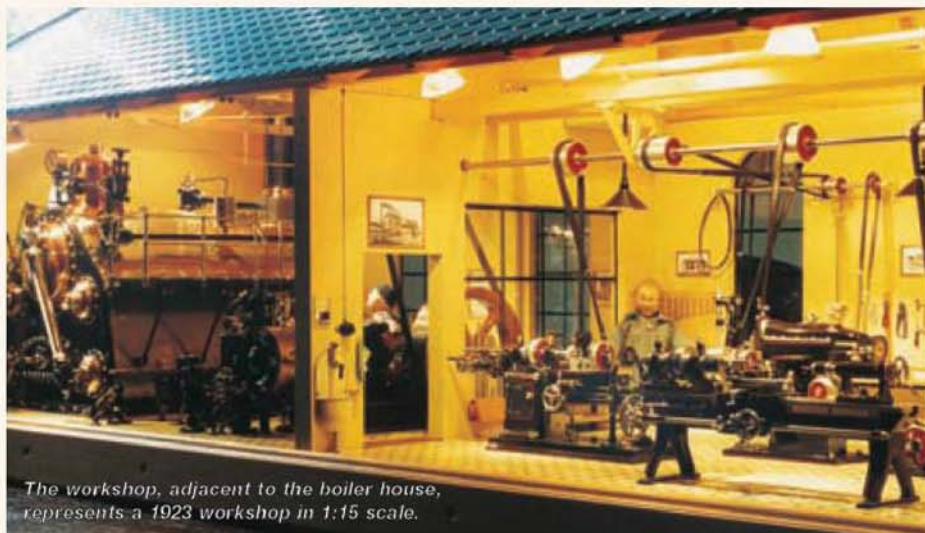
The boiler is fired with two 140 x 50mm ceramic burners fed with propane, and all valves are made of aluminium bronze which, although less easy to machine than brass or gunmetal, does the job very well.

An aluminium rod installed below the water level provides electrolytic protection of the copper boiler parts from corrosion. A whistle is located in the chimney which, being warm all the time does not blow out much water when in action.

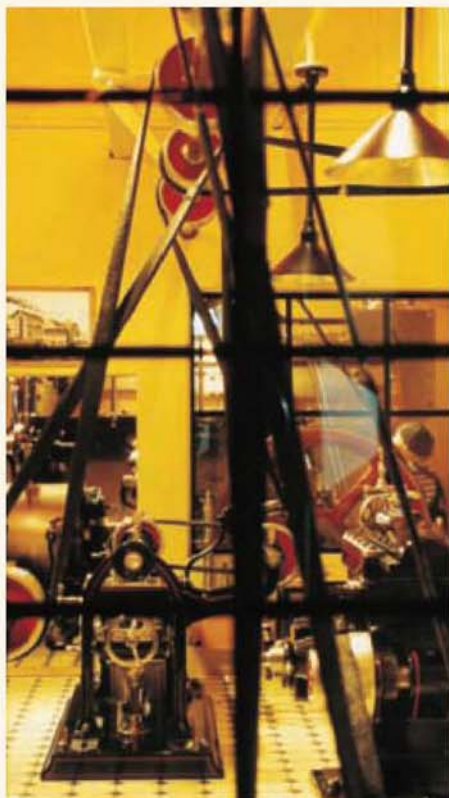
Steam is collected in its dome and is routed via the main stop valve to stainless steel tubular superheater elements in which it is dried and gathers more energy.

Engine

The power plant is a Stuart No. 9 equipped with a steam oil lubricator pump, governor and boiler water feed pump. Smooth operation of the governor was finally managed after I fitted a



The workshop, adjacent to the boiler house, represents a 1923 workshop in 1:15 scale.



hydraulic damper. The stroke of the feed pump is variable by means of a three-spoke handwheel fitted to the steam chest.

A Stuart steam pump, feedwater heater and a 3.5 litre water tank under the roof complete the machine house equipment.



Above: a tidy workbench and immaculate machinery under the watchful gaze of a diminutive 'Boss' demonstrate the superb craftsmanship involved in this miniature workshop.

Left: a view into the workshop through one of the windows reveals details of the line shafting.

Workshop machinery

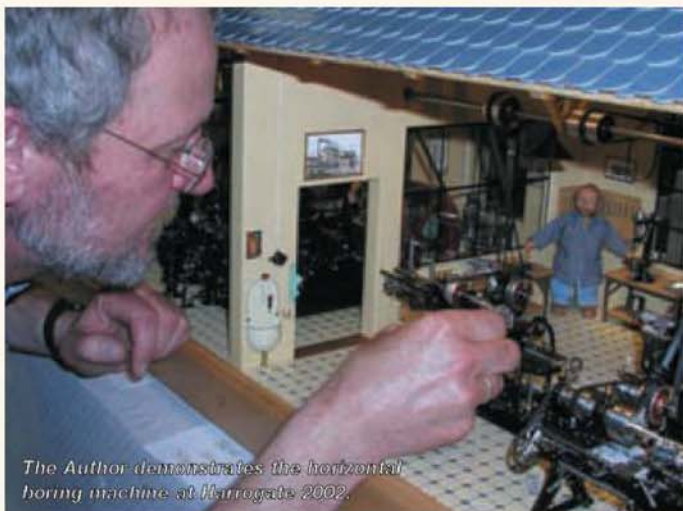
At the front of the workshop is positioned a lathe which features a scraped flat bed and a power feed. Its 3-jaw chuck is working and, provided you bear its scale in mind, cutting mild steel is possible. On the left-hand side is a boring and milling machine with 3-speed axial spindle feed. In the background is a shaping machine that is

great when operating because you can actually hear the 'ssst, ssst' sound of it cutting!

Further equipment comprises a machine saw, bench grinder and a boring machine. Connection of the various machinery items to the line shaft transmission in the roof is achieved by leather belts which are equipped with little wire links to enable them to be shortened when tension decreases.



The speed of this Stuart-No. 9 engine is controlled by means of a hydraulically damped governor.



The Author demonstrates the horizontal boring machine at Harrogate 2002.



The horizontal boring machine at the start of the show, before being covered in steam!



A place for everything, and everything in its place.

Having all items under steam at an exhibition can be a little stressful. The machine tools operate, and I like to show them working. When cutting metal and answering questions it is easy to get carried away and forget to check the boiler water level, steam pressure, water in the feed tank, amount of oil in the lubricator and so on.

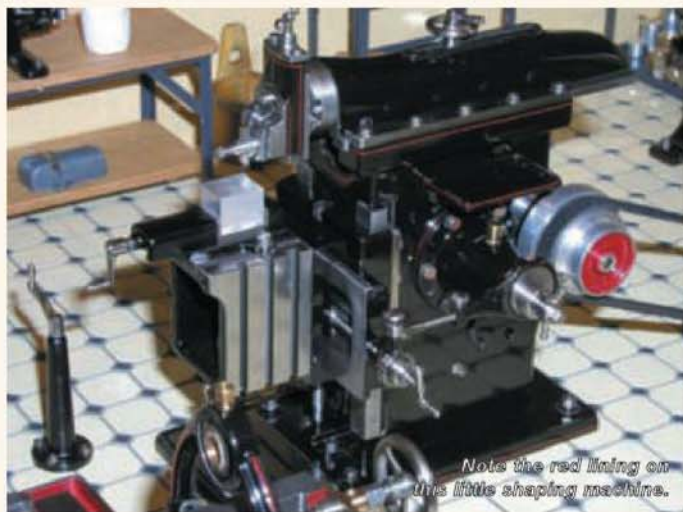
It's not easy being foreman of a miniature steam powered workshop!



Sharp eyes were needed to spot the tiny oscillating engine alongside the bench grinder.



A corner of the workshop. Note the flat belt joint clips and the rack of stock material.



Note the red lining on this little shaping machine.



The centre lathe at the front of the workshop was in operation throughout Harrogate 2002.



It is difficult to realise that this busy scene is in 1:15 scale. (All photos on this page by Mike Chrisp)



The tool dismantled to show the body, the end cap and five inserts made for different sizes of bolt.



A bolt is inserted into the tool ready for end trimming to length and profile; finger pressure alone on the cap is sufficient to clamp the bolt firmly.

A BOLT TRIMMING TOOL

Alan Priddey

shows us how a little time spent in the workshop produces a tool which makes the job easy.

Sooner or later a job comes along where a bolt of the correct length is not available. The stock sizes are either too long or too short. Little looks worse than a bolt that has just been sawn off at the nut and filed up, as it is difficult to get a nice rounded end. Small bolts are notoriously difficult to grip truly in the 3-jaw chuck in order to file or turn the ends to the correct rounded shape.

The accompanying drawings and photographs show a little gadget which takes care of these problems. It consists of a main body which is reduced and threaded at one end, an end cap to clamp the head of the bolt against the end of the body, and an insert drilled to suit the diameter of the bolt to be trimmed. The assembled tool, with a bolt in place, is placed in the lathe chuck so that the exposed bolt end can be cleaned up by turning or by filing, if you prefer.



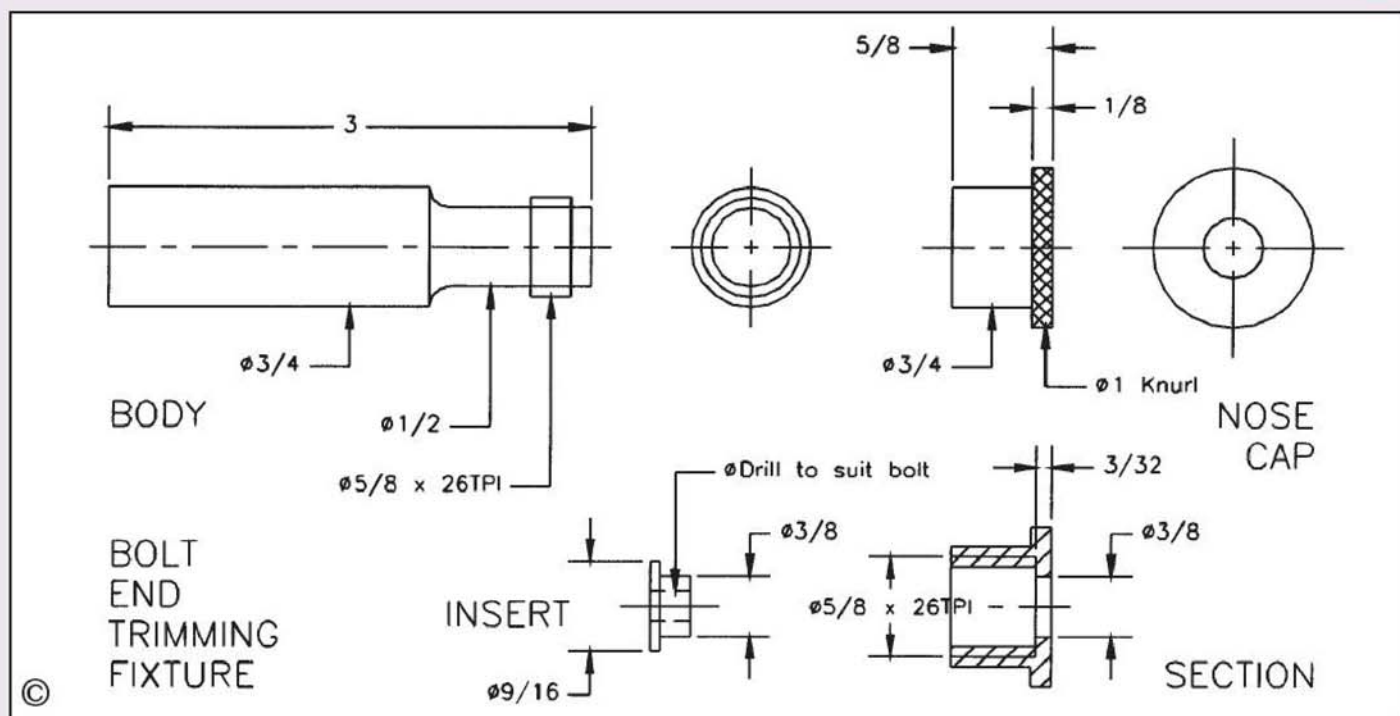
The tool in use. Here the body has been gripped in a self-centring 4-jaw chuck, but any reasonably true running chuck would do.

Some readers may recognise a family resemblance to a tool called a lantern chuck, commonly used by clock makers. These are often quite delicate chucks which have been designed and made for cleaning up clock and watch screws. They are usually designed to fit directly into the mandrel of a horological lathe. The device described here is made along much more robust lines and is more suited to model engineering.

If you require better concentricity than that offered by your 3-jaw chuck, then the device can always be set up in your 4-jaw chuck.

Machining up the little tool is straightforward and warrants no explanation. **Photograph 1** shows the component parts with a number of inserts drilled for different sizes of bolt. **Photograph 2** shows a bolt inserted into the tool and **photo 3** shows the tool in the chuck and the end of a bolt filed to a nice finish.

The drawing shows the tool as I made it, but there is nothing to stop you modifying it to suit your particular needs.



A BURNT AIR ENGINE



Now in its nineteenth year of development, the Author refers to his hot air engine as a burnt air engine because it runs on air from which the oxygen has been burnt out.

Frank Taylor

introduces his experiments with a hot air engine by discussing his objectives and describing some of the work which went into his first endeavours.

●Part I

Having spent most of my life in telecommunications, I retired from British Telecom in 1981 which is an indication of my electrical/electronic background, but all branches of engineering interest me. In the beginning, I had virtually no machining experience, possessing only a worn out old Myford ML4 and a little grinding wheel. With these I could hack out something you might call a bush, but on the other hand you could equally well call it something else!

In the months preceding the Great Day, I began looking for a project that would produce a constant source of interesting problems to occupy my mind and to keep me out of mischief. I came up with this one, and it has been the greatest success story ever. Now in its nineteenth year, it has virtually become open-ended; all that time to make a hot air engine! Our American friends might say "What kept you Bud?" It is most likely that the full answer to that question would be severely edited, so I shall do my best to pick out the interesting bits for your perusal. Perhaps I should make clear that this is a hot air engine, but it uses air with the oxygen burnt out of it. Reasons for this will be discussed later.

In a nutshell

The first ten years were spent building up my workshop facilities and on the Mk. I engine. Although I enjoyed making it, and learned a lot, the engine would not run; its shortcomings will also be discussed in due course. Five years later Mk. II arrived and was more successful.

I then set about trying to take simultaneous manual readings of various parameters, to gain some idea of what goes on inside the engine. It was with some difficulty, compounded by unreliability, that I managed three parameters. In general the figures obtained were not repeatable and were thus useless.

Later years have produced a computer/interface system which can control and run the engine in different ways, take measurements of seven parameters, record and display the data. If appropriate care is taken with regard to ambient conditions, the results are repeatable. Armed with the data, improvements have been made, but I believe that much more information is there to be prised out of the engine, which should produce further improvement and understanding. This is something for me to enjoy in the future.

Early objectives

These boiled down to a wish or want list; I wanted to:

- plough my own furrow.
- do everything in my own shop.
- personally discover things about the subject.
- enjoy the experience.

That I have kept to these objectives is reflected in what has been produced

Early thoughts

These were to shape the design, and I have to admit that they were very fanciful and wishy-washy, which is hardly surprising since I had little knowledge of the subject.

Easy in retrospect, an analysis of my choice follows; I chose:

- motor car type engineering because it would be nice to do,
- Ross Rider yoke drive because I was fascinated by it.
- high torque/low speed/long stroke to reduce friction losses and to fully expand the hot gas.
- a crankshaft and bottom end that would run for thousands of hours and could be used for all, because I realised that in the light of experience later engines would be developed.

This was to be a life saver.

Some of these choices condemned me to failure ten years later.

Mark I engine

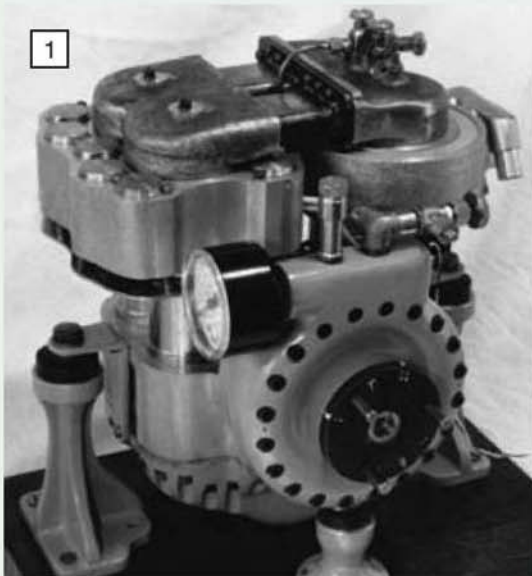
The views of the engine shown in photos 1 and 2 reveal that it has four cylinders. The crankcase is made in two parts, assembled using many cap screws. The upper part of the case supports the crankshaft which runs between the cylinders. The connecting rods are attached to a yoke type drive which turns the crankshaft

above it. Inverting the yoke from the usual configuration produces a compact engine. The lower part of the case contains slides which guide the yoke and allow vertical movement. If you are unfamiliar with this drive arrangement, all will be revealed when we take a look at the internals.

Photograph 1 shows that the drive end, with its ring of bolts, contains the flywheel and a metal axial seal similar to that used on large refrigeration compressors which employ a separate electric motor. Perhaps I should mention at this stage that from the top of the cylinders downwards is common to both the Mk. I and II engines.

From the top of the cylinders upwards is regrettably now scrap, so suffice it to say that one side of the engine was hot and the other was cold.

1



The drive end is characterised by the flywheel housing with its ring of bolts. This is the Mk. I version of the engine.

2



This view of the Mk. I engine shows the oil management housing. The bottom end was used for the Mk. II engine.



Close scrutiny of this view of the heater castings reveals the finned bores which presented an interesting challenge!

The cold side is easily recognised by the water hose fittings. Photograph 2 shows the other end of the engine. The protrusion facing us is the oil management casting which contains the oil pump gearing, gear type oil pump, pressure regulator, oil light switch and oil filter.

Before leaving the Mk. I engine I will just show you a little of what had to be scrapped and how the finning was done. **Photograph 3** shows the heater casting with the finning which caused a lot of head scratching and unsuccessful experiments. In the end I sawed them out with a junior hacksaw blade together with a few bits of junk (sorry, wrong word: 'Treasure Trove'!)

On the floor at the tailstock end of the Myford sits the innards of a twin-tub washing machine (**photo 4**). The paddle shaft was extended and coupled to the shaft and bearing of an old car water pump screwed to a piece of plywood. Part of a car window-winding mechanism was screwed to the pump impeller to provide a crank.

The connecting rod from this crank disappears out of the left of the picture and enters at the right of **photo 5**. The rod pivots on a very old lathe cross-slide that was given to me. On the end of the slide is a tool holder which holds the saw holder. This comprised a $\frac{5}{8}$ in. rod with a slot to accommodate the back of the saw to keep it straight, together with means of tensioning. The saw now moves back and forth when the washing machine is switched on.

In the foreground of **photo 5** is a microswitch, and behind the moving slide is another. The latter switch operates ON every time the saw retracts. This operates a 12 volt solenoid situated in the change wheel area of the lathe (**photo 6**). The solenoid has a hard copper pawl which ratchets round the lathe gear one tooth at a time.

By arranging a suitable ratio in the quick change gearbox and engaging power cross-feed I had a feed for the saw. At the end of the cut the square screw on the cross-slide, seen in the foreground of **photo 5**, operates the other microswitch which turns OFF the feed. I didn't get round to turning off the motor! However, there is always a snag, isn't there?

Fortunately I tried it out on some scrap first. With ragged sides, the cuts were awful, and the saw continually shouted its protests. All teeth in the saw did see the light of day, but for some teeth this exposure was only brief. The chips did not clear from the saw and were carried back into the slot. Lubrication of the blade made matters worse. The solution turned out to be a very fine jet of compressed air applied to the point where the teeth just emerged on the retraction. **Photograph 7** shows everything running sweetly. The thin pipe going to the critical spot can just

be seen; I'm sorry about the mess on the left-hand side of the picture, but everything had to be covered up for fairly obvious reasons.

There were 60 slots $\frac{3}{16}$ in. deep and four castings. If my sums are right that's 45in. of cutting in material $1\frac{1}{2}$ in. thick. To my great surprise I only used two Sandvik saw blades.

The reason for the Mk. I Failure? It is now my opinion that the type of engine I chose to make is best suited to a short-stroke high-speed power plant. With a

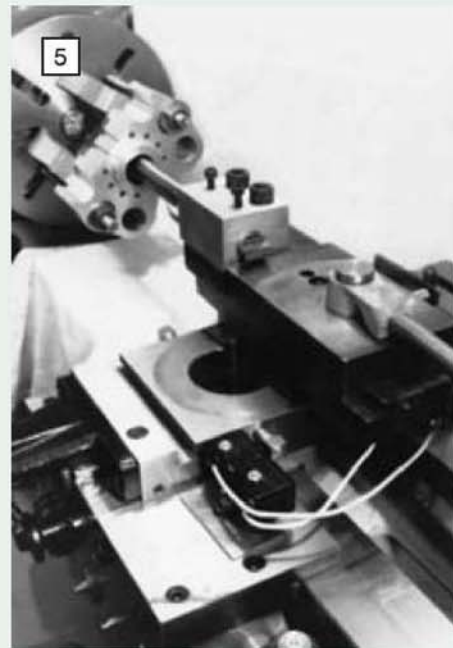
short stroke, the correct ratio between cylinder volume and displaced air can be achieved. With a long stroke it definitely cannot. Although the engine has very high friction by hot air engine standards, I do not think it would have run, even with low friction.

With my L plates now firmly secured, I really began to think about the subject for the first time. It's strange how failure helps to concentrate the mind. On the plus side, I didn't get it all wrong; the bottom part could be used for the next attempt...or the one after that!

●To be continued.



The drive to the hacksaw unit for cutting the heater fins combined parts from a washing machine and a windscren wiper mechanism.



The hacksaw unit is driven back and forth by the rod entering from the right. Microswitches and cross-slide feed control the saw blade feed rate.



A solenoid indexes a headstock gear to provide the required saw blade feed per cut via the quick change gearbox and cross-slide feed.



The Author's ingenuity paid off, cutting the fins in the bore of the heater casting is seen here in progress with an air jet to clear the swarf.

A LARGE SCALE CYLINDER LUBRICATOR

Eric Lindsay

uses commercial components to design and build a reliable unit.

For a number of years my model engineering was limited generally to 5in. gauge locomotives where I found the LBSC oscillating type lubricator more than adequate and relatively simple to build and operate. Some four years ago, getting rather tired of going round in circles, I built a 4in. scale McLaren compound road locomotive. Operating at a pressure of 180psi., I found that the LBSC lubricator was not too successful. Unless the cylinder retaining spring was very strong, the cylinder would lift off its seat and lose pressure. The strength of spring needed to overcome this would have led to excessive wear in the unit and so I started to look for an alternative design.

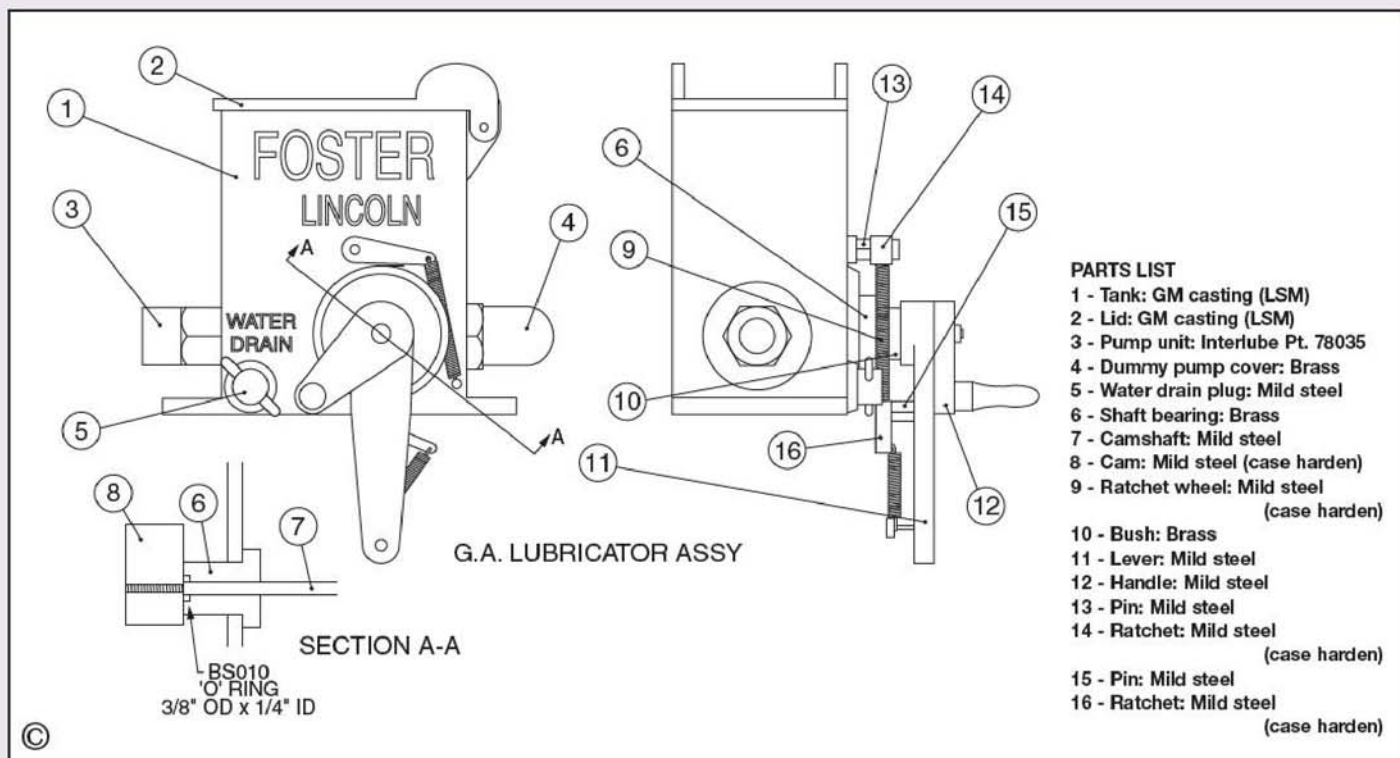
In my professional life I am involved with the repair and maintenance of buses and coaches. Many of these have an automatic chassis lubrication system consisting of a centrally mounted pump piped to each lubrication point on the vehicle. This pump is a rotary unit with a central camshaft operating a ring of individual pumping elements. It occurred to me that one of these pump elements would be a good starting point for a cylinder lubricator. They are capable of generating pressures much higher than we would ever need, they are made to very tight tolerances and are

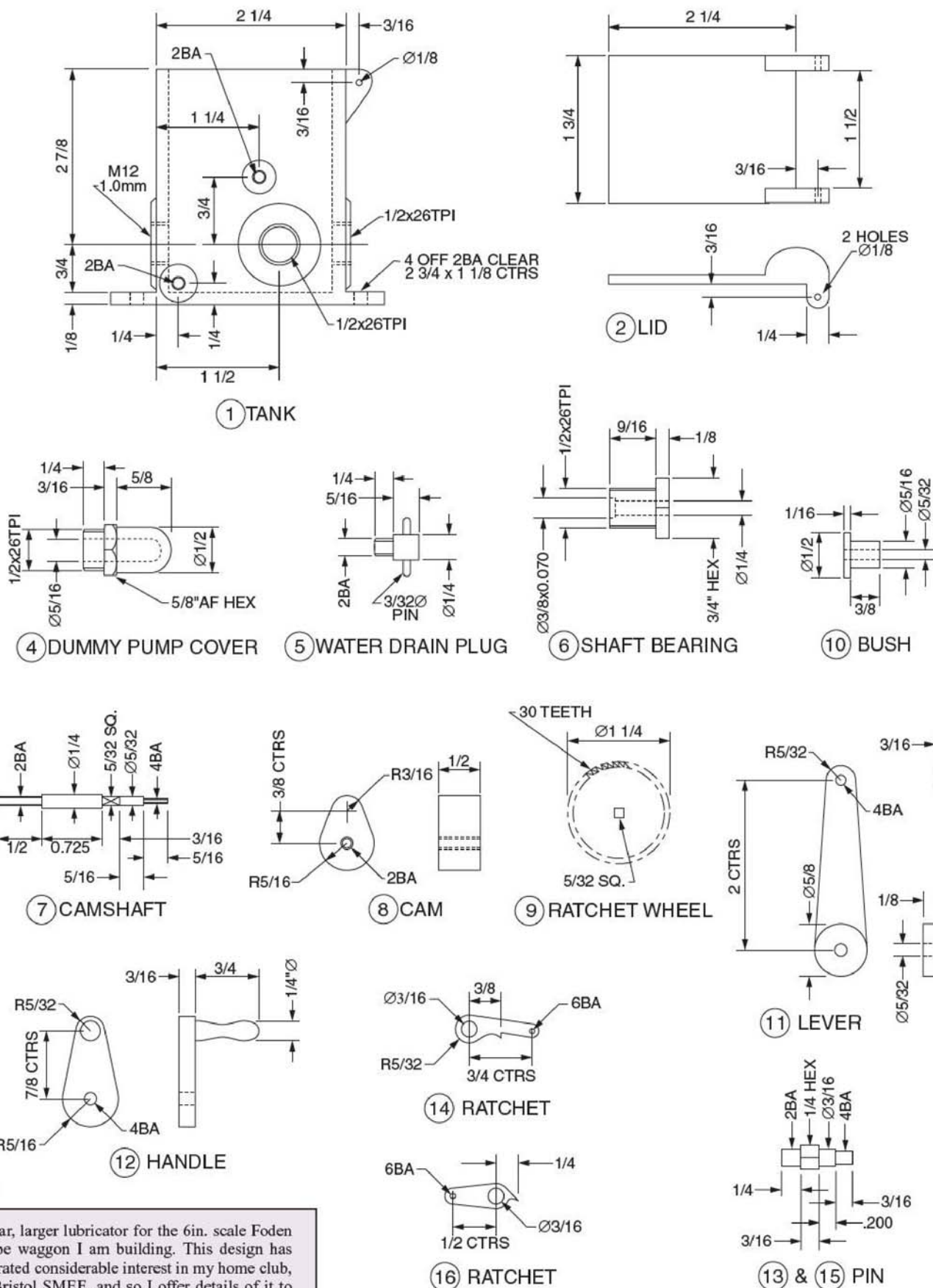
available with various full-stroke outputs from 0.010cc to 0.040cc per stroke. More importantly, they are produced in high volumes and so are well within the budget of most model engineers.

At the time of writing, my McLaren has now been running for three years with this design of lubricator without any problems and I have now made a



Three views of the Author's high pressure lubricator designed, made and fitted to his 4in. scale McLaren compound road locomotive on which it has worked successfully for some years.





©

similar, larger lubricator for the 6in. scale Foden C-type waggon I am building. This design has generated considerable interest in my home club, the Bristol SMEE, and so I offer details of it to readers of *Model Engineer*.

Castings for the tank and lid are available in 4in. and 6in. scales from Live Steam Models. Pumping elements are available from Interlube Systems Ltd. (phone for details of local outlets). M12 x 1.0mm taps to suit the pump thread are available from Tracy Tools Ltd. Usual disclaimers apply.

Stockists

Live Steam Models Ltd., Unit 7, Old Hall Mills, Little Eaton, Derby DE21 5DN; tel: 01332-830811.

Interlube Systems Ltd., 85A St. Modwen

Road, Plymouth, Devon PL6 8LH; tel: 01752-676000.

Tracy Tools Ltd., 2 Mayors Avenue, Dartmouth, Devon TQ6 9NF; tel: 01803-833134.



A FERRIS WHEEL CLOCK

Richard Stephen
completes the construction of
the Ferris wheel and moves on to
describe the assembly of the train.
●Part VI continued from page 74
(M.E. 4174, 26 July 2002)

The details of the spacers for the Ferris wheel are illustrated here in fig 17. The arbor for the wheel is also shown. Constructing these should present no problems. The arbor is made of brass with a 5mm steel central shaft. As the wheel runs on ball races there is no need for the pivots to be hardened. The fit of the pivots in the ball races should be similar to the fit one would aim at for any other clock pivot: the pivot should drop easily into the ball race.

To complete the wheel, the spokes are attached to the flange on the arbor with three 2mm dia. screws positioned as illustrated in fig 17. The two drive wheels are also attached to the arbor using three 1.6mm dia. countersunk screws. Figure 18 illustrates the countersink which I use to ensure that all the screw heads are countersunk to exactly the same depth. Nothing looks worse on a clock than badly fitting countersunk screws. The countersink is no more than a 2mm dia. 90deg. spade drill fitted with a collar to limit the depth of cut. If a suitable drill is not to hand, making one only takes a few minutes.

Cut off a 40mm length of 3mm dia. silver-steel rod. Face off both ends and reduce one end to 2mm dia. for 10mm length. File about 5mm on two sides to leave a thickness of about 1mm and form the cutting edges as shown in fig 18. To harden the countersink I find it best to grip the shank in the chuck of a cordless drill and, with the drill running, heat the end to a cherry red and quench in cold water. Temper to a pale straw colour and sharpen the cutting edges on an oilstone having bevelled the point of the drill as illustrated.

The collar is best made of brass. Drill a 2mm dia. hole about 10mm deep in a piece of 3mm brass rod and part off the section of tube. Slip it over the drill. About 0.5mm of the shank of the drill should extend beyond the end of the collar. Secure the collar in place with Loctite high strength retainer.

Counterbores

The Ferris wheel and centre wheel both run on ball races, and the remaining wheels on aluminium bronze bushes fitted with end caps. The plates require counterboring for both the ball races and the end caps. The diameter of the counterbores for the ball races and the end caps are 7mm and 8mm respectively. If you have no suitable counterbores, you may choose to make them; details of the 8mm dia. counterbore are shown in fig 18.



This view shows some of the constructional details of the Ferris wheel clock and the arrangement of the train. Note the method of attachment of the Ferris wheel cages to the spoked support member.

The 7mm dia. counterbore is the same except for the diameter of the cutter. Cut a 70mm length from a piece of 8mm dia. silver-steel. Reduce a 50mm length to 6mm dia. to make the shank of the tool. Face the other end and drill and ream a 3mm dia. hole to a depth of 12mm for the guide pin. Using a hacksaw, cut away the material on either side of the 3mm hole down to a depth of about 8mm to form the cutting blade. Finish off the sides with a file. The blade should finish at about 2mm thickness. Form the cutting edges using a file; final sharpening being done after the counterbore is hardened and tempered. Hardening can be carried out in the manner described for the countersinks above. Harden and temper a piece of 3mm dia. silver-steel rod for the guide pin which should be long enough to protrude about 4mm beyond the cutting edge

when in place. The guide pin needs to be removable so that the bore can be re-sharpened at a later date. The 7mm bore should also be made now.

The cutting edges are best sharpened on a tool and cutter grinder. If you have no access to such a machine you can do so by hand but be careful to ensure that both cutting edges are the same height.

Assembling the train

With all the wheels and pinions now made, a start can be made on assembling the train (fig 19). Begin with the Ferris wheel which runs between the two time bars. Clamp the two time bars together with the register pegs in the pillar holes. Locate the centre of the middle time bar and drill and ream a 3mm hole through both bars. At this point it is worth clearly marking the two outside

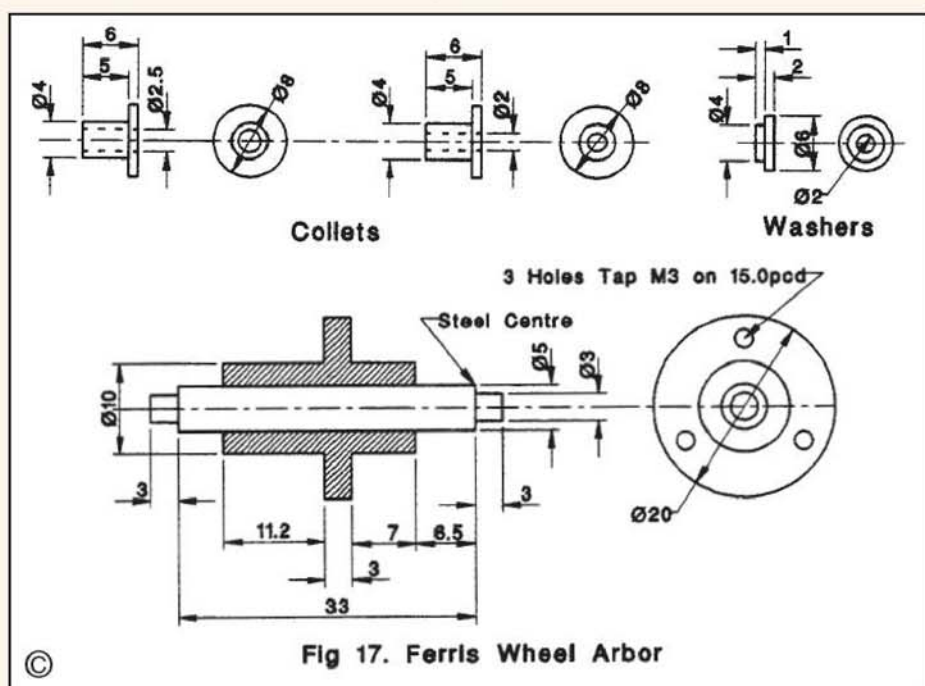
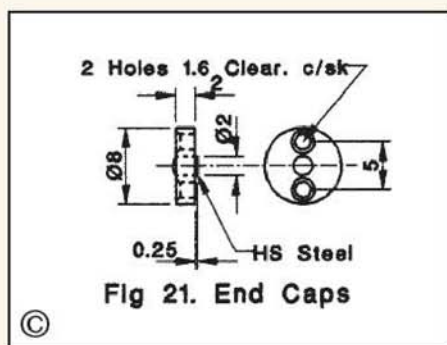
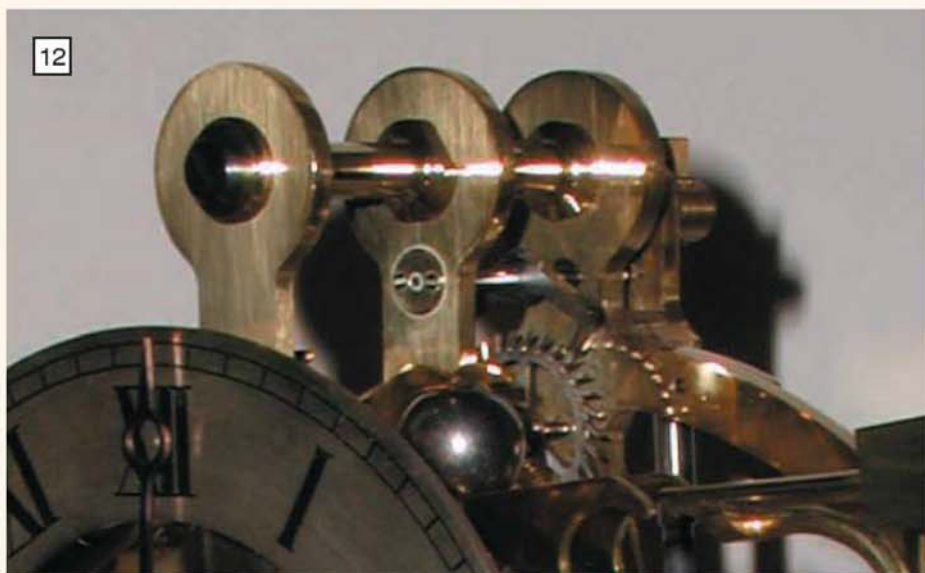


Fig 17. Ferris Wheel Arbor



Right: this close up view of the top portion of the clock shows the time bars, back plate and pillars. Note the end cap, visible in the centre of the photograph.



back plate. Before drilling this hole I suggest that you drill a trial hole in a scrap of 4mm brass.

Drill a 3mm hole in this piece of brass and, using the depth tool, drill a second hole at the arbor spacing. Fit the two runners in the holes and fit the wheel and pinion. Check the meshing of the wheels. If satisfactory, proceed with drilling the hole for the centre arbor. Once a hole has been drilled incorrectly in the plates, the plates will probably be destined for the scrap box. Before doing anything on any part of the clock, carefully check before you do it. Mistakes are easily made and difficult to correct.

Fitting the centre arbor

Just like the Ferris wheel arbor, the centre arbor also runs in ball races. The front section, which drives the motion work, runs in a 3mm race while the rear section, which drives the train, runs in a 3mm front race and a 2mm rear race. All three races are of 6mm outer diameter. Fit the races in the middle bar and back plate, at this stage following the same procedure as previously described.

The dimensions of the rear section of the centre arbor are given in fig 20. As the pivots are running in ball races the arbor can be made from EN1A. The rear centre pinion is attached to the arbor with a 2mm dia. grub screw. To prevent the pinion from turning on the arbor, the end of the grub screw is reduced to 1mm dia. and a 1mm dia. hole drilled in the arbor. The 1mm dia. hole in the arbor can be located by filing a sharp point on the end of the grub screw before turning it down. This can be done while the screw is turning in the lathe. Fit the pinion in place and tighten the screw. The point on the screw will make a dimple in the arbor which you should be able to pick up with the centring microscope — if you have made it. If you haven't made the microscope you'll have to devise your own method of drilling the hole accurately.

Planting the remainder of the train

Following the same procedure for planting the centre wheel, drill the 3mm dia. bushing holes for the intermediate, escape wheel and pallet arbors. Check as previously, before committing the drill to the clock plates. This is particularly important for the escape and pallet bushing holes. With a well-made escapement, the tolerance in the spacing of the escape and pallet arbors is no more than 0.02mm.

With all the bushing holes in the plates drilled, the recesses for the end caps should be drilled

using the 8mm dia. counterbore. The recesses in the middle bar should be 1.5mm deep and those in the back plate 2mm deep.

The dimensions of the arbors for the intermediate and escape wheels and the pallets are given in fig 20. The intermediate and escape arbors can also be made from EN1A mild steel. The pallet arbor is made from a length of 2mm blue steel if you have some. If have no blue steel, silver-steel will do.

The pivots for all three arbors are made from lengths of high-speed drill blank inserted into the ends of the arbors and secured with Loctite high strength retainer which, I appreciate, is not the traditional method of making pivots. The traditionalists would still have us turning pivots by hand using a graver but I feel engineering has moved a bit beyond hand turning! There are several definite advantages of HSS inserted pivots. First, HSS is significantly tougher than carbon steel. Secondly, the drill blanks come highly polished and are made to a very close tolerance. Thirdly, the shoulders of the pivots are absolutely square. And finally, the arbors are a lot easier to make.

Before making the arbors, assemble the middle bar and the back plate with the pillars. Measure the spacing between the plate and the bar. The length of the intermediate and the escape arbor should be about 0.4mm less than the space between the plate and bar. Making the pallet arbor can wait until the back cock has been made. Having made the arbors, drill a 0.75mm dia. hole to a depth of about 4mm in the end. Open the hole with a 0.80mm dia. drill. The pivot will be made from a length of No. 67 drill rod (0.812mm diameter.). As drills often seem to drill slightly oversize, the drill rod should be a good fit. If it is a bit tight grind the end of the drill rod off at an acute angle to create a reamer and open out the hole. Secure the pivot in place using Loctite.

When the Loctite has set, cut the pivot off about 3mm from the shoulder. The best method of cutting the drill rod is to use a dental carborundum cutting disc in a Dremel type mini-drill. Rotate the arbor in the lathe and touch the carborundum disc against the drill rod. It will cut it through in seconds. The pivot is still much too long; it will be ground to length after the end caps have been fitted. Fit the remaining pivots.

Making and fitting the aluminium bronze bushes

The pivots of the intermediate, escape and pallet arbors run in aluminium bronze bushes. Turn down a piece of aluminium bronze bar to

3.02mm diameter. Slightly chamfer the end to make it easier to press the bush in place. Drill a 2.5mm dia. hole 1.8mm deep in the end. Using a 0.75mm dia. drill, extend the hole for a further 2mm. Part off 3mm from the end. The final length of the bush is 2.5mm. Face off the parted end to this length. Press the bush in position flush with the surface of the plate. Using a tapered broach open the hole in the bush so that the 0.8mm dia. pivot just enters. Final burnishing of the hole will slightly increase the size.

Sewing needles make excellent burnishers. Use one with a shank slightly larger than the hole. I put the needle in a Dremel mini drill and, using a spot of oil, burnished the pivot hole from both sides until the pivot passed easily into the hole. The hole is the 'right' size when, with the pivot in the hole, the arbor can rock sideways about 10deg. with little resistance. Assemble the arbor in position between the front plate and the front cock. There should be a small amount of end shake.

End caps

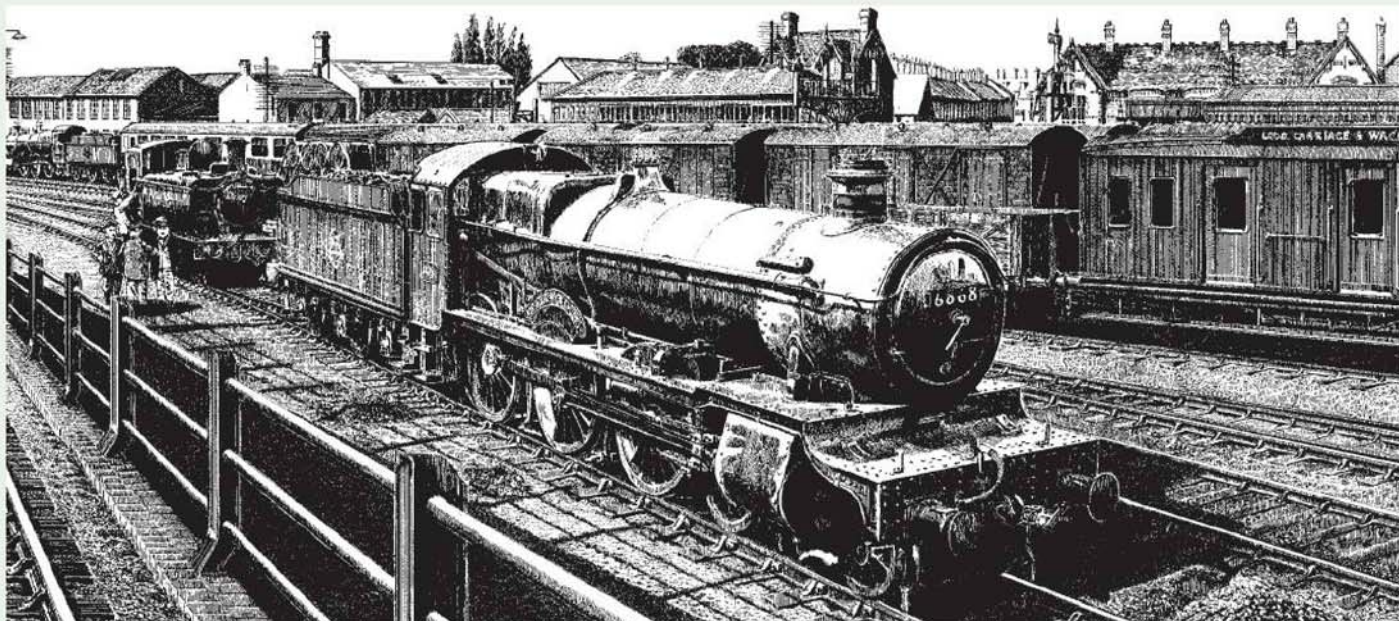
The end caps are illustrated in fig 21. Six of these required. The three for the middle bar are chamfered, as these end caps stand slightly proud of the surface. The end caps should present few problems. The end stop is made from 2mm dia. high-speed steel drill rod.

Using the face of a carborundum cutting disc in the mini-drill, round off the end of a length of drill rod. Polish the end using fine wet and dry finishing with crocus paper to give a good shine. Using the cutting disc, cut the end stop slightly over 2mm long. Grind the face flat and to length. Polish using fine wet and dry paper. The hole in the end cap for the end stop should initially be drilled 1.9mm dia. and then reamed to 1.97mm diameter.

To make a suitable reamer, file down a piece of 2mm silver-steel rod to 1.97mm dia. in the lathe and grind the end at an angle of about 30 degrees. Harden, temper, and sharpen on a fine oilstone. The end stops should be a tight press fit in the end cap. Leave about 0.25mm protruding. The end cap is held in place by two 1.6mm dia. countersunk screws. The countersinks are drilled with the countersinking drill described earlier.

There are six end caps in the clock. If all the screws in the end caps are positioned randomly the final result will look a bit of a mess. Decide how you like the screws positioned and do all of them the same. It is little things like this that give a clock that special something.

●To be continued.



Penrhos Grange on Taunton Shed from a drawing by Simon Bowditch G.R.A.

GWR 68xx Grange Class 4-6-0 No. 6868 Penrhos Grange is seen at the slope of the coaling stage at Taunton Shed in the early 1950s. Footplate and shed staff are engaged in conversation near 57xx Class 0-6-0 Pannier Tank No. 9663 as a 63xx Class 2-6-0 leaves Taunton with a Barnstaple bound train. In the background can be seen Taunton West Station Signal Box, the industrial buildings of Avimo Ltd. and properties in Railway Street and William Street.

PENRHOS GRANGE

Neville Evans

takes a break from describing the construction of his Jones 'Big Goods' and 'Loch' 4-4-0 locos to introduce his next project, a 5in. gauge version of the powerful, docile and much admired GWR Grange Class locomotives.

●Part I.

It is very sad to see the retirement of Martin Evans, in my opinion the best and certainly one of the most prolific of small locomotive designers. From first to last, starting with *Jubilee* in 3½in. gauge, he has turned out a series of practical, close to scale engines, some of which have become the great classics of our time, including *Springbok*, *Firefly*, *Nigel Gresley*, *Royal Engineer*, *Simplex* and latterly *Marquess* in 3½in. gauge, to name but a few. My friend Roger has just finished a *Marquess* and he says that it runs like a watch.

Possibly Martin's finest design was *Torquay Manor*, a small version of the smallest GWR 4-6-0. I have seen many locos built to this design and they all seem to give great satisfaction as reliable, true to scale, attractive little engines which are capable of sustained, hard work. The full-sized 'Manors' were derived from the 'Granges' which used the Swindon No. 1 boiler. The 'Manors' sported a new lightweight boiler, the No. 14, which meant that the frames could be shortened by 15 inches. This, together with lighter scantlings (the frames are shallower, for instance), reduced the engine weight from about 75 to 69 tons. I say 'about' because engine weights are notoriously approximate, and always seem to err on the light side. The 'Manors' were, of course, destined for the secondary lines such as the Cambrian in central Wales.

I am well aware that many designs for GWR locos are available from many sources and in many gauges, but I am convinced that there is a gap in the range for 5in. gauge, which is still the most popular size. The attraction of a loco one size larger than a 'Manor', is that we will have about 20% more boiler power, together with the increase in adhesive weight to be able to use it. From an aesthetic point of view, the general proportions of the 'Grange' are really excellent, in fact as can be seen from the general arrangement, she looks just like a slightly smaller 'King'.

I have in the past drawn small versions of the 'Modified Hall' and the 'County', of which a few have been built, using the existing drawings and castings of 'Torquay Manor' which to my mind can hardly be improved by way of motion and cylinders. So, as a tribute to my illustrious namesake, here are the rest of the GWR 2 cylinder 4-6-0s using standard castings as far as possible, except for the driving wheels for the 'Hall', the 'County' and the 'Saint' and the bogie wheels for the 'Saint'. The wheels of the 'Modified Hall', although retaining the 20 spokes of the earlier 'Halls', have the crankpin bosses bisecting the two bottom spokes, which are webbed, as was the later GWR practice. In fact, as these later wheels found their way onto many of the earlier 'Halls', we needn't really duplicate, which will save a pattern. Wheels will be obtainable, with average luck, from Practical Scale, as will the new cylinders. The rest of the castings can be bought from our usual advertisers, as supplied for *Torquay Manor*.

One point that springs to mind is that the later webbed wheels don't seem to have been fitted to the 'Granges', which had to make do with left overs from the scrapped (or rather dismantled) 4300 'Moguls', that they replaced. There is no doubt of course that the webbed wheels were used as new construction on the batch of 10 'Manors', built by BR and as replacements on the earlier 'Manors'. I have recently spent a few hours looking over *Cookham Manor* at Didcot,

which is in more or less the form in which it was received from BR, complete with the late wheels. I would be most obliged if any gimlet-eyed reader could produce hard evidence of the webbed wheels having been used on a 'Grange'. It would certainly help, as we could then use the Trevor Shortland 6100 coupled wheels, which are absolutely true to prototype.

Penrhos Grange

We can start with 6868 *Penrhos Grange* which happens to be Simon's favourite engine, hence his magic drawing at the head of this article. The full-size 'Granges' were magnificent locomotives. For some reason, all the factors that go into the make-up of a loco were there in their correct proportions. They were said to be the most powerful of the GWR 2-cylinder 4-6-0s, but possessed a lovely docility which belied their capability for tremendous feats of strength. They were smooth, quiet and economical, so much so that myth and rumour have grown up around them.

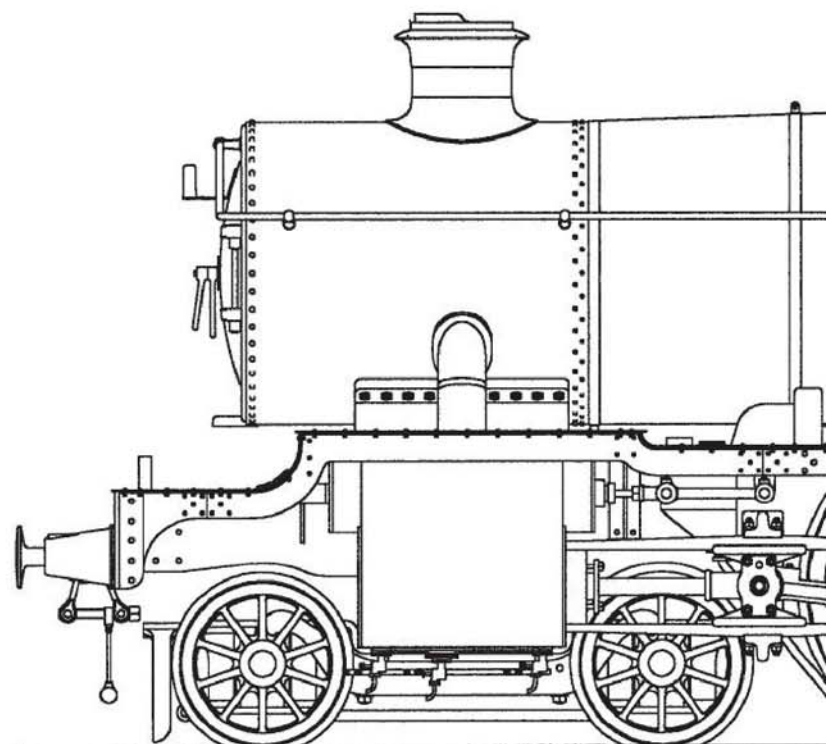
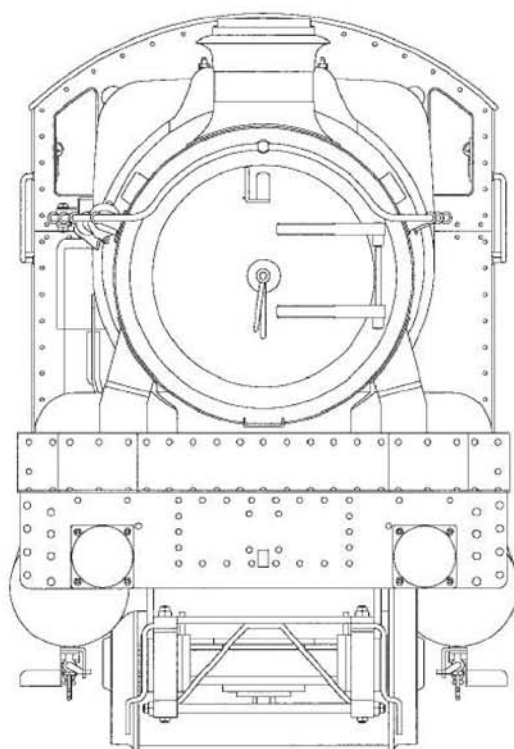
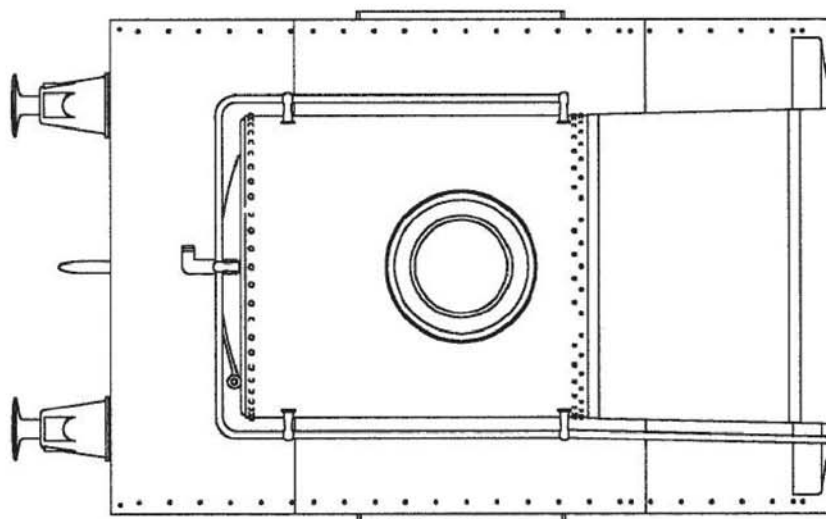
One reads that the cylinders were modified secretly by the drawing office staff to give them the same valve chest volume as the original 2900s. This provokes bellows of rage from the oracles who have the 'original works drawings' and all that. In point of fact, as my then four year-old daughter was fond of saying, a few years ago I rebuilt a shambolic 5in. gauge 'King', and during that time the ever kind Alan Bray, gave me the working drawings for the 'King' connecting and side rods. To my astonishment, they specified squared off ends to the fluting side of the connecting rod bosses, like a 'Royal Scot'. They certainly weren't built like that. If you look at any photo of a 'King', you will immediately see that they have rounded bosses, just like the drawing of the 10ft. 8½in. rod. So please, don't take it as gospel just because it appears on the 'works drawing'.

I was recently talking to Colin Dinsdale, who makes a lot, if not all, of the rods that you see on rebuilt locos that have lost their own equipment.

GWR 68xx No. 6868

PENRHOS GRANGE

by Neville Evans



©

He tells me that they can't make round bosses at a reasonable price, and that he turns out rods with squared off ends, viz. *Earl Bathurst* at Didcot. I believe that the original rods were drop forged and then hand finished. I doubt that we do that sort of thing any more. At least, not in Britain.

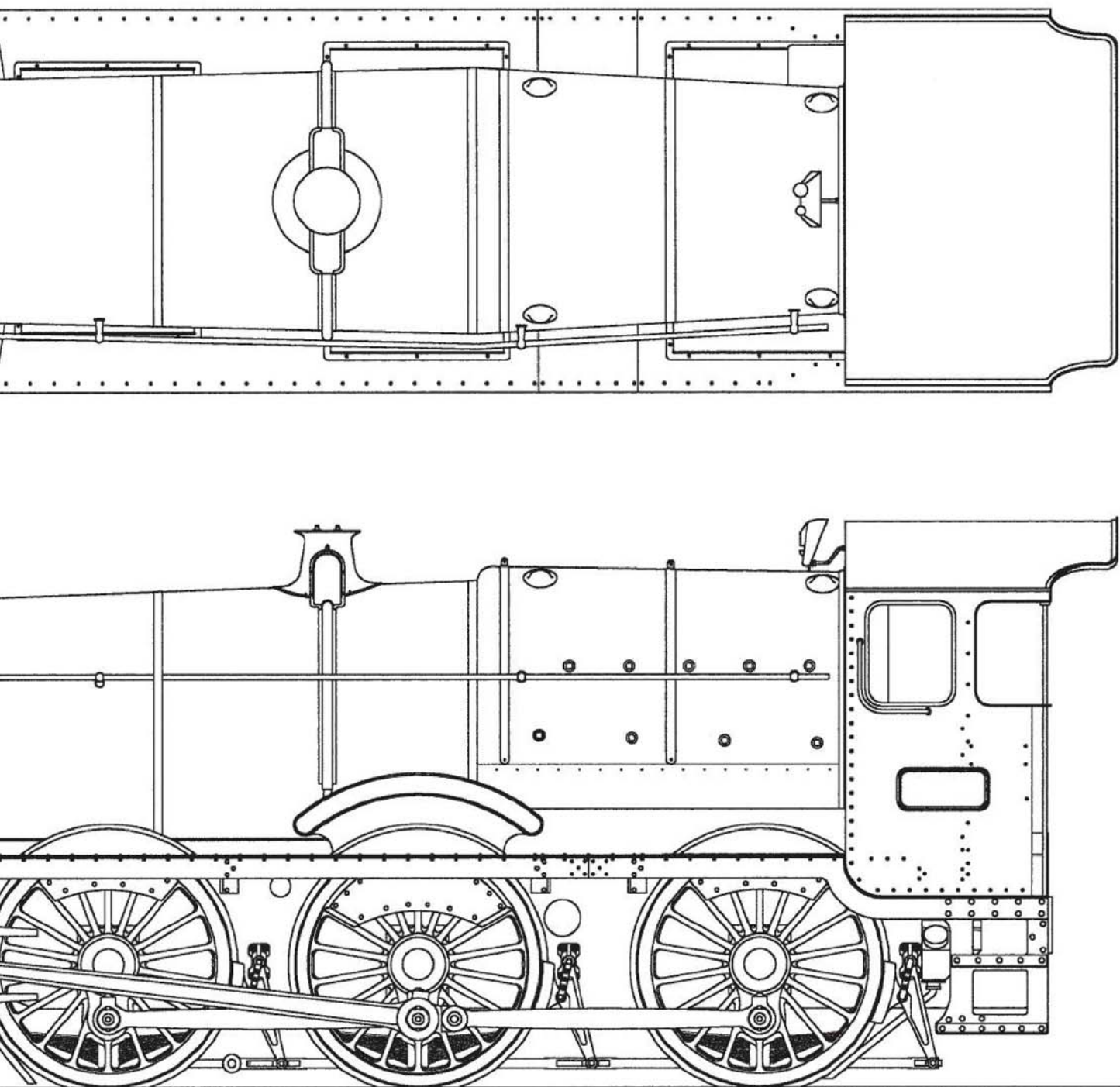
One important fact does however emerge from a study of the drawings. The 'Granges' did have a deeper steam chest than even the 'Converted Halls', there being two more inches between the piston and valve centre lines, which probably accounts for the milk in the coconut, as LBSC would have said. It is also said that they were given greater clearance volumes than the 'Halls', which might explain why they were such

sweet running locos. One thing is certain, and that is that the 'Halls' could impart a most unpleasant surging motion to the leading carriages of their trains. Many different explanations of this phenomenon have been put forward, one of which is too little clearance volume!

I have drawn my own version of the No. 1 Standard boiler, which will suit four of the new locos, the 'Grange', the 'Hall', the 2900s (the 'Saints'), and the 'Modified Hall'. The 'County' will have to have its own boiler, but it is basically a 'Modified Hall' chassis, apart from the 6ft. 3in. wheels. Simon is even now running the proportions of the various organs of the engine, through his confuser, to see fair play

and all that. I have incorporated rod stays and a smokebox regulator.

Among the standard fittings applicable to all five locos are the 10ft. 8¹/₂in. conrods, I say that in the plural as there are at least two variations on the theme. The long rod was modified at about the time of the 'Halls' to include larger oil boxes fore and aft. I presume that most of the earlier 2900s sported these later rods at some time in their careers. Photographic evidence will no doubt become available as the series progresses. I have drawn the rods in their correct form, complete with the very evident fish-belly and circular bosses, a difficult item to make, though Pete Rich seems to be able to turn them out like shelling peas.



The coupling rods vary more according to date than to class. Basically, the older type were hinged in front of the driving crank pin and the later behind. In fact, I once questioned a friend of mine who used to drive 'Saints', as to when the change in coupling rod hinge actually took place. He told me that at one period, one of the 'Saints' had the new type on the left side and the old type on the right side, presumably just to annoy the rivet counters. The first batch of 'Halls' certainly had the hinges in front of the driving crankpins. 5900 *Hinderton Hall* at Didcot has these early side rods. The later rods, with hinges behind the driving wheels, started with 5921 *Bingley Hall*.

A series of boiler fittings which are closer to

scale and are based on Roy Amsbury's work will be detailed, and a series of superb fittings, including authentic cylinder drain cocks, is already available from Dave Noble. The locos present their own challenges; for instance, there are more variations in the '2900s' than in the rest of them put together, so we shall have to go carefully through them.

Let me make it absolutely plain, however, that I am not interested in complete authenticity with respect to inside parts that can't be seen. I am interested in correct proportion and as much detail as can be included, bearing in mind that a balance has to be struck between the inclusion of small detail and vulnerability. These engines are

meant to be able to do a hard day's work. We are, however, working from the original drawings and therefore choosing a particular loco on a particular day will be up to particular builders.

My philosophy is that if you can't see it, then don't worry about it. I shall therefore use my standard steel axle boxes with roller bearings, and stainless steel radiant super-heaters. 'Ivor the Engine' has been experimenting and has now achieved what seems to be complete success, with PTFE piston valve rings which have O-rings underneath. The O-rings afford just the right amount of spring to seal the valve when running under compressed air, as well as preventing leakage under the ring in normal running. It crosses my



mind, though I'm not completely certain, that it may now be possible to offer ringed piston valve cylinders in gunmetal that will have at least as long a life as cast iron.

Two more cylinder patterns, one for the older locos and the 'Modified Halls' and 'Counties', which had the valve and main bore centres at 1ft. 5⁵/₈in. and one for the 'Granges' at 1ft. 7⁵/₈in., are another possibility. The difference between the two cylinders in 5in. gauge is nearly 3/16in., a considerable amount. It may also be possible to thin down the amount of material to be heated at the start of each run, by reducing the thickness of the cylinder walls.

Ivor fitted ball bearings in his 'Manor' eccentrics in 1984, and the '6100' in 1992. I don't think that he's touched them since, apart from their annual oiling. When I tried the '6100' the other day the eccentric straps were as tight as the day they were made. We can also offer motion with roller bearings on hardened silver-steel pins. There will, of course, be plain bushed alternatives for them as prefers it. We shall be relying on the *Torquay Manor* drawings, for the wheels, cylinders, bogie and valve gear for the 'Grange', in fact, anyone with a part built *Torquay Manor* chassis will be practically there. There will be the obvious addition of some goodies like investment cast GWR crossheads for the whole series.



The latest 'Hall' type wheel as fitted to Saint Martin, the prototype for the 'Halls' which was converted from a 'Saint'.

GWR 29xx 4-6-0 No. 2902, Lady of the Lake, our Contributor's favourite portrait of a favourite locomotive.

The two photos which accompany this article are of 2900s; well, in one case an ex-29-cr. The first is my favourite portrait of my favourite loco, 2902 *Lady of the Lake*. It is also, believe it or not, one of my earliest possessions, as I took it from my first book: *Locos of the Royal Road*, obtained at age about three. I have always thought this to be the finest picture ever taken of any engine.

The second picture is of the latest 'Hall' wheel, as fitted to *Saint Martin*, the prototype of the 'Halls', which was of course converted from a 'Saint'. Eagle-eyed readers will by now have spotted that the drawing in the centre spread is unfinished. True enough. I'm finding great difficulty in locating suitable drawings of the ejector, particularly a plan view. I also need some more concrete information about the two smokebox casings and the right-hand side of the boiler. Any assistance will be gratefully received.

To those many worthy people who have replied to my query about a 5in. gauge 'Schools', I can say that this engine is now a definite maybe. The drawings are well advanced, and I'm enquiring about pattern making as you read this.

●To be continued.

SEQLEC 2002

Applications for entry are welcome for the
Twelfth 7¹/₄in. gauge Locomotive Efficiency Competition
which will be hosted by
WESTON PARK MINIATURE RAILWAY

at the track at Weston Park, Shifnal, Nr Telford, Shropshire
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Please call Bruce Whalley on 01952-850555 for an Official Entry Form

All visitors will be very welcome,
model engineers and their families particularly so.

Please note that it may be necessary to restrict the number of entries

Entries are now welcome for the LBSC MEMORIAL BOWL COMPETITION

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SOCIETY OF MODEL ENGINEERS**
on

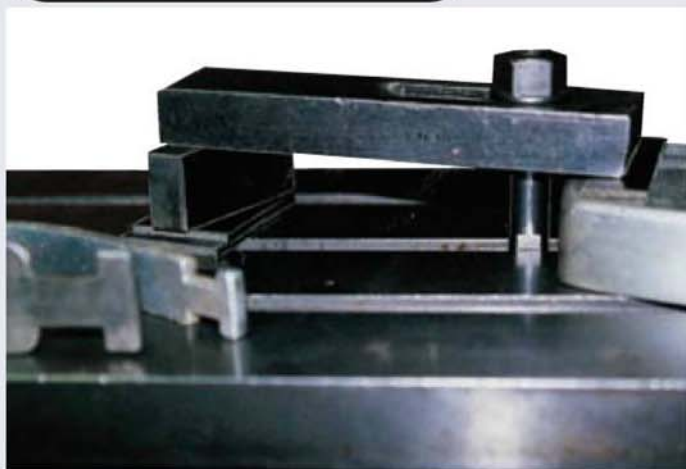
SUNDAY 15 SEPTEMBER 2002

visit www.honsec.yorksme.org.uk for location, etc
Any steam locomotive to, or based on an LBSC design in 2¹/₂, 3¹/₂ or 5in. gauge
is eligible provided it has not won an award in a previous
LBSC Memorial Bowl Competition

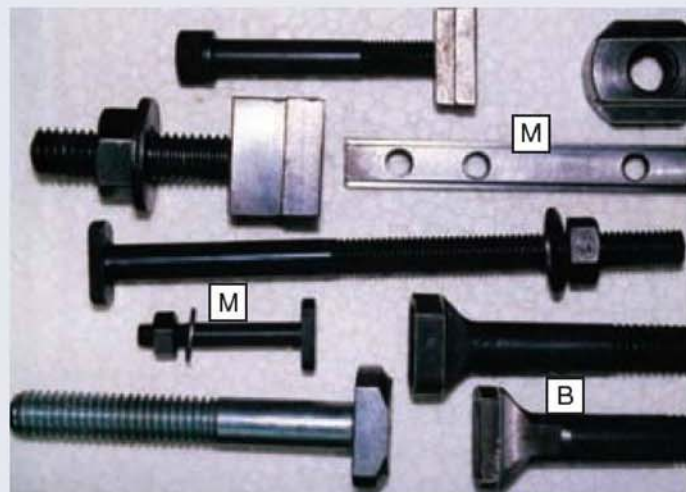
Please contact Ken Bateman
(01904-421455; kenbateman@nthworld.com)
for an Official Entry Form

All visitors will be very welcome,
model engineers and their families particularly so.
Please note that it may be necessary to restrict the number of entries

T-SLOTS & CLAMPS



A plain strap clamp in use on a milling machine table to grip the left hand side of an aluminium casting; a second similar clamp is out of view to the right. At least two clamps should always be used. Note the scrap of bright mild steel strip between the strap and the work to avoid dents. Note also that the bolt is close to work so as to provide adequate clamping pressure where it is most needed. The packing block lifts the back of the strap clamp a few thou. higher than the workpiece thereby avoiding possible crushing of the edge of the workpiece. Two T-slot scrapers, filed from strip metal, are also shown; these are used to remove swarf from the T-slots.



A selection of T-slot nuts and bolts.

M: two Myford T-bolts as supplied and a long T-nut for boring table; the spacing of the $\frac{5}{16}$ in. BSF tapped holes matches a cross-slide milling head. B: at the top is a hot forged T-bolt for industrial use; at the bottom, a similar T-bolt with a re-profiled head to suit a smaller T-slot.

Other items include two 'normal' T-nuts which are easy to mill in a long strip and a round T-nut, which is not so easy to make. Bolts and studs should be screwed all the way into T-nuts but no further.

Peter Spenlove-Spenlove

introduces some basic yet vital workholding techniques, written particularly with the newcomer to model engineering in mind.

●Part I

This article is aimed at the newcomer who is not so familiar with machine tools. You are keen to make progress and have installed a milling machine or have a lathe with a boring table and perhaps a vertical slide. You have also noticed slots shaped like an inverted 'T' cut into them. These are commonly known as T-slots and most machine manufacturers stick to standard sizes. Many offer complete sets of T-bolts, T-nuts, studs, nuts and stout washers to suit their machine. Some offer 'strap' clamps as well. Myford supply clamping kits for their T-slots. These items are needed to clamp a workpiece to the machine table before using a cutting tool.

Two types of threaded fastener are available to fit into T-slots. One is the T-bolt which has a threaded bolt with a specially shaped head to fit the slot. The other is a specially shaped T-nut made to fit the slot and is tapped through to accept a stud. You will need T-bolts of various lengths to suit the height of the workpiece. The same applies to studs. But why the two types? After all, each will hold work or a machine vice firmly in place.

There is one rule that applies to both. The bolt head is bigger than a normal hexagon head. A T-nut is also larger than a normal nut. If you modify a standard hexagon so that it will fit and slide along the T-slot, you will notice that its contact area on the underside of the slot is rather small. Excluding ex-industrial machines, our home workshop machine tools usually have rather small T-slots. Vigorous use of the spanner

to tighten the nut can pull the head out of a small T-slot by breaking two chunks of cast iron away. Almost all T-slotted surfaces are made from cast iron which is brittle.

T-bolts are costly to make as, say a $\frac{3}{8}$ in. Whitworth bolt for Myford slots has to be turned or forged from high quality bar. It follows therefore that T-nuts with studs are usually cheaper. The owner of a milling machine will usually acquire a machine vice. It will be supplied with two holding down slots, but no fixing bolts, etc. You need the vice to mill some T-nuts. So one answer would be to use the lathe to turn a couple of T-bolts and file two opposite flats on the head. As the bolts are short you'll not use up too much costly bar stock.

With nuts and thick washers, the vice can be clamped and set true on the milling machine table, ready to convert a piece of square bright mild steel into a T-nut section. The length of each nut (plus enough for a saw cut) can then be marked out and each potential nut drilled and tapped. You will seldom need more than four to six for a milling job.

For the studs, lengths of fully threaded rod called studding can be purchased fairly readily. It is reasonably cheap and available from many tooling suppliers. Saw it into various paired lengths. Pop it into the lathe, face one end straight across and de-burr. This end enters the T-nut as far as it will go to give the maximum thread engagement. Round off the other end so that there are no sharp edges to catch your skin while you're setting up and working. After turning the two ends, it's a good idea to wire brush them with a steel bristle rotary brush, being sure to wear goggles for proper eye protection while doing so. This will dull any remaining sharp edges.

For my vice and rotary table, I have turned dedicated T-bolts, a pair for each, complete with thick washers and hexagon nuts. Each pair is kept

with the item, and is always ready for use. After a year or two you may have a box or tray full of assorted T-nuts, studs and bolts, etc. Murphy's law ensures that the one you need is missing, having gone out with the swarf or fallen behind the machine! My Myford lathe has small slots, the milling machine big ones and the rotary table, middle sized slots, so I keep a clamping kit with each, to save much valuable time.

After making the T-bolt, etc. kit, you'll need an assortment of strap clamps, and I shall expand on the making and use of these in the next part.

●To be continued.



A hot forged strap clamp with a pivoting $\frac{1}{2}$ in. T-bolt bought at an M.E. Exhibition. Having a rounded heel and toe, packing height is less critical than with common flat strap clamps.



SAVAGE'S LITTLE SAMSON in 3in, 4in. (and other) Scales

Martin Wallis

positions the essentially complete cylinder on the boiler barrel ready for future fixing, and describes the crosshead trunk guide.

●Part XXVIII continued from page 82
(M.E. 4174, 26 July 2002)

A part from drilling for the valve rod, which is best jig-drilled later from the trunk guide assembly, the cylinder is essentially complete. The cylinder may now be placed on the boiler in the 'best guess' position and held with a Jubilee clip. If one sufficiently large is not to hand, two smaller ones may easily be joined together to make a clip which will reach around the barrel. Note that the boiler should *not* be drilled for the cylinder fixings at this stage.

The next step is to machine up the trunk guide, piston, piston rod, crosshead and connecting rod.

These bits are then assembled and dropped in place between the cylinder and crankshaft. Since the boiler sides were machined parallel to each other and the boiler barrel, and given that the hornplates are flat — and even if they aren't the boiler, spectacle plate and front plate will soon pull them flat, alignment will be assured. The cylinder may need to be tapped around the barrel a tiny bit to align it with the crankshaft, or moved fore-and-aft to provide equal clearances between the piston and covers, but little fiddling should be necessary to get the motion turning sweetly.

I prefer to do this job *without* the piston rings and am happy when it all turns over nicely, without any tight spots or binding. With the piston rings missing there should be very little (if any) resistance, so a single finger between the spokes should be all that is needed to turn it over. When you are entirely satisfied, the cylinder may then be fixed to the barrel with studs and nuts, but that is a story for a future date.

Full-size Little Samson and Savage Wagon progress

Before starting work on the trunk guide, a brief update on the full-size *Little Samson* and *Road Steam's* next project, the 3in. scale Savage steam wagon, may not go amiss.

Richard Morgan is making impressive progress on his full-size *Little Samson*, a large and awesome project. Remember, he is building it in his domestic garage, not in a fully equipped industrial machine shop. His workshop may be seen in photo 3. His machines are an old but substantial Clarkson horizontal milling machine, a Colchester Student lathe, and one of the 'Far Eastern' vertical milling machines. All four wheels have now been completed, as has the front axle, front fork, front spring, crankshaft, and other sundry parts. The differential centre casting has now been poured and a number of the road gears have been made, one of the pinions may be seen being cut in the Clarkson in photo 3. A start has been made on the boiler.



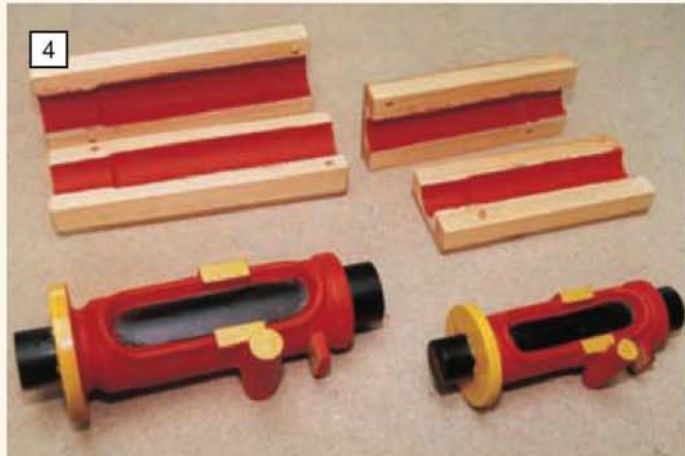
The completed pair of 12in. to the foot Savage Little Samson wheels took twelve months in the manufacture.



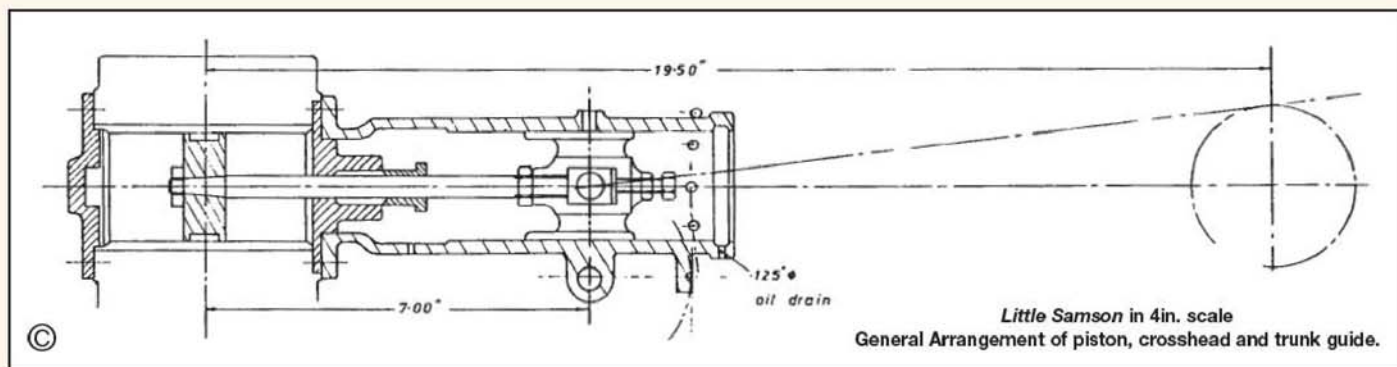
One of the 12in. to the foot back wheels during construction; note that the spokes are welded to the steel hub.



Gear cutting one of the full-size pinions. The cutter is not a form tool but an ordinary side and face cutter. Repeated cuts are taken 'at all points' on the tooth profile until the tooth fits templates of the desired tooth form made in advance. (Photos 1-3: Richard Morgan)



Patterns and core boxes for the 3in. and 4in. trunk guides. The semi-circular profile core boxes are cast in plaster around a turned wooden plug. Plaster core boxes are fairly robust and will give a reasonable service life provided they are used carefully.



The pair of back wheels represents a year's work. Each wheel weighs about 200kg, double the weight of the front wheels. The wheels were assembled with rivets closed hot, the rivets being heated white-hot by his wife before insertion. Each rivet had then to be subsequently reheated four or five times until a good head was achieved. The hubs were fabricated in steel, not cast in iron, so that the spokes could be electrically welded in place. The back wheels were first assembled with 8mm screws holding the spokes to check it ran true, which it did. The cover plates were assembled with 8mm countersunk screws between the spokes and then welded in place to avoid the paint line/crack which is sometimes seen on model wheels.

Our two Steam wagon builders, Stan Nipper and John Thompson, are now well ahead and a steady flow of pictures has been dropping onto my doormat. As with so many of Savages' products the wagons come in several guises, John is fitting wooden artillery style wheels to his wagon and Stan the iron wheels. The pattern making is now complete for the underslung, totally enclosed

compound engine. The crankcase and covers have been cast in high tensile aluminium alloy and heat-treated afterwards as advised; the compound cylinders and covers have been cast in iron. To the untrained eye, Stan's engine unit is all but complete, but several points of detail are still to be added, such as the geared down feed pump. Both wagon chassis are built up and on their wheels.

Two further sets of drawings have been sent out, one of which resulted in some very helpful and constructive comment, but as far as I know no metal has been cut by either recipient.

Trunk guide

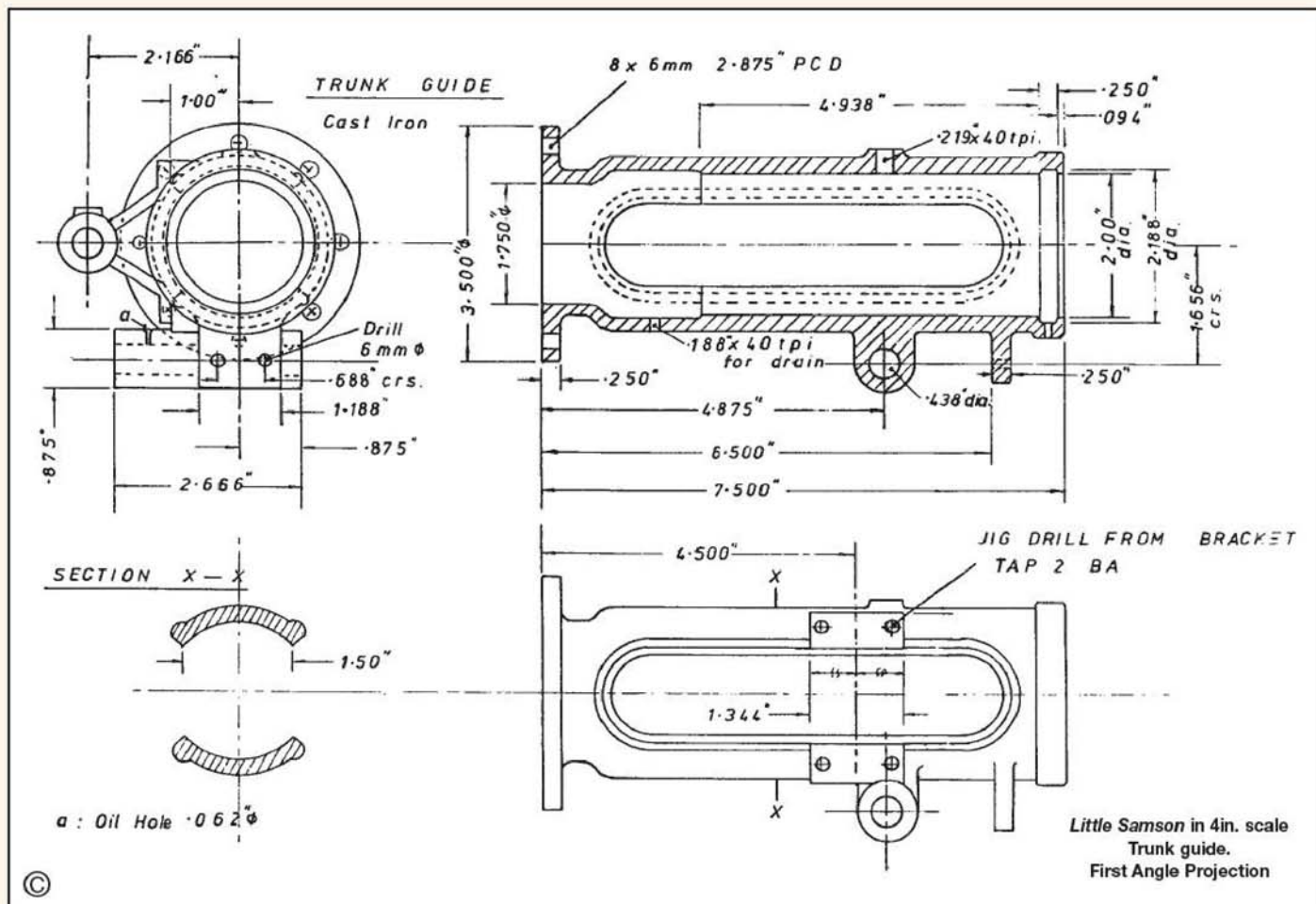
And so to the trunk guide, the main thrust of these notes. A guide is needed to resist the up-and-down thrusts exerted by the crosshead when the engine is working. Road steam engines had either a trunk guide with a circular bore in which the crosshead runs, or flat bars above and below the crosshead which guide it in a similar way. In both cases the crosshead would have had adjustable slippers which could be packed out should wear take place. Flat slide bars are more compact and hence

tend to be favoured on compound engines, where space between the hornplates is at a premium, and as far as I am aware, are more or less universally chosen on railway engines.

Our *Little Samson* was fitted with a trunk guide, which may either be machined from a casting or fabricated. Unusually, the crosshead did not have adjustable slippers, presumably a cost consideration. The patterns in 3in. and 4in. scale are illustrated along with the core boxes in **photo 4**. The colour coding conveys important information to the foundry. The red surfaces are to be left as cast, yellow surfaces are to be machined, and black details are core prints. Each pattern is split into two halves so that it may be pulled cleanly from the sand.

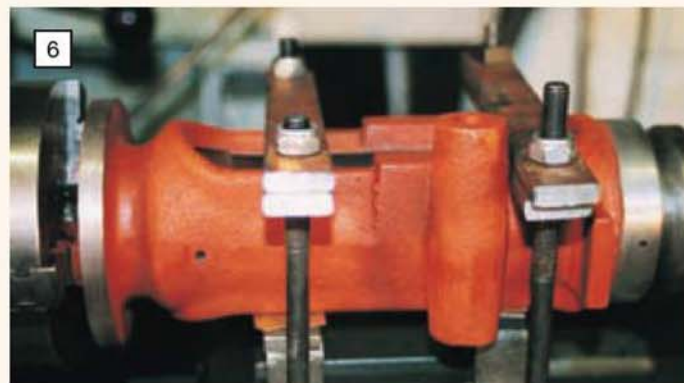
Marking out

A few minutes with a rule should confirm that there is sufficient metal where it matters, and that the cored hole is in the middle. just for a change, this month the drawings are in 4in. scale which show a 19 1/2in. piston to crankshaft distance. Removing any knobby bits and generally cleaning





John Freeborne's 4in. scale trunk guide is supported on a cone centre in his Myford lathe. (Photos 5-8: P. Kybert)



Still supported on a cone centre, the trunk guide is bolted securely to the crossslide. Note the freshly annealed thin copper sheet between the steel blocks and the rough casting.

up the casting with an old file is always worthwhile at an early stage — far better now than when there are machined surfaces that might get damaged.

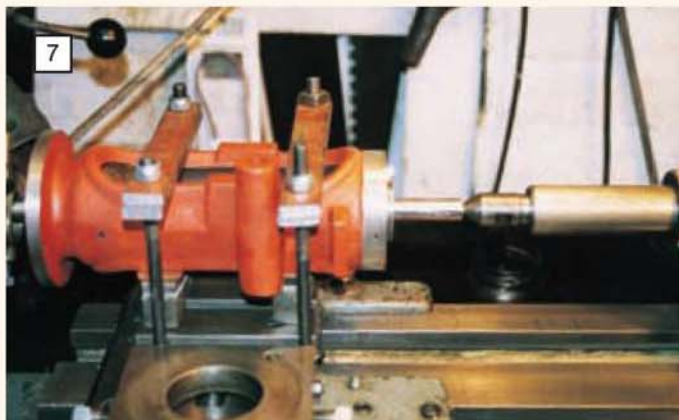
There are two things to worry about when machining. First, it is important that the bore is parallel, round, and has a good finish. Remember that the intermittent cut will not help. Secondly, the faced-off cylinder end must be truly axial to the bore to achieve the correct alignment.

As ever, there are different ways of tackling things, the divergence being the method of machining the bore down the middle. One way is to bore it with a boring bar held between-centres, this method ought to work well but will require some careful preparation in holding the casting. The other is to use a conventional boring bar and to hold the trunk guide either in a special collet or to clamp it concentrically on the faceplate.

Between-centres method

I am greatly indebted to John Freeborne, and Peter Kybert for the photography, for the 'between-centres' illustrations. John also sent some accompanying notes which were a great help.

To make a start, the casting is mounted in the lathe between the chuck and a cone centre (photo 5), but if you do not have access to such a centre, a plug will be required which can be pushed into the end of the casting. The diameters are thus concentric



Left: the cross-slide was then locked and the chuck and cone centre replaced by a between-centres boring bar. Note how far the tailstock has to be extended to allow the casting to traverse enough to complete the cut.

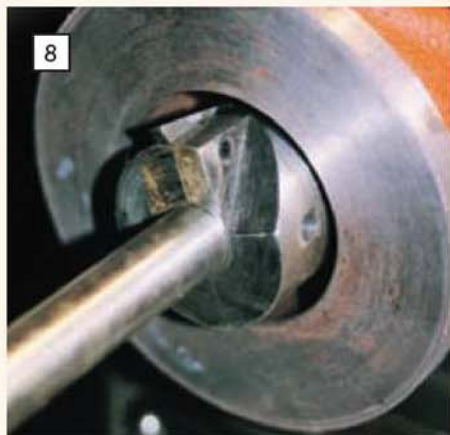
to the axis of the lathe and may be skimmed over if desired, but that is not the primary reason for the set-up. The plan is to accurately position the casting at lathe centre height. While thus held, the casting is packed up from below and bolted down to the lathe cross-slide ready for boring. Care has to be taken to ensure the flat surfaces are horizontal as the same set-up is used in several subsequent machining operations.

The casting should be set with the cylinder mounting flange towards the headstock so that the flange may be machined at the same setting as the hole through the middle. This will ensure the flange is truly axial with the crosshead guide faces and correct alignment will be assured. To

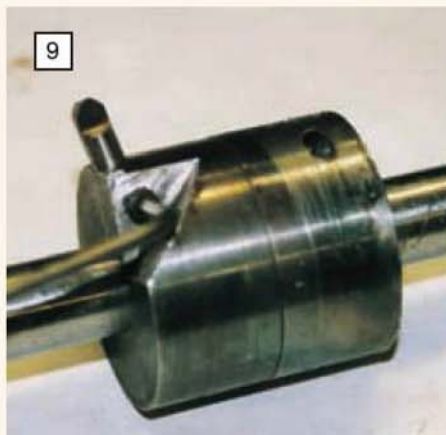
machine the flange at the same setting a boring and facing head will be needed. Such a tool is illustrated in photo 10; when facing, the tool has to be fed across the face while the lathe is running. The 'bicycle sprocket' in the bottom of the illustration, which is fixed to the feedscrew of the facing head achieves this. As the facing head revolves, a peg at the rear of the lathe engages with a tooth and knocks it around an increment at each pass.

If a boring and facing head is not available, the trunk guide will need to be mounted on a mandrel between centres later so the flange may be machined concentric to the bore.

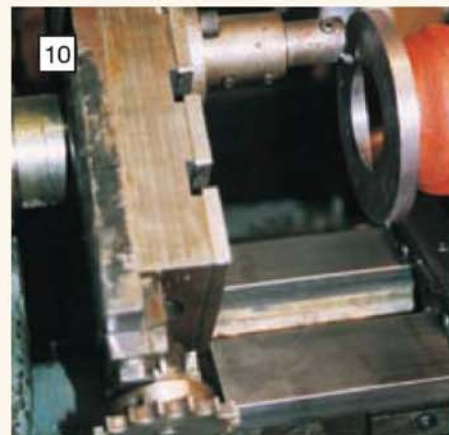
With a between-centres boring bar, the cut is put on by slackening the tool clamping screw and advancing the tool by tapping it very gently from behind. More exotic between-centres bars may have micrometer settings, advancing the tool by rotating a dial, but most of us I guess are more used to the slightly more hit-and-miss arrangement shown in photo 9. Happily, in this case the diameter of the main bore is unimportant, so delicate and fiddly tool setting is unnecessary. A good finish and a parallel bore are all that is needed. The crosshead may be machined to suit. However, the smaller internal bore has to marry up with the front cylinder cover, so a little more care is needed with the diameter of that. The cover itself may be offered up to gauge the fit. It should be a close sliding fit.



John's neat between-centres boring bar is designed to use 'throw away' triangular tungsten carbide tool bits.



Alternatively, a standard round HSS cutting tool can be used in a boring head as here. If it were mine, the tool would more than likely be a broken off slot drill! The Allen screw allows the tool to be advanced to put on successive cuts.



John Freeborne's boring and facing head. A discarded lathe top-slide was purchased at a club sale for the grand sum of £6 and suitably adapted. Note that the T-slots are fabricated.



Undisturbed, the trunk guide and cross-slide are mounted on the milling machine table to machine the horizontal surfaces. The cross-slide feed screw assembly has had to be removed so the cross-slide seats properly on the machine table.

John's clever bit

So after the main bore and the cylinder flange end has been machined, how is the other end to be dealt with? John's answer is simple, and clever. The whole cross-slide, casting and all, is removed from the lathe, turned through 180deg. and re-fitted. The height will, of course, be 'spot on' and the other horizontal axis, easy to pick up with a dial test indicator (DTI). The lathe will look decidedly odd with the cross-slide feedscrew and handle behind the bedways, but not to worry.

The casting and cross-slide together are then dismantled from the lathe and moved across to the milling machine to face across the pads that take the valve spindle guide, and to face over weighshaft boss. If the table on the milling machine will drop far enough, or the head rise far enough, the weighshaft hole may be drilled and reamed at the same setting. If the drill cannot be accommodated, as in John's case, the set-up needs



Still safely secured to the cross-slide, the trunk guide has been moved to the drilling machine which had more 'window' than the mill for drilling and reaming the weighshaft hole. (Photos 9-12: P. Kybert)

to be transferred to the drilling machine where there will probably be more headroom (photo 12).

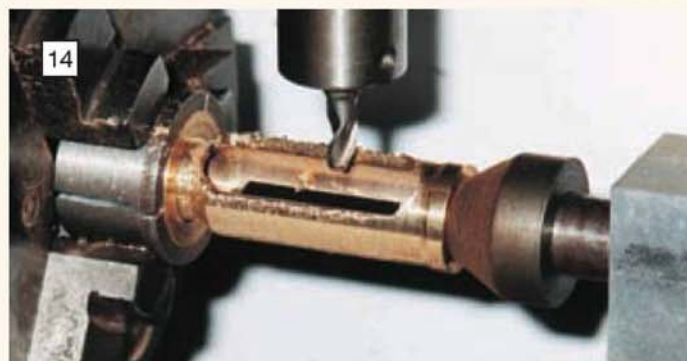
Conventional boring bar

If a conventional boring bar is to be used, some means of holding the trunk guide needs to be devised. The first thing to do would be to machine the cylinder mounting flange so there is a machined face from which to work. Tailstock support is essential; gripping on the end of so long a casting and hoping to machine the other end would be a certain recipe for disaster. A bung of some sort needs to be driven into the bore so that tailstock support may be offered.

Once the flange is machined, the trunk guide may be clamped to the faceplate and somehow clocked true, or alternatively, held in a specially devised collet in the chuck. Such an arrangement is shown in photo 13. Light cuts and a fine feed would be needed and every care taken to avoid



Left: David Hall's 3in. scale trunk guide is mounted in a special collet to guarantee concentricity with the cylinder mounting flange. (Photo: B. Camps)



Right: the internals of John Freeborne's 4in. scale tender with his reinforcing straps. (Photo: Peter Kybert)

Left: Jonathan's 1in. Little Samson trunk guide was cut from the solid. Here it is in the dividing head on the vertical milling machine to cut the windows in the sides. (Photo: J. Milne-Fowler)

'chatter' which results in those annoying surface patterns commonly resulting from working with long slender tooling.

To stay or not to stay

Both on the drawings and on the casting, readers will notice the tongue of metal pointing downwards on the front of the trunk guide. It is clearly visible on the patterns in photo 4 as well as in other illustrations. It is an original Savage feature and, as such, has been incorporated in the design. It is designed to take a flat steel stay which is connected to the boiler barrel. Other makers fitted a similar stay, including the famous Allchin *Royal Chester* which was, and indeed is, so popular with modellers. The stay is to stop the trunk guide flexing when in use resulting perhaps in fatiguing and eventually failure. This may be fair enough on full-size engines, but looking at how solid the 3 and 4in. castings are, I doubt very much if the stay is needed.

On the model I suggest that the flat faces of the stay bracket are machined, a slot is cut in the lagging under it, and a *dummy* stay is fitted to span the gap between the bracket and the slot in the lagging. I would not advise drilling and tapping for fixings into the boiler. Making the stay non-functional will facilitate fitting the lagging, as much as anything else, and potential leaks will be avoided.

Tender reinforcing

As a postscript I include photo 15 showing John Freeborne's method of reinforcing his brass tender in anticipation of a hard life of passenger hauling. The steelwork down the sides of the tender is $1\frac{1}{2} \times \frac{1}{4}$ in. and ends in two pieces $2 \times \frac{5}{16}$ in., substantial by anyone's standards. John feels his 'inner harness', as he calls it, is a sensible addition to the strengthening plate already detailed on the drawing. I am happy to agree. It would, of course, not be needed on a steel tender.

●To be continued.





THE JUNIOR A STATIONARY INTERNAL COMBUSTION ENGINE



Stan Bray introduces his new project: a vertical, hopper cooled, stationary internal combustion engine, and describes the making and use of a handy subsidiary faceplate.

●Part I

Numerous designs and castings are available for stationary steam engines, but the number for internal combustion engines is rather limited. This particularly applies to small models that can be machined on lathes with a 3 1/2 in. or so centre height, which seemingly are among the most popular to be found in most model engineering workshops. This model should therefore be a welcome addition to the ranks of available projects, and is ideal for those with limited workshop resources.

While every effort is normally made to establish whether the necessary work can be completed without one, a milling machine has been used to make the model to be described. Many workshops are now equipped with a milling machine of one sort or another. It is my view that some of the set-ups required to machine these castings on the lathe could have been very time consuming, so the decision was taken to go ahead and use the milling machine. Nevertheless, I suspect that some readers may prefer to make the model using nothing more than a lathe, and no doubt with little ingenuity it would indeed be possible. However, since it is not practicable to offer assistance on these in this series, I shall have to leave the set-ups required to the reader.

Glow plug ignition

The most noticeable difference between this model and others of a similar type is possibly in the form ignition used. Readers involved with model aircraft will be quite familiar with glow plug ignition, but glow plugs may well be a new departure to some. As the name implies, a glow plug is a little device which, when connected to a single cell battery, provides a small heat source. They have the considerable advantage that there is no need for ignition coils or contact breakers. Although the use of a glow plug may differ from usual practice, for many years hot wire and hot tube ignition have been used on full size engines of various sorts, indicating that the technique is well tried and tested.

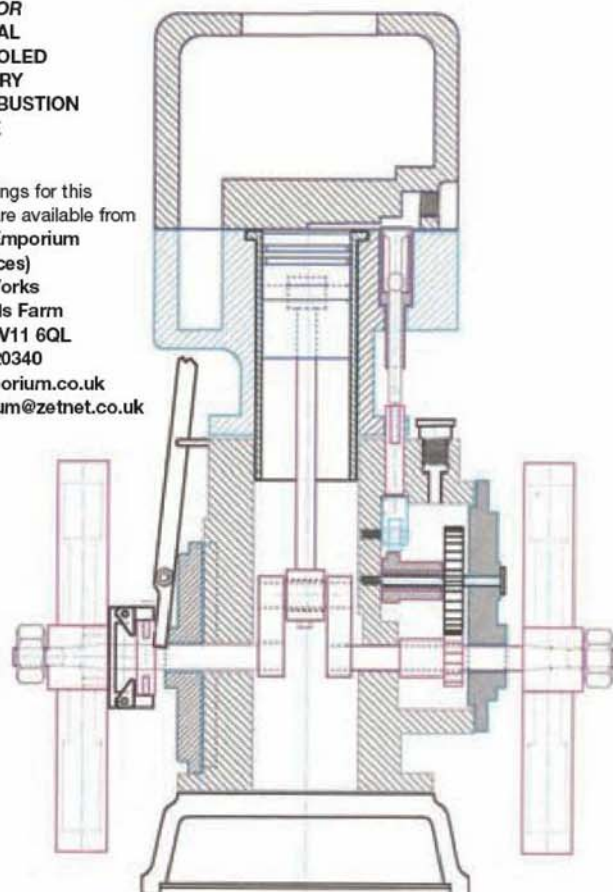
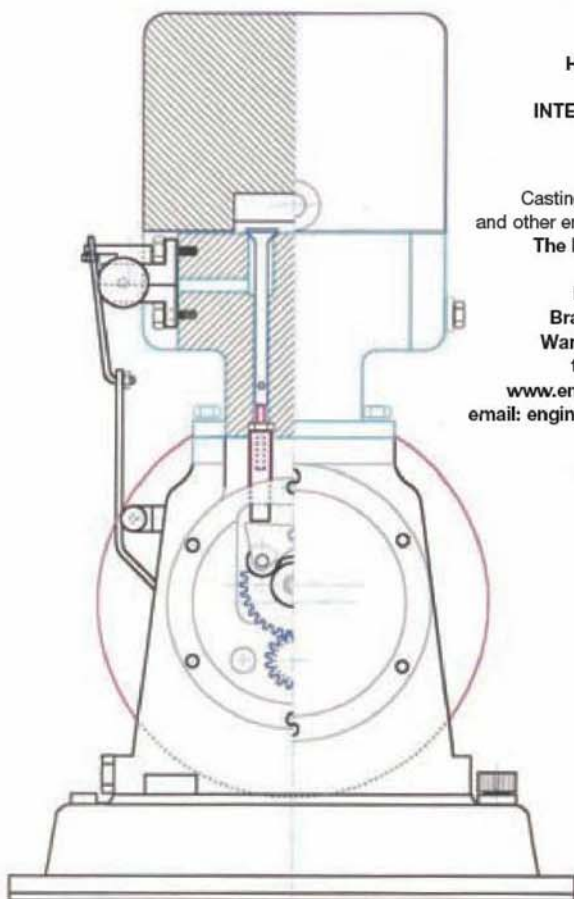
Castings and drawings

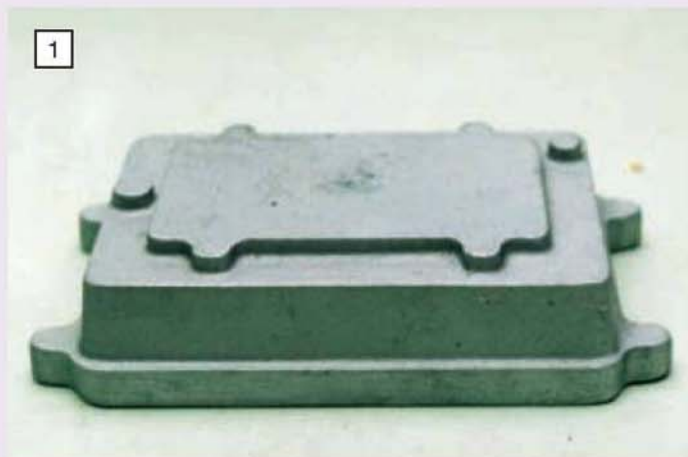
The casting set consists of six items: a pair of flywheels, base, crankcase, cylinder and cylinder head which is also the cooling hopper, plus two covers for the crank case. There is also aluminium alloy strip material the connecting rod.

The castings are all in aluminium alloy and of very high quality, near enough free of flash,

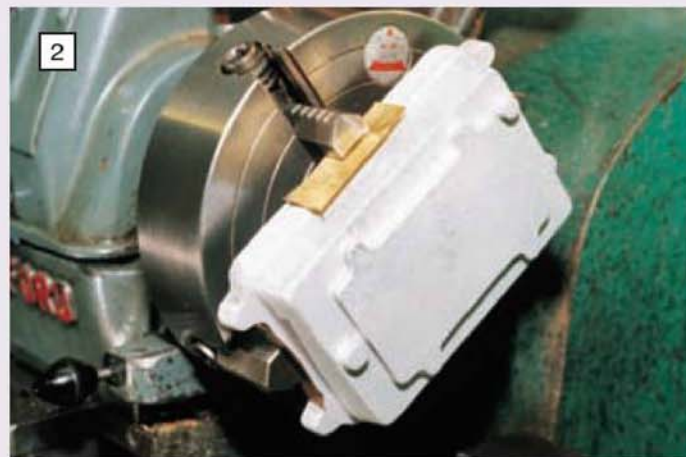
THE JUNIOR A VERTICAL HOPPER COOLED STATIONARY INTERNAL COMBUSTION ENGINE

Castings and drawings for this and other engines, etc. are available from
The Engineers' Emporium
(L. A. Services)
Bramcote Works
Bramcote Fields Farm
Warwickshire CV11 6QL
tel: 01455-220340
www.engineersemporium.co.uk
email: engineersemporium@zetnet.co.uk





The aluminium alloy base casting was well made and free from flash so required very little cleaning up prior to machining.



The base is not required until later but machining it is a simple operation with which to start. Note packing to prevent the jaws bruising the casting.

except in a couple of instances easily taken care of by the machining required. Little if any effort is therefore needed to clean them up by hand before use. Although at the time of writing the model is not complete, there have been no problems at all with the castings, other than the build up of metal on tools, which one expects with this material. The application of copious quantities of white spirit or paraffin during operations, taking all due care to minimise the fire and health risks in doing so, can prevent this.

It is left to the builder to supply the small quantity of mild steel and brass, and the various screws required to complete the model, which appears to be fairly standard practice these days, pretty well throughout the hobby. Eight drawings are supplied which cover the various parts including a general arrangement. I must say that while these are generally dimensionally correct, they do leave a little to be desired and working out what goes where is not always easy, but with any luck and a following wind, all should be revealed as we progress through this series.

I have a personal dislike of finishing a part and putting it aside while making the next one, so readers will find a fair amount of switching backwards and forwards as the model progresses. This has enabled me to match pieces to one another during construction. It may not have been necessary to go about the job this way as it was ultimately found that, so long as the dimensions shown on the drawings were carefully adhered to, assembly was no problem.

So, having introduced *Junior*, let us make a start.

Base

The base (photo 1) performs a dual role. Not only does it support the engine but it also acts as a fuel tank, the first example of excellent ideas which keep everything compact. It also obviously saves the bother and clutter of an external tank and associated piping when running the model.

Although it won't be used until later in the construction, truing the top and bottom surfaces is such an

easy task that it seemed to me to be a good place to start. All that is required is to face the top and bottom of the casting and drill six holes, two of which need to be tapped. The casting will fit in most 4-jaw chucks, but should be protected from damage by fitting shims between it and the jaws (photo 2).

Subsidiary faceplate

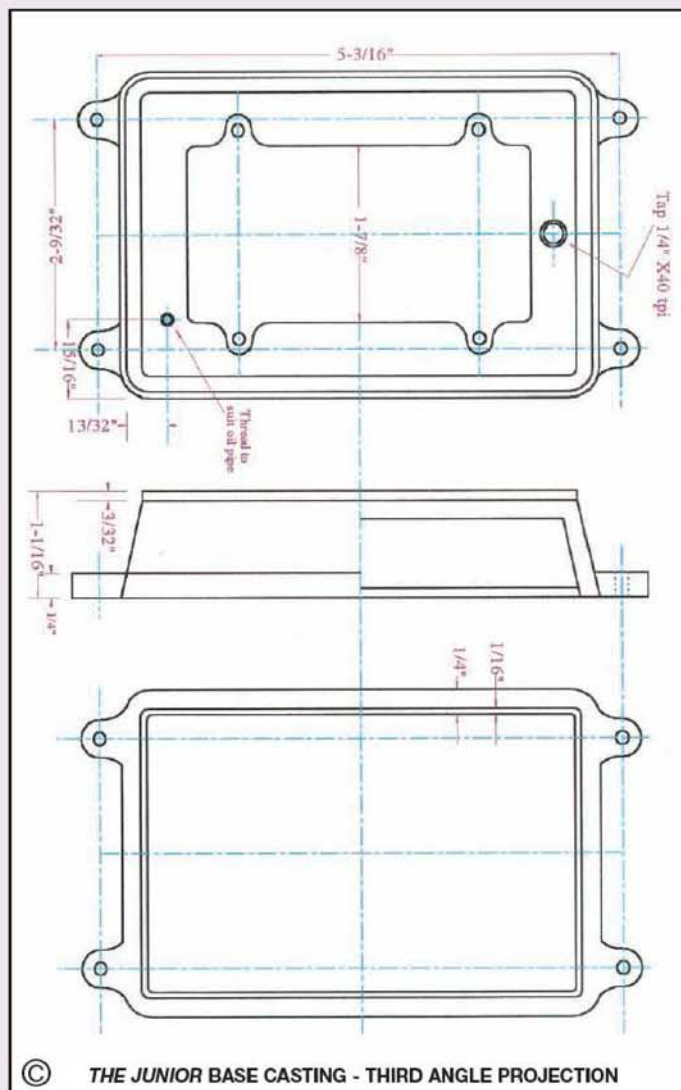
Anyone who finds that the casting won't fit in their chuck can start by drilling the four bolting holes and using these to bolt the casting to a piece of steel plate. Secure this sub-plate to the

lathe faceplate and use the set-up for the machining operations; there is no need even to centralise the casting in order to face it. Some may shudder at the thought of what appears to be a waste of a good piece of steel plate, but if set aside, it can be used time and time again for other such projects over the years. The plate does not have to be costly, many steel stockists have short lengths of 10 or 12mm ($\frac{3}{8}$ or $\frac{1}{2}$ in.) plate in their scrap bins which they are only too happy to dispose of for a small consideration. Steel scrap has little value these days and they sometimes even have to actually pay to have it taken away!

Drill and tap suitable holes in the plate to enable it to be bolted to your faceplate, and fit lengths of studding in them. The work can then be mounted on this sub-plate. With the plate bolted in position on the faceplate, but before you attempt to mount the work, take a light skim across it to ensure that it is running true, remove it, reverse it and repeat the operation on the other side. You now have a most useful subsidiary faceplate that can be drilled and tapped at will to accept any awkward shaped workpiece that has holes through which bolts will pass and which can save hours of setting up on a faceplate.

When using this technique to make this model, bolts passed through the four bolting down holes are fine when machining the top. However, it will not be possible to bolt through these fixing holes when machining the bottom of the casting. So, instead of using clearance holes in the casting, they should be drilled and tapped so that the casting can then be held by means of screws or bolts fitted through the back of the sub-plate. Spacers will be required between the faceplate and the sub-plate in order to clear the fixing nuts or bolts heads. It does not matter how many holes are eventually drilled in the plate, it can be used until it looks like a piece of Gouda cheese; the only thing to remember is that all the holes must be thoroughly deburred so that the workpiece sits flat. It can also be used where normal machining would mean gouging the faceplate.

●To be continued.



Keith Wilson

takes a look at a neat backhead and then sets about describing the boiler fittings for his locomotives.

●Part XXIX continued from page 86
(M.E. 4174, 26 July 2002)

As can be seen from the accompanying photograph, a very near 'scale' backhead is perfectly possible in this gauge. This is the backhead of Graham Tyler's *Prairie*. I must plead guilty to having made the basic locomotive, but I must emphasise that the finer details and the excellent overall finish are due to Graham only.

At the extreme left can just be seen the hand-brake handle. Next there are two pressure gauges; the upper one is for steam, the lower one is on an output supply to the hydrostatic lubricator. Next comes the water gauge, one of the most important fittings of all, equal only to the safety valve. The fairly large pipe to the right of this is the steam supply to the left-hand injector, further on is the regulator with its associated control valve for the hydrostatic lubricator system. Then comes the right-hand injector steam pipe and the brake valve. Tucked away under the right-hand end of this is the blower valve and over it is the vacuum gauge. Down lower is the sight-feed lubricator, and 'the pole' or reversing lever is out of frame on the far right. Regrettably the fountain or turret is not completely visible, just the injector steam valve handles.

Along the bottom can be seen the firedoor and above it the shelf with its obligatory supply of tea billies and an oil can. The green item at the lower right-hand corner is the driver's toolbox, the hinges are just visible.

The brake valve is different for 29s and 47s, for the one in the photograph has the ejector cones built in. The larger boiler engines had a big 4-cone ejector along the right-hand side of the boiler immediately 'inside' the handrail; as far as I am aware the 28s/38s had the type shown in the photograph. Early Saints were the same, and to avoid the question, I do not know when the big ejector came into force.

Safety valve

The body can be made from a solid lump of brass, with the top-feed bosses silver-brazed into place, or a casting may be available. Machining it is an interesting exercise in milling, with a rotary table in use, plus some lathe work. Note that the actual seating for the valves is at the bottom of a fairly deep hole with two liners fitted; this makes for better sealing and also directs escaping steam upwards. The liners are best bonded in, or a fairly good press fit, from below upwards.

Make sure that the liners are reamed to size with a good finish across the small or seating end, this makes for easier sealing. I have often found that further treatment (such as hitting a hard steel ball into the seating) quite unnecessary, a perfect seal being made with a ground stainless steel or bronze ball. Note the little rebate at the bottom of each top-feed hole, this is

SAINT CHRISTOPHER

A GWR LOCOMOTIVE for 7¹/₄in. gauge



*This view of the backhead of Graham Taylor's GW *Prairie* tank locomotive shows the fittings described in this article and demonstrates that a good looking working backhead is feasible in 7¹/₄in. gauge.*

for a piece of 1/4in. tube soft-soldered into place; as the photographs show these are curved to send the incoming water forwards. Note also that the eight holes for attachment to the boiler are not equally spaced.

The somewhat cryptic notes re. 5/8in. cutter and angles refer to the milling of the top face to get the right profile, thus if machining from solid, set the rotary table to 0 and take the first cut round to 115deg., back out from the cut, set to 180deg. and take the second cut round to 295 degrees. I hope this is clear.

With the characteristic habit of computers, some of the decimal figures are misleading. Thus 0.248in. should obviously be 1/4in., similarly 0.498 should be 1/2 inch.

I suggest bronze for preference for the liners. If stainless balls are used, the machining of the stem will be different, for nowadays all steel balls are hardened and you would have a merry time drilling through them, and a darned sight harder time tapping them.

An easy way to wind the springs is to use a bar of steel with a hole in it about No. 53 drill from which the sharp edges have been removed. Mount the bar in the lathe toolpost parallel to the lathe axis, chuck a piece of 3/16in. dia. steel in the lathe, and set the feed to 8tpi. Running the lathe in reverse helps as the wire then is clearly visible as it feeds over the top of the mandrel. To anchor

the wire into the chuck, a 90deg. bend in its end will locate it in the chuck jaws. Set the toolpost bit up close to the chuck, engage the saddle having set the saddle to traverse away from the chuck, run the lathe slowly, and watch the spring make itself. Cutting to length is easy enough, and the ends are then ground off flat.

The top cap is one of those fiddling bits that look right when finished.

The bonnet is a right pain; it is available as a casting but needs very careful attention to clean it up. The wings covering the top feeds may be beaten into shape over a former, they are best done as one unit. Silver-braze into the bonnet, using great care(!), and cut the middle portion away afterwards. The main part of the bonnet is polished for Saints, but the wings are painted green. For 47s, the whole bonnet is painted.

Now, I am fully aware that full-size top feeds contain clack (non-return) valves, but space is a bit limited and it is better to have the clack on the end of the injector. The only handicap is that injectors cannot so easily be changed when in steam, but they are now so reliable that this is rarely a problem.

Blower valve

This appears to be rather small for a 7¹/₄in. locomotive, but from experience I can confirm it has an adequate capacity. Used with an adequate



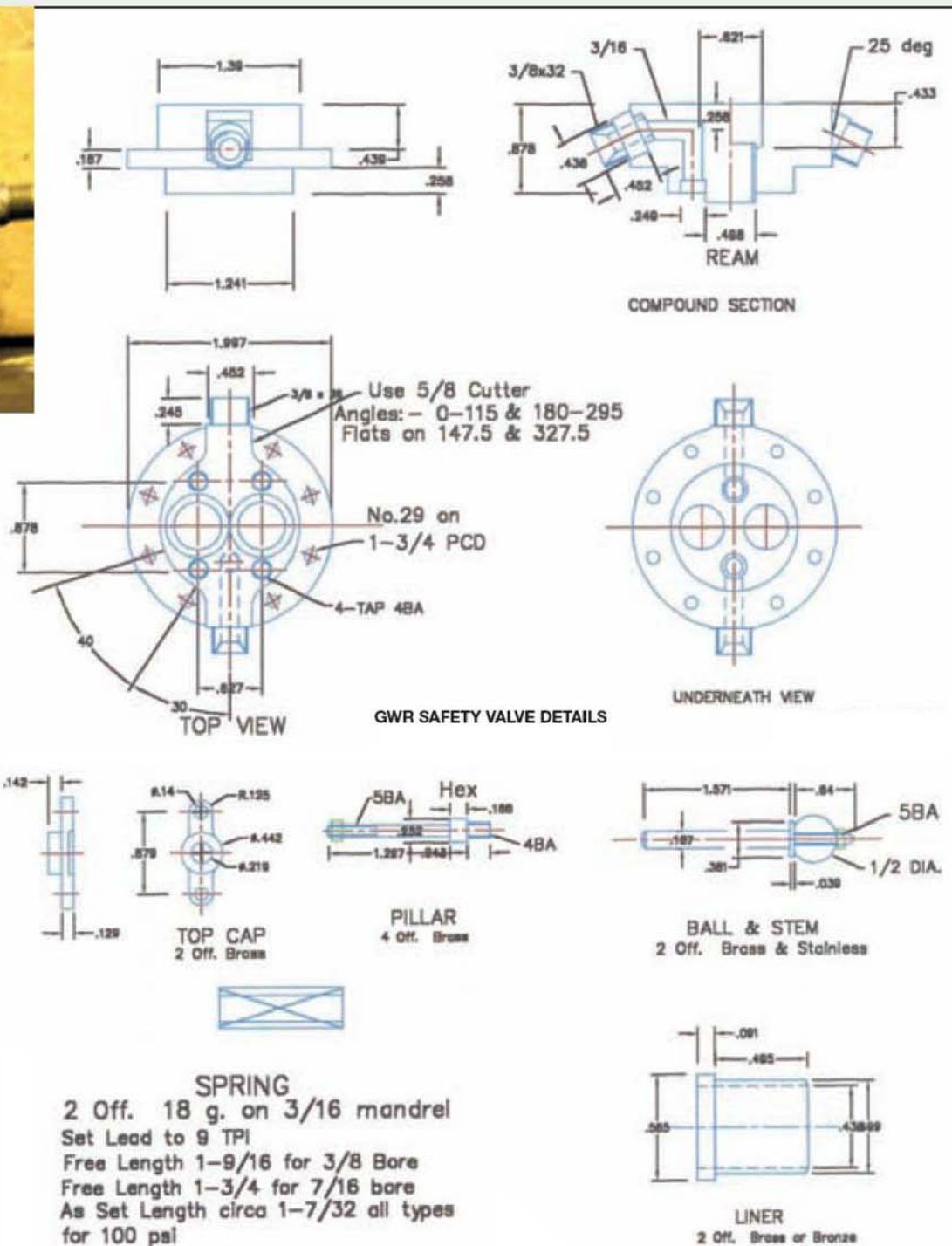
Safety valve and top feed fitting; note the forward facing feed pipes.

connecting pipe as already shown on the boiler drawings, and coupled to the blast nozzle/jet assembly with a $\frac{3}{16}$ in. pipe, it will do all that can be desired. Incidentally, to design scale valves, begin by plotting out the outline to scale, then see what insides can be fitted. You will see that all valves, apart from the water gauge blowdown, are captive, in that they cannot be unscrewed so far as to come out if opened too fully; a very embarrassing experience. (No, I haven't, but I have witnessed!)

It is somewhat tricky to get the lower hole into the right place, for it is fairly easy to have it break through into the existing or upper hole too near the base; should that happen, then use a D-bit to deepen the main bore, it might be needful to increase the length of the valve stem to compensate.

The machining of the remainder of the valve, the screw-in bit, should need no further comment, the end cap being held on with a wee dollop of Loctite 601. It is quite easy to poke the required O-ring into place provided the cavity is about twice ring thickness long. The valve stem itself is a bit tricky, being rather long and thin. Begin at the end, and work backwards, bejabours! So put the stock $\frac{3}{16}$ in. in the chuck with about $\frac{3}{8}$ in. outstanding, reduce to size and thread 8BA. Then use a small file to put the square part on. To do this easily, put chuck jaw No. 1 at top. File about half-a dozen strokes, then turn chuck so No. 1 jaw is at 9 o'clock, repeat filing. Then (as if it were not obvious) at 6 o'clock, then 3 o'clock. This should produce an adequate square section; if not, go through the process again, but with fewer file-strokes.

Pull the job out of the chuck so that about $\frac{3}{8}$ in. stock is proud, reduce to just over $\frac{1}{8}$ in. dia., pull out another $\frac{3}{8}$ in. and repeat, remembering to stop turning at the $\frac{5}{8}$ in. long mark.



©

Then a final cut at high speed with a sharp tool (just round off the pointed tip with a slipstone), a fine feed will leave a good finish of the right diameter. Pull out another $\frac{5}{16}$ in. and (preferably) screw-cut to 24tpi, completing the task with a $\frac{3}{16}$ in. Whitworth die. Then pull out another $\frac{3}{8}$ in. and part off.

I have mentioned it before, but the smallest Eclipse parting-off blade is only $\frac{1}{16}$ in. wide x $\frac{5}{16}$ in. deep; it is not often stocked by high-street toolshops, however Chronos (01727-832793) list them, they suit a $\frac{3}{16}$ in. lathe down to the ground and are ideal for these small jobs.

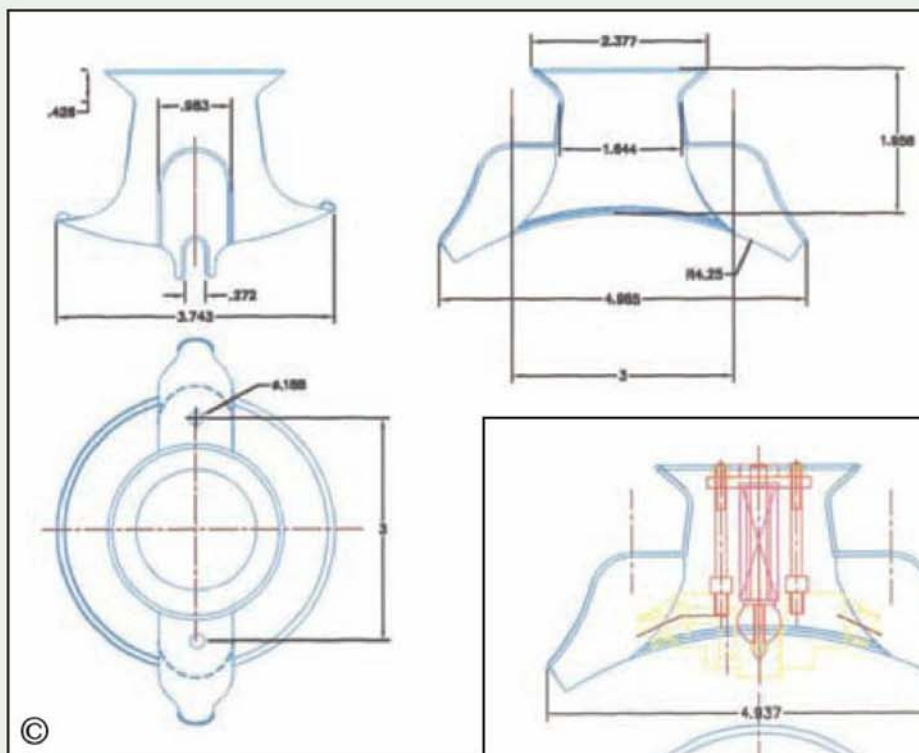
The last operation is to chuck again, t'other way about, and produce the conical end, which is not critical.

The boss of the handle is a 4-jaw chuck job. The hole should be drilled before parting off, and

opened out halfway through to $\frac{1}{8}$ in. dia; the use of a square needle file will soon produce a square hole to match the valve; it should be a tight fit. The easiest way is to get the square hole almost to the right size, then use the stainless valve as a broach; the 8BA nut (preferably with a washer) will make all secure.

The full-size handles were of wood, probably ash, like file handles, and in our sizes are best made from Tufnol. I find 'Carp' brand to be satisfactory, and 'ere parting off, a quick squeeze of the still-rotating handle with the average workshop not-over-clean finger and thumb will impart the correct colour.

The resulting handle, as shews in the photographs, is not only realistic but far easier to handle (pun deliberate) than the wheeled type, notched on circumference or not.

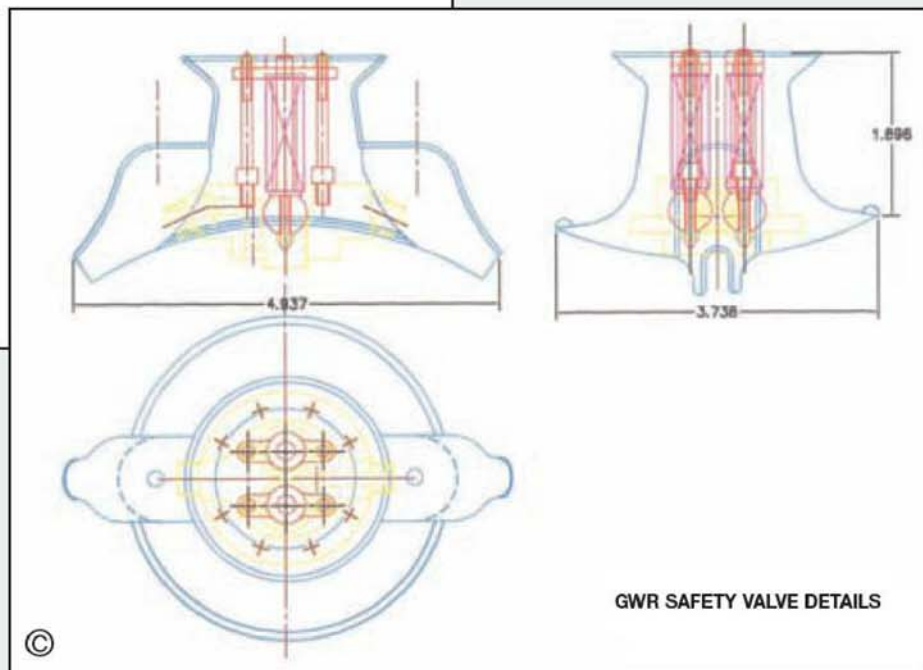


Fountain or turret

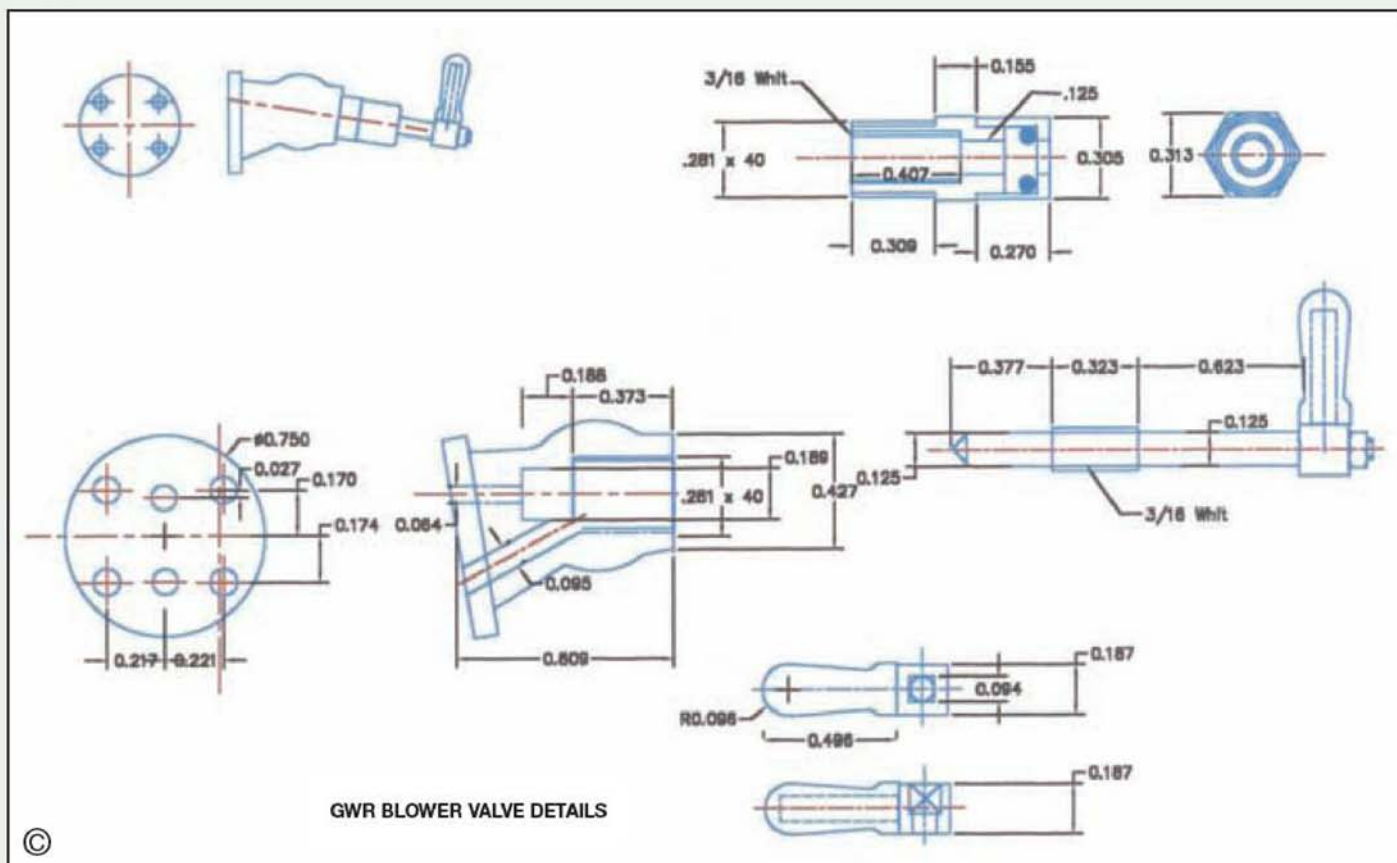
Lots of bits, but worth it in the end. The main body is silver-brazed together, and it may prove to be easier to make the round body out of square material, turning it round after drilling. The valve stems, etc. have just been described, and although the whistle valve top bodies are shown with two outlets, they are required one to each hand. Note that the two main valves are screwed into bushes which in turn are silver-brazed into the main body.

A brief note here. The full-size fountains were cast with three such bushes, the centre one being a supply of live steam to boost the exhaust steam

injector in the case of large locomotives other than Kings. These had automatic change-over valves for the exhaust steam injector (mounted on the left side of the engine), so only two control valves were needed on the fountain. There were some fountains with only two such bosses, in the main for smaller locomotives which had only two live steam injectors. (Prairies, moguls, tank engines generally; I am not sure about the 28s and



GWR SAFETY VALVE DETAILS



GWR BLOWER VALVE DETAILS



Boiler fittings as described in the text:
 Top left: valve bosses.
 Top centre: blower valves.
 Top right: steam valve stem.
 Bottom left: injector steam valve.
 Bottom right: fountain body.



47s.) On full-size, there were several other bosses on the fountain, but we don't need them.

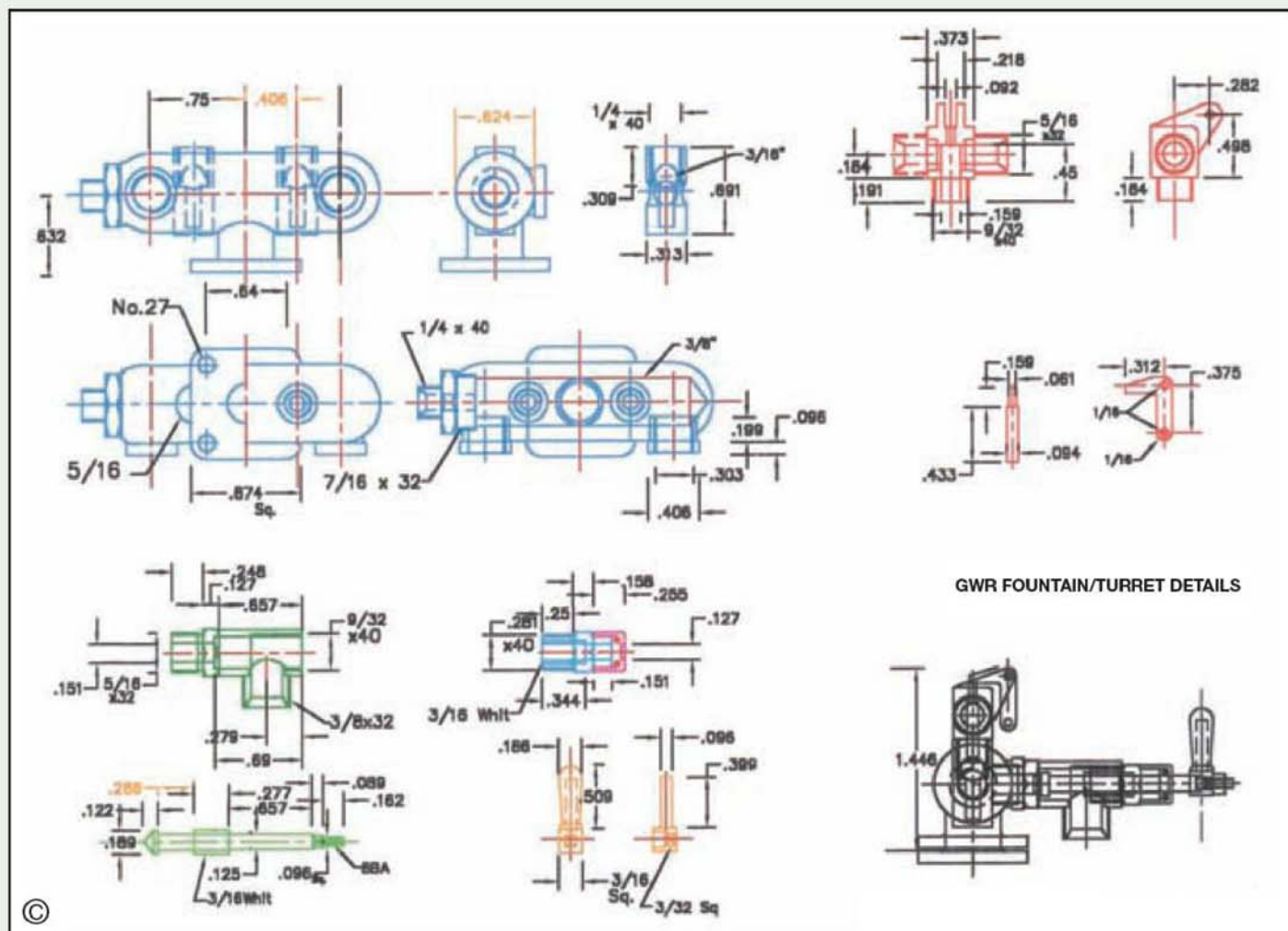
Preparing a full-size casting with cast-in interior is a somewhat different matter to trying to cast one in our sizes, so fabrication is more or less obligatory. Reeves do a suitable casting, but the inside is solid which means that the casting must be cut in two, drilled out, and silver-brazed together again. Their pattern allows for this, but so far I have always used the complete fabrication method. The built-in whistle valve control is tricky but there is very little room for them outside. So far, I have failed to 'scale' the full-sized valves and have them pass enough steam for a decent whistle.

My very first locomotive was a 2¹/₂in. gauge

Mary Ann to a design by LBSC, it is probably unique in having the whistle valve push-rod made of pure titanium! I was testing some in a science laboratory — we had to find its surface tension when molten (I don't know why). It was supplied in 16g wire form with plenty to spare, so I 'procured' an inch or so and used part of it. In those days it was fairly rare, presumably being difficult to extract from its ores; nowadays it is relatively common. For example, titanium dioxide has a very high albedo so it is used in large quantities in super-white paint. But the thing I remember most about titanium is not so much its very high strength but its glorious thistle-purple-blue flame coloration.

Whistle chain is a problem, bath-plug chain is a bit coarse in appearance. A clock-repair firm can obtain suitable brass chain as used in cuckoo clocks. (What's a cuckoo clock? A clock that strikes 13!) I find this will pass easily through a 7/32in. hole so, to help keep it clear of backhead fittings generally, mount a little bracket on the inside of the cab roof with a couple of 7/32in. I/D brass bushes soldered in it. The chains can be led from the actual whistle valve levers through these holes and attach to the rear of the cab roof; they are then easy to tug when needed. If mounted in 'scale position' they are certain to catch your fingers when reaching for other backhead controls.

●To be continued.



CLUB CHAT

With Stan Bray

UK News

In preparation for excavation of the track bed so that work can start on the ground level track extension as soon as convenient, members of **Bedford MES** have been marking out the route during the summer. Improvement work also continues on the raised track, assisted by the use of a specially made set of bending rolls and involving the replacement of all the existing track with profiled aluminium rail. It is anticipated that by next winter the layout will be some 950ft. long. Members and visitors alike were able to enjoy a well stocked club exhibition during which the annual club competition was judged with the following results. *The Eddie Lancaster Cup* went to Phil Wright for a 3 1/2in. gauge Derby 4F locomotive, *The Combes Plate* to Dorothy Millard for a collection of knitted dolls and *The Winifred Hindes Cup* to Les Shaw for a 3 1/2in. gauge *Princess Royal*. *The Best Stationary Engine* was judged to be Geoff Brandon's Hick oscillating engine, the *Best Engineering Section Item*, Peter Wilton's miniature lathe and accessories, the *Best Unfinished Model*, Peter Wilton's 1 1/2in. scale traction engine, the *Best Work by a Junior*, Jack Soames' oscillating engine, and the *Best Marine Model*, David Elvin's twin cylinder steam plant.

With a number of different layouts available for display and more members to supply the manpower, the **Gauge '1' MRA** has recently been represented at more exhibitions than ever before. The latest layout, *Dobson Bridge*, differs from previous layouts in that the locomotive yard is raised which gives onlookers a better view of what is going on while also providing useful storage space for made-up trains beneath. Several regionally based layouts are available and while maybe not as large as the main layout, these are welcomed by exhibition organisers. The Association's worldwide appeal is well known, and the first ever such Get Together was held in April at Devonport, a borough of Auckland in New Zealand. A good turnout of members resulted in plenty of locomotives and rolling stock being available to keep things busy. However, members who live too far from Auckland were unable to make the trip, but doubtless, now that a start has been made, other gatherings will be convened in other parts of New Zealand.

All steam locomotives used by **City of Oxford SME** for passenger hauling this

year have been successfully fitted with spark arrestors and regardless of type, all have worked successfully with no evident impairment of locomotive performance. It seems that problems were imagined rather than actual, and concerns regarding their fitting and use were unfounded. Having been invited to return to the old site at Blenheim Palace with a 25 year lease, after careful consideration of all the information available about such a move, and full discussion at committee, members have decided that the club is better served by staying where it is in Cuttleslow Park where they appear to have a good working relationship with the authorities. The first family day of the year saw a number of partners and children making good use of the opportunity to drive locomotives; the success of the day has resulted in another to be scheduled for October. To maintain an accurate record of boiler tests, a database has been set up, and for the information and peace of mind of all concerned, a regularly updated printout listing locomotives whose boilers have a current certificate is displayed on the club notice board.

A visit by members of **Bristol SMEE** to the JCB works at Uttoxeter was so popular that virtually every seat on the coach was occupied, even though the long journey called for an early start. A breakfast stop was made *en route* and the coach eventually reached its destination at around lunchtime. The visitors were introduced to three retired members of the company who were to be their guides for the visit, and lunch was taken in the works canteen. After lunch, a most interesting tour lasted some three hours during which the visitors were able to hear every word of a full and detailed commentary via microphone, transmitter and earphones, an arrangement which was particularly convenient in the noisier parts of the works. Planning permission for the club to build a new carriage shed has been granted and although delayed for a while because the ground was too wet for a mechanical digger to be used, work has begun. A new traverser has been completed and looks very impressive with the two tracks curving away in opposite directions, unlike the more traditional arrangement with parallel lines.

For use by fellow members of **Manx Steam & MEC**, John Barber

is building a casting furnace for the club. Making castings may be a new skill for many, but once the art has been mastered the satisfaction of preparing and making castings for themselves will be considerable. Castings should also be available at a fraction of the commercial rate, always assuming a jobbing foundry could be located to do the work. The club's AGM was attended by 14 members and the committee was re-elected *en bloc*. A day or two later everyone was shocked to learn of the sudden death of founder member Chris Rogers, the club Secretary. Treasurer John Messenger has stepped in to take on the role of Secretary so readers who wish to make contact with the society are asked to contact John on 01624-628081.

All the facilities at **Birmingham SME** are being given a major face lift in order to restore them to pristine condition; this will also involve minor alterations as appropriate where hindsight, that most useful facility, indicates that improvement will be beneficial. The club facilities have developed over the years, making their maintenance an increasing problem, so it has been suggested that following this summer's major 'sort out', regular twice-yearly sessions should be arranged, one each spring to prepare for the summer running and the other each autumn to clear up after the summer and 'batten down the hatches' before winter takes hold. It has also been suggested that a boating section is formed within the society; it now remains to be seen how many members will be sufficiently interested to support the proposal. The garden gauge track has certainly proved to be a winner, and is now possibly the most popular feature in the club. We understand that the club's upgraded catering facilities have passed a local authority inspection with flying colours. As an Easter treat for the children, Cyril and Sheila Millward planned an egg hunt, carefully distributing and hiding chocolate mini-eggs around the track site. When the hunt began everyone was disappointed that the eggs were nowhere to be found. After puzzling why this should be, a glance upwards into the trees revealed some very satisfied squirrels which had obviously got there first!

West Riding SLS has a new Secretary; after a very long term of office, Marjorie Bradley has stood down and the position is now held by David Batty, 6 Silcoates Lane, Wrenthorpe, Wakefield WF2 0NX (01924-363908), to whom all corre-

spondence relating to the club should be sent.

The number of models on show in the annual **Rotherham DMES** exhibition has gradually increased over the years, as indeed has its popularity with the public. This year was no exception and for the first time the event filled two halls at the Rawmarsh Leisure Centre. Support came from **Scunthorpe MES**, **Doncaster DMES**, **Leeds SMEE**, **Grimsby & Cleethorpes MES** and **York City DME**, thereby ensuring that this year's was a really first class show. As now seems inevitable when a society manages to stage a successful function, the owners of the premises have substantially increased their charges for next year. The club envisages considerable problems with this and will seek a concessionary rate, but careful forethought and pre-planning will be necessary before a decision can be taken whether future exhibitions will be viable at the new rates. Hopefully they will go ahead at the same venue; having built up a reputation for a successful event a move to a new venue would be unhelpful. Members have also been busy completing a variety of tasks which, as well as constructional work, involved clearing up and filling three skips with general rubbish. The local authority is to endeavour to assist in keeping vandals at bay by providing security barriers on the roof of the club room and workshop, while anti-graffiti paint will also be supplied for the tunnel doors. On inviting Eric Lowe to become President, the committee was particularly pleased when he accepted the position.

Rail to allow the operation of 2 1/2in. gauge models on the **Fylde SME** track was completed in June, work having started in November 1999. The prime mover behind this project was Norman Almond who adapted his router to use the 3 1/2in. gauge rail as a guide to groove the sleepers to accept the new rail. Several other club members became fired by his enthusiasm and assisted in a task which involved making 525 brackets, welding them to the rail and then drilling hundreds of holes for screws to hold the brackets in place. The team worked through some pretty awful weather, wellies being the order of the day on several occasions. Towards the end of the project, the router decided that enough was enough and showed a marked reluctance to rotate. The problem was traced to worn-out brushes, the result of grooving some 3000 sleepers. The steaming

bays have now been adapted with the extra rail so it's 'all systems go' for 2 1/2in. gauge models to use the track which, at over 1000ft. in length will provide a good test of driving ability as well as locomotive performance.

Having completed the signalling system, Saffron Walden DSME now needs a signal box in which to house the operating gear, and a miniature lever frame to operate the pointwork. The signal box will have to be designed and built to complement its surroundings, and there has been a suggestion that when erected it should be sunk a little way into the ground so that from an external point of view it will appear to be of scale height. At a childrens' day held on 23 June on the Audley End Estate Railway, club members dressed themselves as bears or cartoon characters to assist, and all appear to have had as much fun as the children! Some members have also been busy helping with the design of an automatic signalling system for the estate railway, basing it on train detectors bolted to the rails that react to the sound of a train approaching. The system is expected to be more reliable than infra-red detectors, which are liable to react to movement other than the trains, thus upsetting the whole system.

With official permission to occupy their track site at Lynnsport for another 10 years now granted, the way is clear for members of Kings Lynn DSME to plan for the future. A number of improvements were set in hand to make operation easier and safer as soon as permission was received. Some negotiation with the contractors responsible for cutting the grass will be necessary in an endeavour to prevent them from running their equipment across the track and by doing so altering the camber and alignments. 'Inclement weather', a good British euphemism,

In Memoriam

It is with the deepest regret that we record the passing of the following members of model engineering societies. The sympathy of staff at *Model Engineer* is extended to the family and friends they leave behind.

Chris Rogers
Geoff Tomlinson
John Comrie

Manx Steam & MEC
Rotherham and District MES
Maidstone (New Zealand) MES

meant that the club barbecue could hardly be classed as an outstanding success; high winds made off with the tent and torrential rain washed everything else out, despite which a number of members claim to have enjoyed themselves. With regret we report that the club will not be holding its exhibition this year, the first time for many years that there has been no such event. Uncertainty regarding the situation at Lynnsport caused difficulties finding volunteers to run it. This news will be greeted with disappointment by many local people and members of other societies in the area, the members of which like to go along to renew established acquaintanceships. With uncertainty regarding their occupation of the Lynnsport track site, 2002 has been a difficult year leaving little opportunity to even think about an exhibition, let alone arrange one, but it is anticipated that there will be one in 2003.

World News

Canada

During the last year or so the Ottawa Valley LS & ME tracks have been much improved. Most upgrades have been concerned with improving operational work, including some pointwork modification and replacement of the 5in. gauge steaming bays on the ground level track with dual gauge 5 & 7 1/4in. gauge lines. A new coach siding has been added, leading from the station area to near the turntable and long enough to allow a complete train to be parked without any need for uncoupling. A new raised track is proving very popular, and it is hoped that it will be extended to its full proposed 400m length during

the summer. Except for the raised track extension, all work was completed in time for the Heritage Weekend and was much appreciated by the many visitors in attendance. An extensive exhibition was also much enjoyed, the numerous exhibits covering a whole range of disciplines within the hobby.

An interesting and entertaining evening was enjoyed by members of British Columbia SME when John Clarke talked about and demonstrated a radio controlled machine which he had built. Last winter he used it to clear the snow from his front drive, something which we might think unremarkable until we learn that at the time he was sitting comfortably in an armchair by a nice warm fire. As a result he seems to be the envy of his neighbours. A matter taken very seriously by the club is the ability of a driver to stop a train within a reasonable distance, the criterion for drivers being the ability to stop within the distance that they can see. This means that speed should be adjusted according to the immediate situation, taking into account the load being hauled. Some time ago, tests were carried out by placing a cone on the rail and using it as a marker to check that trains were able to stop; everyone passed the test with flying colours. Many more people have recently wanted to ride on the railway, with the result that trains are heavier and drivers are under pressure to travel faster in order to keep the traffic flowing. With this in mind, the braking distance test was repeated in June with the result that all the trains running at the time failed to stop within the allotted distance. This has led to a

suggestion that braking tests become a regular part of the club procedure until drivers are better able to judge the stopping requirement with greater loads and speeds. It is remarkable that since the 11 September terrorist attack in the US last year, the club has had a massive increase in insurance premiums. Does the insurance company really believe the railway is likely to become the focus of a terrorist attack, or are they just trying to recover lost revenue?

New Zealand

A problem to be resolved as soon as possible by Hutt Valley MES is the storage of the club passenger cars which have previously been kept in the tunnel. Improved facilities mean that the cars no longer fit and a new arrangement is urgently required. The society's AGM was held in June and passed with no major committee changes and, possibly more important to all present, no increase in the society's annual subscription. It was agreed that an increase in membership would be welcome (and necessary) and suggestions were invited.

A decision by Maidstone MES to continue public running throughout the winter seems to have been well received, a number of visitors having complimented them on doing so. There have also been quite a few passengers that do not normally attend in the summer, for whatever reason. Additional publicity for their programme will come in the form of a special promotion of all local clubs and societies by the community newspaper. Preparations for a new station apron to include a barbecue area for which both physical and financial help has been received from the local Round Table group, are now complete and by the time this is in print, the concrete will have been poured

CLUB DIARY

A minimum of 6 weeks notice is required for diary entries. Clubs and Societies are asked to include a telephone number for the assistance of would-be visitors.

To 3 September STEAM - Museum of the Great Western Railway.
All Aboard the Holiday Express. Information: 01793-466646.

To 30 September. Kew Bridge Steam Museum. Exhibition:
Richard Trevithick - Maverick Genius of Steam. Information: 020-8568-4757.

AUGUST

- 24 Chesterfield MES. Running Day. Contact Mike Rhodes: 01623-648676.
- 24 GL5MLA. AGM. Contact Chris Nesbitt: 01332-756128.
- 24 Hornsby ME. Family Day. Contact Ted Gray: 9484-7583.
- 24 STEAM - Museum of the Great Western Railway. Meet the Railway Workers. Information: 01793-466646.
- 24-26 Erewash Valley MES. Invitation to Grimsby & Cleethorpes. Contact Jim Matthews: 01332-705259.

- 24-26 GW Soc. (Didcot Rly. Ctr.) Steamings. Contact Jeanette Howse: 01235-817200.
- 24-26 Harrow & Wembley SME. Open Weekend. Contact Dr. Roger Greenwood: 020-8427-2755.
- 24-26 Ryedale SME. Mainline Rally. Contact Michael Burch: 01439-788033.
- 25 Ascot LS. Members' Steam-Up. Contact Tony Alderman: 01932-854393.
- 25 Chichester DSME. Steam on Sunday. Contact Brian Bird: 01243-542266.
- 25 MELSA. Sunday in the Park. Contact Graham Chadbone: 07-4121-4341.
- 25 Plymouth MSLS. Running Day at Plym Valley Railway. Contact John Brooker: 01752-671722.
- 25 Reading SME. Running. Contact Graham Bustin: 01189-615450.
- 25 Talylyn Railway. Land Rover Rally. Enquiries: 01654-710472.
- 25 Woking MRS. Open Day. Contact Ronald Dewar: 01932-343331.
- 25/26 Vale of Aylesbury MES. Bank Holiday W/E. Contact Clive Ellam: 01296-623433.

DETAIL in DESIGN



Drawings, castings, fibreglass mouldings, motors and electronic control systems available for the following 5" Gauge locos:

- Class 10*
- Class 20 (Chopper)
- Class 35 (Hymec)
- Class 37
- Class 40 (Whistler)
- Class 45 (Puck)
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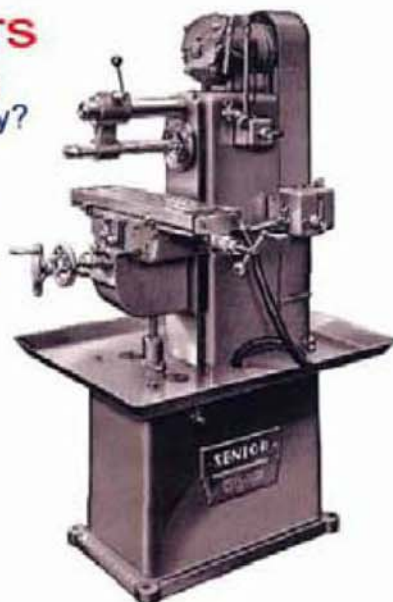
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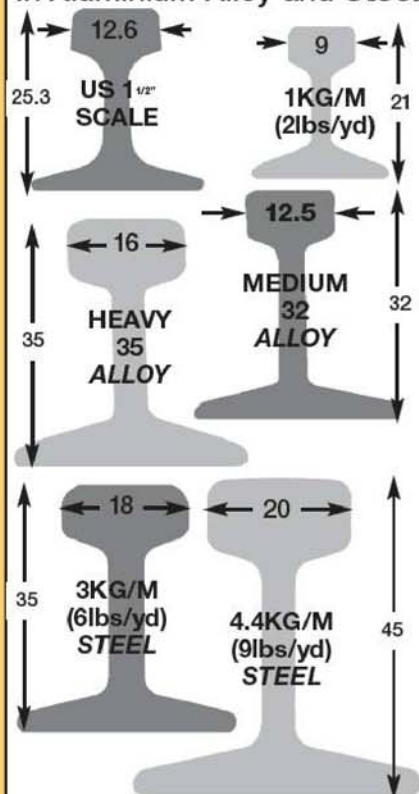
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- Motor: 1/4hp
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920 Lathe Deluxe

- Swing over bed: 229mm
- Swing over cross slide: 133mm
- Distance between centres: 500mm
- Spindle bore: 19mm
- Taper in spindle nose: MT3
- Motor: 1/4hp
- 6 Speed: 100-1800rpm
- Net weight: 100kg

STANDARD EQUIPMENT:

- 4" 3-jaw chuck with 2 sets of jaws
- 7" 4-jaw chuck with reversible jaws
- Steady rest + follow rest
- MT2 Dead centre
- MT3 Dead centre
- 4-way tool post
- Face plate
- Tool Box & Tool Kit
- Turn & Splash Guard



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Model B-Super

- Swing over bed: 420mm
- Distance between centres: 500mm
- Mill drill spindle taper: 19mm
- Tailstock travel: 80mm
- 7 speeds: 60-1360rpm
- Swing over cross slide: 160mm
- Spindle taper: MT3
- Draw bar MT2
- Cross slide travel: 180mm
- Motor: 1/2hp
- Net weight: 155kg

STANDARD EQUIPMENT

- 4" 3-jaw chuck
- 2 dead centres
- 1/2 drill chuck
- Change gears
- MT3 chuck arbor

£725

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Comet Lathe

- Swing over bed: 250mm
- Swing over cross slide: 133mm
- Distance between centres: 550mm
- Spindle bore: 19mm
- Taper in spindle nose: MT3
- Motor: 1/4hp
- 6 Speed: 125-2000rpm
- Net weight: 130kg
- Mill Attachment
- Spindle taper: MT3
- Head travel: 215mm
- Speed variable
- Range: 0-3,000rpm
- Motor: 1/4hp
- Net weight: 45kg

£1155

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Centurion

- Swing over bed: 420mm
- Distance between centres: 500mm
- Mill drill spindle taper: MT3
- Tailstock travel: 80mm
- 7 speeds: 160-1360rpm
- Swing over saddle: 160mm
- Spindle taper: MT3
- Draw bar MT2
- Cross slide travel: 200mm
- Motor: 2 x 1/2hp
- Net weight: 250kg

STANDARD EQUIPMENT

- 4" 3-jaw chuck
- 2 dead centres
- 1/2 drill chuck
- Change gears
- MT3 chuck arbor

£1395

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Craftsman Precision Belt Drive

- Swing over bed: 300mm
- Swing over gap: 450mm
- Swing over saddle: 170mm
- Distance between centres: 570mm
- Spindle bore: 36mm
- Spindle nose taper: MT5
- Cross slide travel: 150mm
- Compound travel: 85mm
- Tailstock travel: 92mm
- Range of speeds: 50-1250rpm
- Motor: 11/2 hp
- Net weight: 390kg

STANDARD EQUIPMENT:

- 6" 3-jaw chuck with 2 sets of jaws
- 8" 4-jaw chuck
- Steady rest + follow rest
- Steady rest + face plate
- Splash guard + threading dial
- 4-way thread tool post
- 3MT dead centre
- T-slotted cross slide

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Cub 620/630

- Swing over bed: 300mm
- Swing over gap: 430mm
- Swing over saddle: 174mm
- Distance between centres: 500/750
- Spindle bore: 30mm
- Spindle nose: D1-S
- Spindle nose taper: MT5
- Cross slide travel: 160mm
- Compound travel: 75mm
- Tailstock travel: MT3
- Tailstock travel: 70mm
- Range of speeds: 9-60-2000rpm
- Number of inch threads: 33
- Range of inch threads: 4-72 TPI
- Motor: 11/2hp 240V or 2hp 415V
- Approx shipping weight: 380kg
- Number of metric threads: 27
- Range of metric threads: 0.25-9.0mm
- Motor: 11/2hp 240V or 2hp 415V

STANDARD EQUIPMENT:

- Handwheel and compound gears in handstock
- Built-in stand
- Foot brake
- Heated light
- Locking handwheel retracts
- Face plate
- Emergency stop
- 4-way thread tool post
- 6" 3-jaw chuck with 2 sets of jaws
- 8" 4-jaw chuck
- Steady rest + follow rest
- 2 dead centres
- Coolant system w/ water splash guard
- Threading dial
- Direct reading dial cross slide
- Removable chip tray

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