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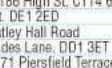


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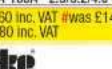


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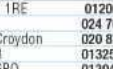
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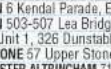


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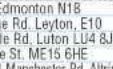


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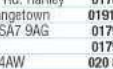


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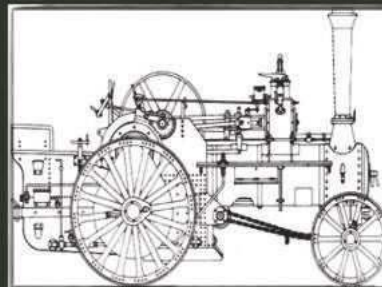
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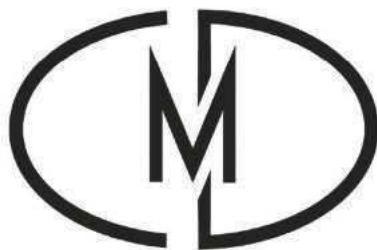
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A Line in Winter

Well – was that it? It seems that winter is over already, if it ever arrived. It was so mild this year, I gather, (at least in Suffolk) that even the hedgehogs didn't bother to hibernate. They may well have been blown away by Storm Ciara though. I haven't seen the hedgehog lately that I discovered in my workshop recently so that is certainly a possibility. Is the mild winter a symptom of anthropogenic global warming or simply a set of freak weather conditions – something to do perhaps with the jet stream? Who knows? Perhaps Greta Thunberg will tell us. Anyway, it's a debate I am unwilling to enter as it is guaranteed to divide the readership, which is not my job! In any case I don't want my lawn dug up by the local Chapter of Extinction Rebellion, who, as I write, are hard at work doing their thing in Cambridge, not so far from here – certainly no more than a



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Rodney Oldfield

I have just received the sad news that Rodney Oldfield, one of our current contributors, died on the 18th February after a period of ill health. His series on the Middleton double beam engine is currently running in this magazine. I hope to include a few words about Rodney in our next issue.

day's journey by horse and cart, or traction engine.

Like the Sunderland club (see last issue) I too can claim to have been a victim of the winter weather. The top 15 feet of one of the trees came crashing down on my garden railway one night. However, it managed to miss anything valuable or fragile (like the greenhouse) and ended up lying reasonably elegantly across the track. I was fortunate in that (unlike Sunderland) no civil engineering works were required and the resolution of the problem required only the use of a chainsaw.

So - I imagine that clubs are buzzing now with preparations

for the running season and, if not, why not? There must be leaves to remove from railway lines, signal lenses to be polished, boating ponds to be skimmed of all manner of floating things and tea caddies to be restocked. Your editor is busily adding an enhancement to his signalling system by adding a facility to change the points, on the run, without having to get off the train. This is very simply done using a key-fob wireless remote control (of the type used for opening garage doors) – Amazon, £8.99. Amazing, isn't it? Watch these pages for a Garden Railway update in due course!

Sweet Pea Rally

This year's Sweet Pea Rally will be held at the Hereford Society of Model Engineers over the weekend of the 6th/7th of June at their Broomy Hill site. Hopefully the floods will have receded by then and snorkels will not be needed. However, boiler certificates will of course be required, as will insurance for each

entry. Entrants will compete for the June Drake Memorial Trophy, which will be awarded on the Sunday. Broomy Hill has a ground level 7¼ and 5 inch gauge track and a 5 and 3½ inch raised track, both of which may be used. Young engineers may drive under supervision. There is plenty of caravan and camping space. Application

forms are available from John Arrowsmith (01432 265151 or pannier@hotmail.co.uk) and should be returned by the 18th April. The postcode of Broomy Hill is HR4 0LJ and the club's website is at www.hsme.co.uk which includes directions for getting there. It promises to be a fun weekend which can be enjoyed by both visitors and entrants alike.



Last year's Sweet Pea Rally winner, Brian Holland (photo John Arrowsmith).

A Boiler Feed Pump

Ian Couchman redesigns the boiler feed pump for his Ruston Proctor traction engine.



Continued from p. 375
M.E. 4633 28 February 2020



Partly machined casting for the main valve.



Turning the shuttle.

Valves

Now we've got the housing, let's add the bits which make it work! **Figure 11** shows the valves. The main valve (**photo 50**) is a straightforward machining job. The shuttle (**photo 51** - nearly finished)

should fit the main valve with the minimum clearance end-wise, consistent with free movement. A reasonable amount of sideways clearance is recommended.

The pilot valve (**photo 52**) is also straight forward. The chamfers on the corners should be great enough to allow the valve to travel all the way to the end of its slot in the valve chest. **Photograph 53** shows the valve with its nut and operating rod. The rod should be stainless. **Figure 12** has the details of the pilot

valve actuator and tappet, while **photo 54** shows these assembled on the pump.

You'll notice an airline connected to the input. I couldn't resist a quick run! The actuator clamps to the valve rod, roughly central to the travel. The tappet screws on to the valve rod and can be moved along the rod to get accurate positioning of the operation. Adjustment isn't critical but you may find the pump runs okay dry but stops at one end when pumping. Just move the tappet a little and it will work fine.

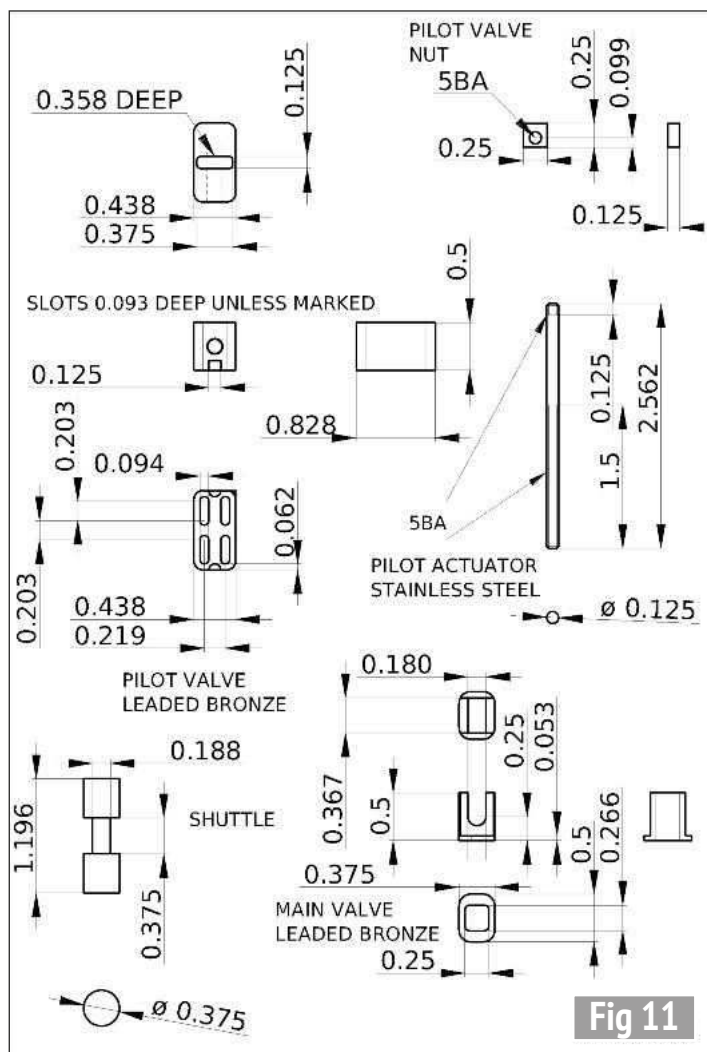


Fig 11

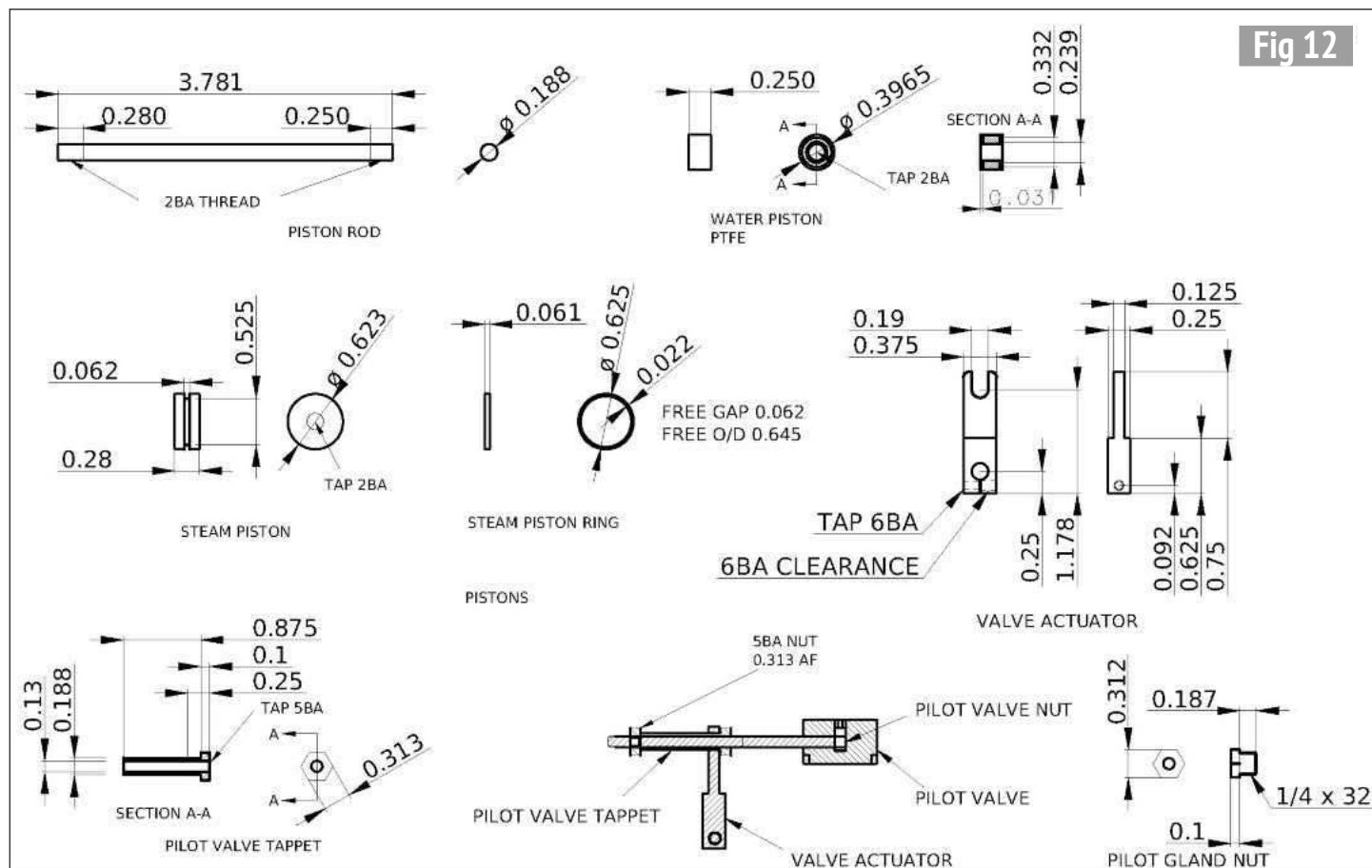


The pilot valve. In need of a little deburring!



Valve with nut and rod.

Fig 12



Pistons

Figure 12 shows the details.

Let's start with the water piston. Take a length of PTFE rod... **photo 55** shows it under construction. The idea is that the tapered recess in each end creates a fine, flexible sealing edge, which is forced out against the pump wall to create a good seal. The higher the pressure, the better the seal - seems to work in practice. The piston will be drilled and tapped 2BA to fit on the end of the piston rod. On the original pump, I drilled two small holes in one end which allowed the ends of pointed tweezers to grip the piston to un-screw it from the plug end of the pump. Since I never used these, I left them out on this one.

Photograph 56 shows the steam piston having the ring groove machined. I started by turning the piston to length but over-size on the diameter. I drilled and tapped the hole and fitted it to the piston rod, using high temperature Loctite, just to make sure. Then, holding the assembly in a collet, by the rod, the outside

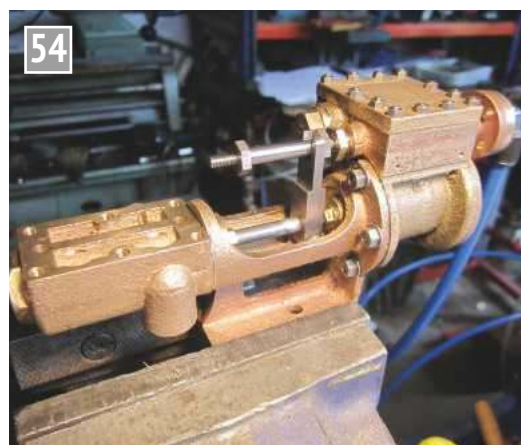


Photo 54: Pilot valve actuator and tappet.



Photo 55: Turning the water piston from PTFE rod.



Photo 56: Turning the steam piston from brass.



Photo 57: Piston ring machining jig.

diameter was turned to size and the groove cut.

Now the piston ring. This seems to be a controversial subject, with 99 different views per 100 model engineers, but here's how I did it. First, I made a jig to machine the rings to final size (**photo 57**). I wanted to end up with a ring that had a free gap of one tenth of the bore, which, with the chosen thickness, should give me a suitable wall pressure. Adding the free gap to the circumference of the bore then dividing by pi gives me the free diameter of 0.645 inch. I turned a piece of cast iron to 0.645 and bored the centre to 0.645 minus twice the ring thickness, which gives 0.601 inch (**photo 58**). I then parted off the ring to the correct width plus a couple of thou.

Next, I cut the ring and filed the gap to fit the sizing ring, which has a bore of 0.645



Boring the inner diameter of the piston ring blank.



Skimming the outside diameter of a piston ring.

inch. The sizing ring was then slid over the jig body, the clamp fitted and the clamping screw tightened. The outside diameter of the ring was then skimmed to the bore size (**photo 59**). Without this process, the ring would no longer be perfectly round when compressed to bore size.

The final operation is to size the ring width to fit the piston. I used a sheet of fine wet or dry

on the surface table, turning the ring while rubbing to keep an equal width (checking with the micrometer while doing it!).

Knowing that I would break at least one ring while fitting, I made three while I was about it. The first ring fitted perfectly (**photo 60**). Anyone need a couple of rings?



● To be continued.

A perfectly fitting piston ring!

ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE NEXT ISSUE

- **Boiler for *Dancer***
John Olsen turns his hand to boiler making

- **Ross Yoke Engine**
Alan Pickering delves into his scrap box and surfaces with an inverted 'Ross Yoke' watercooled Stirling engine

- **Boring Eccentrics**
Ray Griffin bores out a set of eccentrics for his 1 inch scale *Minnie* traction engine

- **Union Nuts**
Having machined his nuts, Brian Baker makes a set of olives to go with them

- **Beam Engine**
David Haythornthwaite machines the steam chest and steam ports for his 1 inch scale *Model Engineer* beam engine

- **Brass, Steel and Fire**
Roger Backhouse pays a visit to the National Railway Museum in York to see the 'Brass, Steel and Fire' exhibition before it moves to the Science Museum in London



Content may be subject to change.

ON SALE 27 MARCH 2020

A New GWR Pannier

PART 16

Doug Hewson decides that LBSC's well-known GWR pannier tank design needs a make-over.



Continued from p. 308
M.E.4632, 14 February 2020

Now to the brake gear. I have altered this quite a bit - the main thing is that there were only very few locomotives that had the same brake gear as the *Pansy* drawings show. In fact, you can just about count them on two hands. There were several 5700s which had similar brake hangers to the *Pansy* drawings and a few of the 6700s. All the rest had some lovely sculptured hangers which I suspect were drop forged and to my mind they look so much better for it too.

The other thing is that I don't know if the builder of the other two chassis which I acquired had their own thoughts on how they should work, but the wheels all have springs and the brake pull rods are all solid from one end of the engine to the other which to me is all wrong! I have introduced two knuckle joints in here the same as on the full size locomotive so that I do know mine will work. I think that I have also altered the way in which the hand brake works but I haven't got a drawing of the original, so I do not know the answer to this.

125



GWR 7760 apparently heading a passenger express (photo from *The Transport Treasury*).

One thing that LBSC did do was to fit the steam brake cylinder in exactly the right place, even though this was quite obviously very much an afterthought. As you will see I have copied this but I have altered the steam entry point for the cylinder to where to should be.

I just thought it would be a good idea to start with some full-size pannier tank photographs again to give you a little in the way of incentive.

Photograph 125 shows Pannier

7760, on, would you believe, an 'Express Passenger Train' judging by the head lamp code. This locomotive is a 5700 fitted with the double flat bar brake hangers. It also has the old type of injector, a short whistle shield and the old type water fillers but it does have the later top feed. I am not sure, but I think the photograph was one of the ones I acquired from *The Transport Treasury*.

Photograph 126 is another one of the photographs supplied by *The Transport*

126



GWR 4674 with all 'mod cons' (photo from *The Transport Treasury*).



GWR 9716 showing a distinct lack of polish.



Plate type brake hanger
(photo by Brian Tickle).

Treasury and it shows a very polished 4674 with what I call 'all mod cons'. It has the latest injector fitted, drop forged brake hangers, new type tank fillers, top feed, long whistle shield and it also looks to have repaired tanks on it as you can see a weld along the bottom where it has rusted though so a plate has been welded.

Photograph 127 shows an 8750 class (9716) which still has its old brake hangers on it but just look at those badly worn brake blocks! It has nothing polished on the engine, even though it is relatively clean, but it does have the new type injector and the later type water fillers and a top feed.

Photograph 128 shows a better view of the plate type brake

BRAKE CRANK - MS
ONE PAIR REQUIRED

Brake shaft.

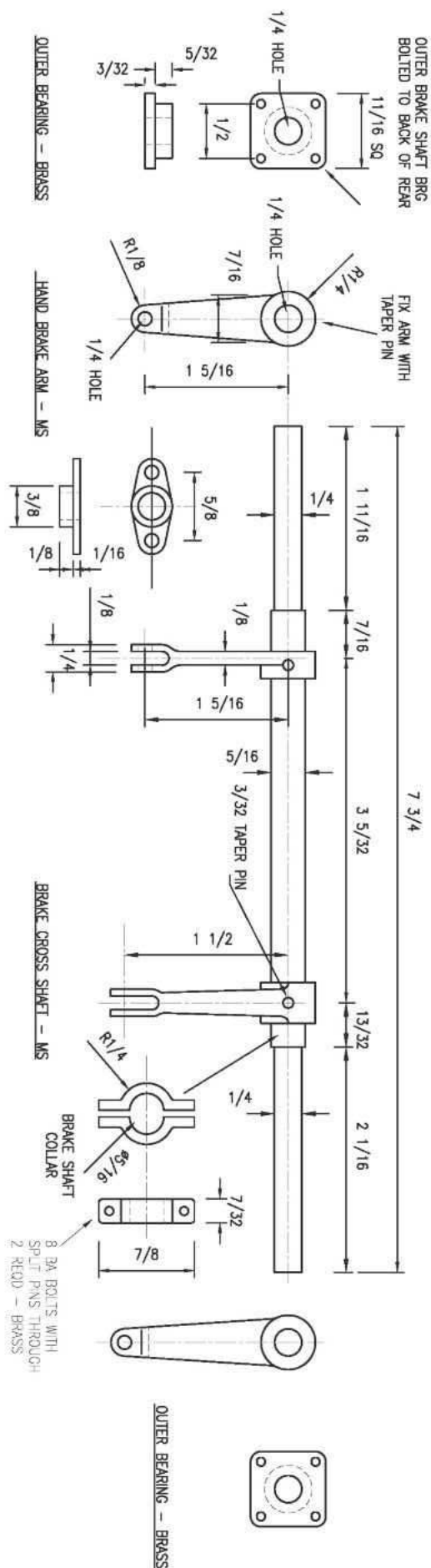
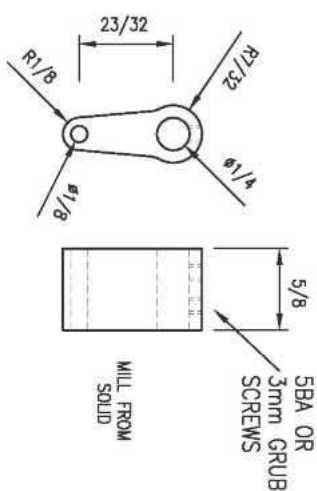
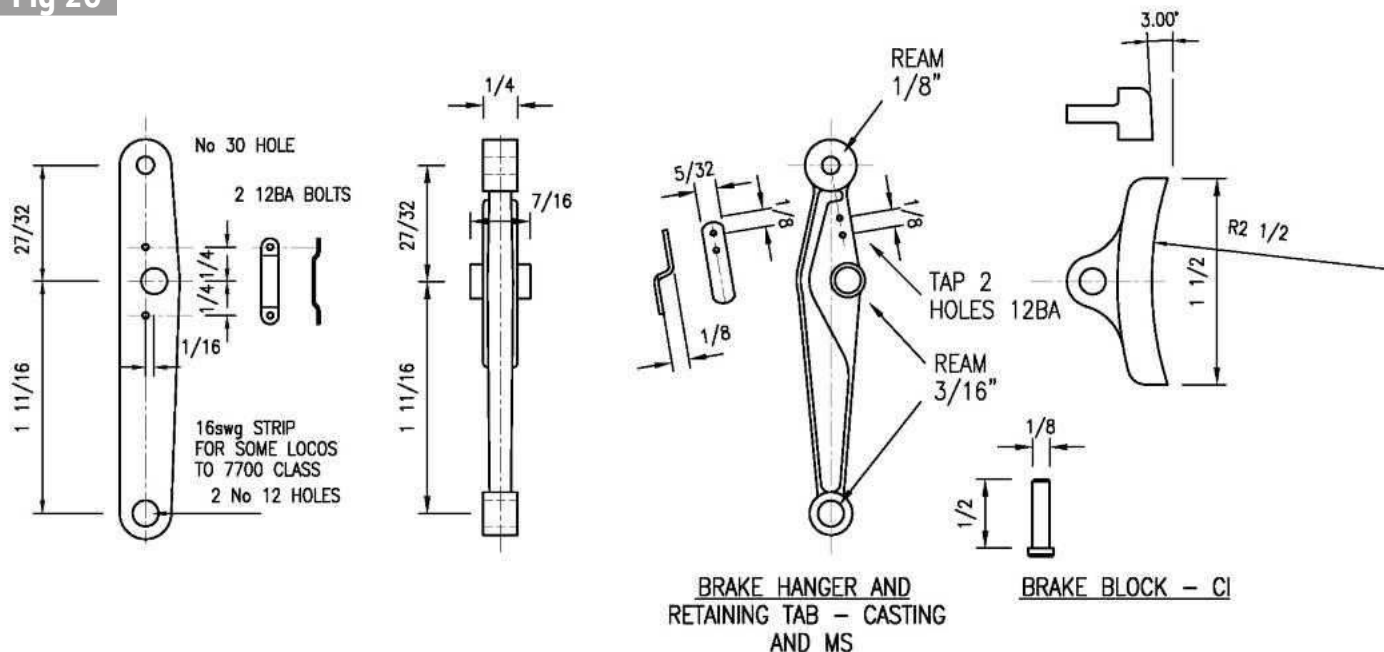


Fig 25

Fig 26



hangers and **photo 129** shows the drop forged type with a new block hanging on it. This was on 8415 whilst undergoing some major attention at Tyseley in September 1959.

Make a start then with the brake shaft (**fig 25**) which is a 7¾ inch length of 5/16 inch BMS bar and turn one end down to ¼ inch diameter for a length of 2¼ inches and the other end to 1½ inches. You will now need to do a little bit of sculpturing to make the two arms for the hand brake and the steam brake cylinder, especially on the steam brake arm if you want to make it anything like the full size one. I think it would be best to fix both of these arms on to the shaft with 3/32 inch taper pins otherwise you will not get the shaft between the frames without dismantling them.

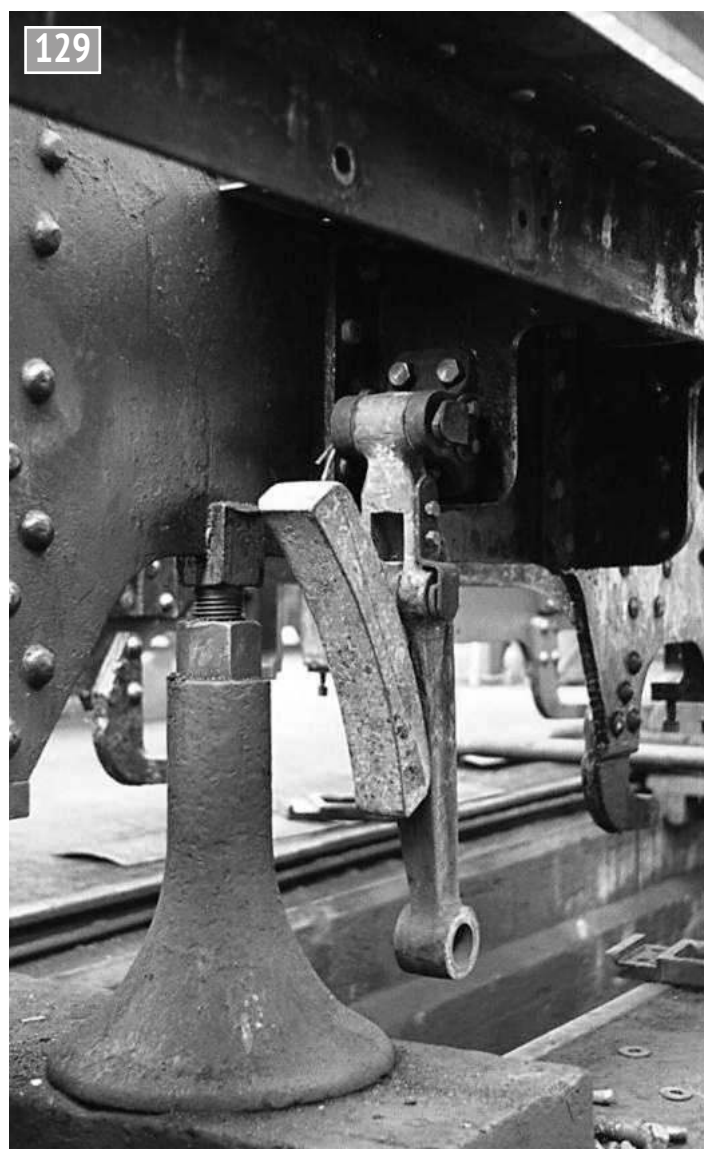
The collar on the brake shaft is fixed with a couple of 8BA bolts with split pins through them. It has to be on there so that the shaft cannot move sideways. One of these needs to be 7/32 inch width and the other needs to be 5/32 inch width. The next thing is the brake hangers but you will need to be very careful with these, not because they are delicate but because you need to get them on the correct engine!

There are some which consist of two pieces of plate but by far the most numerous are the drop forged (or cast steel type). I made the patterns for these ages ago and they should be available from Steam Workshop or G & S supplies (**fig 26**). Blackgates may also have them. The plate type can be made from 16swg strip but there were not many locomotives with this type of hanger. The little tabs which hold the pins in place are quite important as that is all there is. It wouldn't hurt to tap a 6BA hole in the end of the pin so that you can get it out if you need to replace the blocks. I had to replace my Y4 brake blocks at about 2,000 hours as they were half worn because all I use it for is shunting. The pins for the brake hangers can be made from 1/8 inch rod 3/8 inch long and the pins for the brake blocks can be made from 1/8 inch rivets with the heads faced down to 1/32 inch thick.

●To be continued

NEXT TIME

We continue with the brake cylinder and brake rodding.



Drop forged brake hanger.



PART 3

Building Dancer

The Engine

Dancer on the Mahurangi River.

John Olsen constructs a 1:1 scale steam launch.



Continued from p. 367
M.E.4633 28 February 2020

The hull was naturally seen as a major part of the project. Once the engine was able to run on steam I was quite keen to get started, especially since by this time we were settled into the Auckland house and had the floor space - if not quite the headroom - to undertake such a project. Now, some will say that building a 30 foot steamboat hull is not really model engineering, so I will not go into the full detail. There are plenty of resources available to help with that should you decide to attempt a similar project but, hopefully, what is here will help anyone who has built a suitable engine and is thinking about what to put it in, and what might be involved, bearing in mind that most projects will be smaller than mine.

Speaking of size brings us to the question of how much space do you need? A rule of thumb that I would suggest bearing in mind is that you probably want to take

the length and beam of the proposed boat and multiply by at least three for the floor area you need. The actual shape of the space is not all that important, so long as you can get around the hull at each end. Some of the space could be in a separate room; for instance, you could have some of the woodworking machinery in another small shed if that is how it has to be. Much less convenient, but needs must. Small boats have been built in all sorts of strange places, including upstairs bedrooms and even attics. You do need to think about how you will get the finished article out, especially if bedrooms or basements are under consideration. My own workshop in Auckland was I suppose technically a basement, but had drive-in access with a fairly level drive out to the street, so access for removing the boat was quite good.

Another question will be what sort of hull you want to

build. Unless you are a very skilled woodworker or boat builder, I would suggest that there are maybe four main choices to consider:

1. Restoring an old hull. If the hull is in good condition then obviously quite a lot of the work is already done. However it is hard to find an old hull that is ideal for conversion to a steam launch and, unless you know a lot about boats, you may find that restoration can actually take more work and a longer time than building from scratch. Also hulls originally intended for internal combustion often don't provide enough room for the size of propeller a steam engine will need.
2. Fitting out a fibreglass hull. This means that a lot of the more difficult work is already done, but does depend on finding someone with a suitable mould. Locally there ➤



Formers and Keelson set up on hog ready for planking to begin.

was a batch of 14 foot hulls moulded in Christchurch (NZ) some years back. This was used for some very nice boats, but I am not sure whether that mould is still about. The Elliot Bay Steam Boat Company in the USA offers a lovely fibreglass hull and you can find details of that on the Internet (ref 7). Shipping might be a problem if you are in the UK.

3. Plywood construction. This is probably the simplest way, but does tend to produce a rather boxy looking hull. Designs with multiple chines look nicer but are harder to build, although still within the reach of a first time builder. Even the simplest boxy designs tend to look pretty good when they are in the water with the chines out of sight.

4. Strip plank construction. This is the simplest way to get a nice looking hull with a classic shape, and is the way that *Dancer* was built. Although I had completed a partly built plywood dinghy before, this was the first boat building project that I had attempted from scratch. While in this size it was pretty ambitious, I think any reasonably competent model engineer could do this. In the UK, Selway Fisher publishes a wide range of plans for steam launches in different sizes. One of their designs, almost

as long as my own boat, was built in Auckland by an orthopedic surgeon with no previous experience, so it can be done (ref 8).

So getting back to *Dancer*, Peter's design was for strip plank construction. The first move with this is to build a mould. This is nothing like the mould required for a fibreglass boat. It is simply a set of disposable formers for each station of the boat. In *Dancer's* case there was to be a former every three feet. The formers are not part of the finished job so can be made of anything that comes to hand. I was able to obtain a large number of cover sheets from the shipment of MDF (medium density fibre board, also known here as Customwood.) The coarser grained type can also be used, although is not so good for putting fasteners into the edge. Plywood would be very suitable, provided you are not paying for new stuff.

The first stage was to glue and screw enough pieces together to make a strong, straight hog along the concrete floor. The floor was not completely level, so care was taken to make sure that the top edge of the hog was true and level in both directions. The hog was effectively an open topped box about two feet wide by thirty feet long. The formers were set out using the offsets and cut out from the MDF material, then set up on the hog in the appropriate

positions with the height being set carefully to give the correct line for the keelson. The hull is built inverted, so the line of the keelson is at the top. Using a flexible lath, the formers can be checked against each other to ensure that they form a fair line. A certain amount of adjustment is likely to be needed to correct any setting out and cutting errors. The formers near the ends also need a slight bevel added to allow the planks to sit fairly on them as the shape tapers towards the bow and stern. **Photograph 21** shows the formers set up on the hog ready for planking to begin.

The next stage required starting on the actual material for the boat. The keelson, and the stem and stern deadwood, must be made and set up on the hog and formers. For *Dancer*, the keelson is laminated out of four layers of 1 inch thick Jarrah (a very heavy, tough Australian hardwood) with about 300 pounds of lead set near amidships to aid with stability. This lead replaces one layer of wood for about 9 feet. As well as the epoxy glue, the keelson is bolted through at regular intervals with bronze bolts, later completely covered in with epoxy. It is shaped on each side for the planking to butt against it. The stem piece and stern deadwood were also laminated up from Jarrah. The wineglass transom was made up from African Rosewood and fitted to the deadwood.

At this point, one of the trickier bits of work was making a rebate in the stern deadwood where the planks would seat. Some designs need a similar rebate at the bow but this was able to be avoided in *Dancer's* case. Instead, a bow piece was laminated to fit the bow, using box tape to prevent it sticking to the existing stem piece. It was then removed, to be refitted after the planking was done. It could then be faired to match the planking. The rebate on the stern deadwood can be seen in **photo 22**.

The strip planking is the reason that the technique is quite accessible to amateurs. Instead of traditional carvel planking, where each plank has to be fitted closely to its neighbour, requiring quite a lot of skill, strip planking uses a relatively narrow plank. The edge of the planks is supplied with a concave and convex edge, so that the planks will fit together nicely, even while following each other around a curve. They are flexible enough to bend around the fore and aft curves quite easily. The planks for *Dancer* are about 1½ inches wide by about ¾ inch thick. They are cedar, a light timber. The idea of course was to use heavy material below the waterline and lighter materials further up. Sometimes with strip plank construction the strips are edge nailed together but I avoided this since the hull was to be glassed inside and out. Once that is done,



Planking has reached the round of the bilge. Note rebate on deadwood.



Planking in progress.

any nails would not actually be contributing any strength and they are sure to get in the way when openings are needed through the hull.

The hull was planked from the keelson down and from the sheer line up (**photo 23**), keeping the planking on both sides pretty much the same at all times. (Remember the boat is upside down at this time.) The cedar as supplied was in random lengths, so were scarf jointed to make full length planks. My wife and I found that we could generally put on three full length planks in an evening, so there would be two put on one side and one on the other. The reason for trying to keep things fairly symmetrical is to avoid the planking pulling the boat to one side. Planking started from the sheer line, but once about half of the planks were on, planking was also started from the keelson so that the two sets met about one-third of the way from the keelson to the sheer.

The planks are epoxy glued to the stem and stern deadwood and the transom as applicable, and are edge glued to each other with polyurethane foam glue. The polyurethane glue means that there are no hard lines of glue between the planks, which would make fairing more difficult. They are held to the formers by temporary nails and/or by blocks screwed to the formers and clamped to the planks. The latter is needed where the curves and twists are most severe. The planks

between the curve of the bilge and the keelson have the most twist, since they are vertical at the bow and stern deadwood and at the angle of the bottom in the middle of the boat. Box tape in vast quantities was used to pull the edges together, until the planking from top and bottom drew close (**photo 24**). At that stage it was possible to use blocks and wedges between the top and bottom sets of planking, to force each new plank hard against the existing ones. At the last, there were a few planks that were not the full length to fill up the remaining gap. A long, skinny, fine lined boat like *Dancer* is not too hard to plank; a shorter boat with more beam would be more difficult. The more clamps you can find, the better (you cannot own too many!). The box tape mentioned is also useful in later stages when you want to protect parts from getting glued when they should not be.

Once the hull is planked, the next move is to fair up the outside. Peter, the designer, was kind enough to come and assist with that, using a special long belt sander that he had adapted from a commercial unit. Next the outside was glassed. One source advised wetting the wood with epoxy before applying the cloth, but it was rapidly found that if you do this, the glass cloth will stick down with wrinkles that are very hard to remove. It is better to drape the cloth over the dry hull and then wet it



Planking almost complete.

down thoroughly, making sure you get rid of any bubbles as they appear from the wood. You can pre-coat the hull but should let the epoxy set before glassing. The epoxy will soak into the wood to some degree, displacing air. Glassing the outside is not too bad, if somewhat messy, mixing up batches of epoxy a litre or so at a time.

Now it is time to remove the hull from the former. The low headroom made this a bit difficult, but at least the hull was still quite light. The individual formers were unbolted from the hog, and then the hull was turned over and set in a simple cradle made from more of the ubiquitous MDF. You will have to imagine the fun involved in turning over a six foot wide hull in a seven foot high workspace. The inside was cleaned up and then glassed. This turned out to be even messier than glassing the outside. It had to

be done one section of cloth - about 1200mm wide - at a time, since otherwise there would be nowhere to stand. A narrow plank was placed over the section to be done, high enough to give access to the cloth over the keelson, so that it could all be wetted out with epoxy and checked for close adhesion to the planks and keelson. The plank was supported on blocks on the previous section done and on the next section. The cloth used has three sets of strands. Half of the fibres are along the length of the cloth, which is applied to the hull at right angles to the grain in the planks. The remaining two quarters of the fibres are set at 45 degree angles to the main fibres. The cloth is sewn together like this at the factory, rather than woven. Once the cloth is wetted out with the epoxy, the resulting matrix has good strength in all directions.

Having got the hull glassed inside and out, you will feel like ➤



Laminating a rib in place.

you are getting somewhere, although it is not time to relax yet. The next move is to fit any bulkheads, engine bearers and so on inside the hull. I actually planned the interior layout at this point, including making a kind of wooden dog house to represent the boiler, and making the interior partitions and decking out of

disposable material so that the layout could be tried out. If you are working from plans like the Selway Fisher ones, they will save you a lot of messing about! Incidentally, some builders will fit some bulkheads before planking, among the formers. The reason I left them until later was so that the inside and outside

fibreglass layers are complete for the entire length of the boat, forming a true monocoque hull. The formers fitted later are glued to this with a good fillet of epoxy and a glass tape, forming a joint that is as strong as the bulkhead is. One excellent book on the techniques for using epoxy glue for this style of boat building is the West System book (ref 9). I have used West System products throughout and can recommend them, with the usual disclaimer.

Photograph 25 shows a rib being laminated inside the hull, using a temporary former to press the laminations out against the hull. After the glue had set, the rib was removed and excess glue was planed off, before refitting it in place permanently, as shown in **photo 26**.

Now for the hardest part of the whole project. The outside of the hull needs to be cleaned

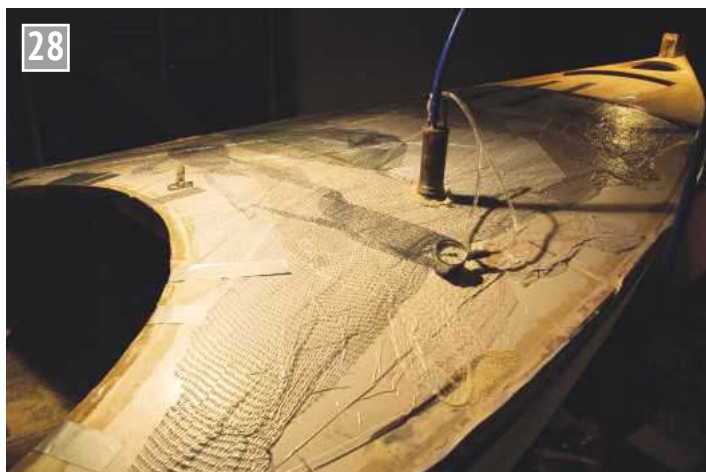
up, filled and smoothed, and painted. It sounds simple enough put like that but represents a lot of time and dusty, noisy work using a power sander. The triaxial cloth used for strength has quite a rough surface after the epoxy has set, so this was covered with a thin layer of a normal weave glass cloth. This layer is then filled with epoxy filler and sanded to give a fair surface. This takes repeated filling and sanding (**photo 27**). Once the surface is fair, the usual process of undercoating and painting can follow. A hull this size takes a lot of sanding. To add to the fun, the batch of paint supplied for the finish coat turned out to have gone bad and set with a lot of little crystals that looked like sandpaper. The paint was of course replaced, but the supplier didn't offer to come around and help sand the bad lot off, or even send around a few beers to help. One



Ribs and bulkheads fitted.



Fully glassed and faired.



Vacuum bagging the foam core of the foredeck.

paragraph does not really do justice to a process that took about three months.

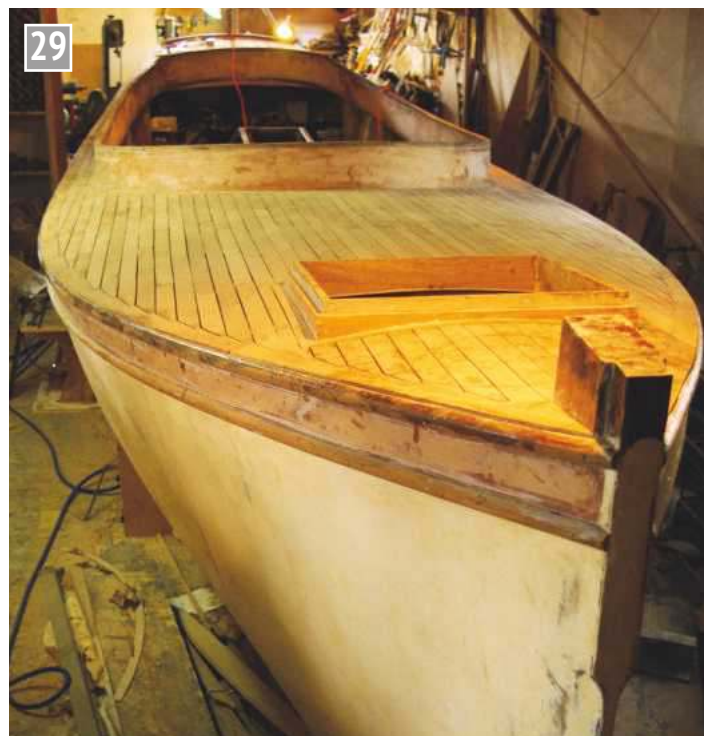
Smaller boats will not have as much in the way of decking and interior fit out as *Dancer* has, so I will not go into detail here, other than to mention that the deck and coaming are made with a closed cell foam core bonded either side with 3mm plywood. These were bonded together using a vacuum bagging technique, shown in **photo 28**. Vacuum bagging is a very useful way of providing a clamping force over large areas. The area is covered with a cloth called Peel ply, then with plastic sheet. The edges are sealed with tape and a vacuum pump is used to suck the air out from under the plastic. The somewhat *ad hoc* sealing arrangements make it hard to get a really good vacuum, but 15 inches or so is quite readily obtained, and this is plenty. It will provide a force of around 7 pounds on every

square inch. The deck then had a thin layer of fibreglass cloth added, and was then decked over with a kind of fake deck 5mm thick made from recycled New Zealand Kauri - one of the finest boat building timbers in the world, being light, strong, straight grained and resistant to rot. It was once much prized by the Royal Navy for masts. The deck planks are joggled into the waterways at each side in the approved way, so that the deck looks really nice. The painted hull and the deck can be seen in **photo 29**.

Photograph 30 shows a temporary arrangement used to make it possible to laminate the coaming in place. It is quite useful to be able to make temporary formers out of disposable material. These can be glued together with a hot glue gun, since they will not form part of the permanent structure. A more extreme example of this sort of technique is shown in **photo 31**,



Laminating an edge around the coaming in situ.



The hull with deck in place.

where the ceiling of the cabin is supported on a temporary structure hot glued together from corrugated cardboard. Once I was happy with the proportions, the temporary pieces were removed a few at a time and used as patterns to make the permanent plywood pieces, which were glued into place without disturbing the

rest of the temporary structure. If you do decide to build your own boat, this article will not be sufficient on its own. However I hope it will be enough to show you that it can be done, and will point you towards possible sources of information.

●To be continued.

REFERENCES

7. Elliot Bay Steam Launch Company.
<http://www.steamlaunch.com/hulls/steamlaunch.html>
8. Selway Fisher Design <http://www.selway-fisher.com/>
9. *The Gougeon Brothers On Boat Construction*; Author, Meade Gougeon. ISBN-13: 978-1878207500 ISBN-10: 1878207504. Also available as a free pdf download.



A cardboard mock-up of the cabin windows.

Vertical Boiler Locomotives PART 5

Martin Ranson presents a pair of 32mm vertical boilered locomotives.



Continued from p. 371
M.E. 4633 28 February 2020

Steam cylinder

Photographs 37 to 43

show various stages of the machining and fitting. My usual starting point is to find some old pieces of gunmetal. A good place to look seems to be model engineering exhibitions. I go hunting for the stalls which are selling off-cuts of metal. Any piece of gunmetal that is large enough is squirrelled away ready for the next project.

A few hours' work with hacksaw and a file should produce the basic parts for the valve chest, the valve chest base and the cylinder barrel. I use the word 'should' because over the years I have made lots of cylinders and a few mistakes. The best (or is it the worst?) mistake ever was to produce a cylinder and then drill all the connecting ports. What a mess, a really good 'senior citizen' moment! I managed to join two holes together and ended up filling all the holes with silver solder and bits of rod. Then I started again!

Photograph 39 shows two cylinders of different types because I could not decide which to use. Photograph 40 shows an idea to simplify drilling the three holes in the valve chest - if I make



Cylinders and valve chests at various stages of manufacture.

a mistake with drilling the three holes directly into the chest base the whole cylinder is probably ruined. A small piece of $\frac{1}{16}$ inch steel or brass sheet can be used as a drilling template and is clamped under the valve chest and the four corner holes spot-marked onto the steel or brass.

When these four have been drilled the chest and brass sheet can be bolted together and a scriber can be used to mark the interior of the filed valve chest recess. The exact centre of this can then be marked and the exhaust port drilled. The two inlet ports can

then be measured from the centre exhaust hole.

After the two inlet ports are drilled then the sheet can be bolted to the chest base. All three holes can now be drilled down into the chest base. I use this method because I have no precision method for marking and drilling the three port holes - a milling table would make this operation extremely easy.

With the proverbial hindsight, the whole cylinder assembly could have been mounted half an inch lower and it would have looked a bit neater. The cylinder for this locomotive has a bore and



Machining the valve chest on the faceplate.



A pair of completed cylinders.

40



Valve chest drilling jig.

42



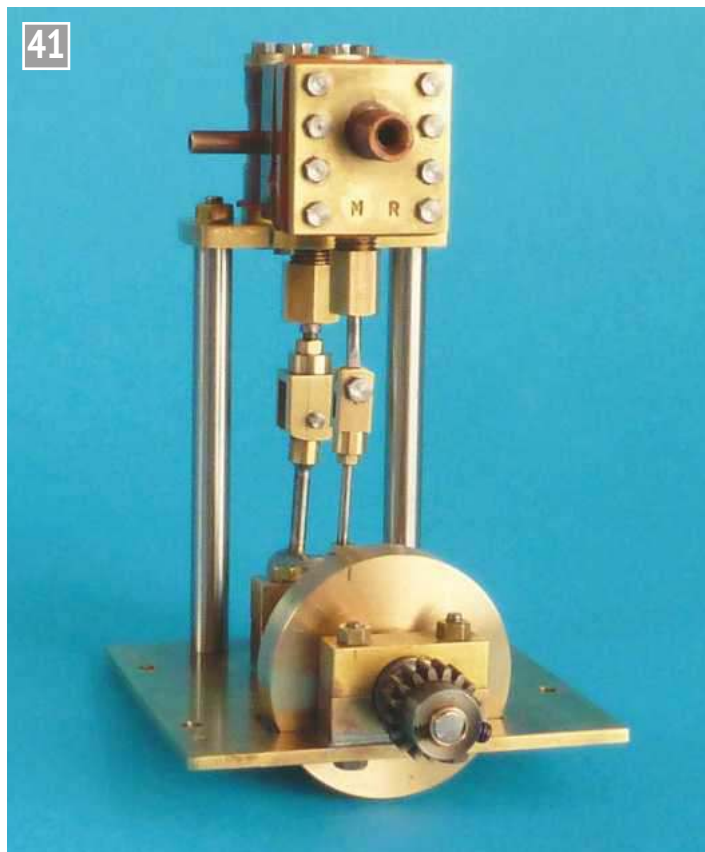
Right-hand side view of the cylinder assembly.

stroke of 0.4 x 0.338 inches. The valve travel is 0.148 inches and the two valve ports are 0.055 inch diameter. The exhaust port is 0.072 inch diameter. The flywheel is 1.26 inches diameter and the crankshaft is 4mm diameter. This runs on two ball bearings. From the crankshaft centre to the top of the cylinder cover is 3.1 inches.

Oscillator loco

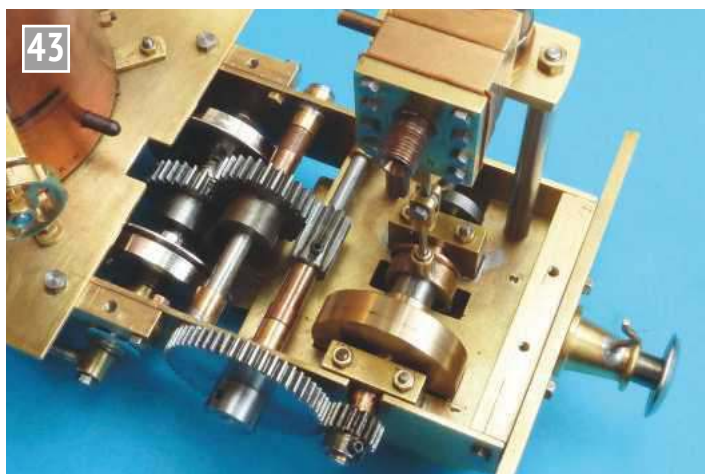
Photograph 44 is a general side view of the equipment - the only real difference between the two locomotives is the type of power plant. It is similar in general layout to the locomotive with the slide valve cylinder. **Photograph 45** shows the actual cylinder and the gear train - some of the gears were quite a squeeze. Between

41



View of the completed cylinder assembly from the flywheel.

43



The cylinder assembly in place.

44



Side view of the complete locomotive.



View of the cylinder and gear train.



Oscillator gas valve.



Oscillator water gauge.

The best (or is it the worst?) mistake ever was to produce a cylinder and then drill all the connecting ports. What a mess, a really good 'senior citizen' moment! I managed to join two holes together and ended up filling all the holes with silver solder and bits of rod. Then I started again!

some of the gears and the adjacent shafts there is very little clearance. **Photograph 46** shows the gas supply valve and the gas regulator, both of which are broadly the same as the second locomotive. **Photograph 47** shows the water gauge, which is silver soldered together. The two tubes from the boiler are angled. The top one goes upwards and the bottom one heads downwards - this gives maximum length available for the gauge glass. Shown at the right of the photograph is the vent valve on the gas tank. This was the old system for filling the gas tank.

Engine speed

Just for curiosity I always like to know the actual speed the crankshaft is turning. To actually count the speed of the wheels as they are turning on a rolling road is very difficult because with

a boiler pressure of 25 to 35 PSI the speed is about 200 to 300 RPM. It is far easier to get a stopwatch and time the locomotive as it runs along a straight section of track. The speed of the locomotive at about 25 PSI is a slow walking speed of 1.4 ft per second. With a wheel circumference of approximately 4.15 inches and a gear ratio of 10.78 to 1 this gives a nominal crankshaft

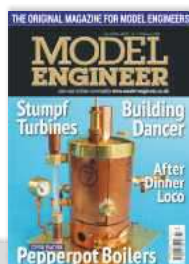
speed of about 2600 RPM at 25 PSI. If the pressure goes up to 40 PSI the cylinder sounds to be screaming its head off. This also empties the boiler extremely quickly. With a bit more running-in the engine should happily run at a slower speed.

NEXT TIME

We'll complete the locomotives and get them running.

● To be continued.

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Garrett 4CD Tractor

in 6 inch scale

PART 67

Chris Gunn
pipes up the
injector.



Continued from p.372
M.E. 4632, 14 February 2020

This article has been written to guide the builder through the construction of the 6 inch scale Garrett 4CD tractor designed by Chris d'Alquen. The writer has previously built a 4 inch scale Garrett and a 6 inch scale Foden wagon so has the benefit of considerable experience in larger scale modelling. Most machining can be done in the average home workshop but the supplier from whom the castings and drawings are currently available is able to provide a machining service for the largest items if required.



The next job was to pipe up the injector, which I had purchased. This is located close to the brake levers and the tender bypass and, as already mentioned, this area is cluttered; **photo 569** shows the area after completion of the engine.

The water feed to the injector is taken from the bottom of the tender and I made a small oval take-off tapped $\frac{1}{4}$ inch BSP which was fitted to the tender by a couple of screws going into another brass oval inside the tender. I got this as low as I could, taking into account the radius on the sides of the tender. I used commercial compression fittings to connect a commercial ball valve and a short section of copper pipe with the injector tube end fitted to it, to connect the ball valve to the injector, which is all in line with the water inlet as was shown in photo 569.

I had made a bronze carrier for the injector steam valve

to look like the one on the full size engine and added a commercial bronze, steam quality, globe valve from one of the major suppliers in this field. I did not want to use a cheap copy on a live steam line. **Photograph 570** shows a picture of the full size valve and **photo 571** shows the half size version.

I had some bronze flat bar and was able to saw three pieces from it; one for the mounting section that bolts back to the tender and the two pieces for the flanges that fit on the valve end. Before I machined the oval blanks, I found a cutter which was $1\frac{1}{6}$ inch diameter so dropped this through the faces of the two pieces which straddle the round centre, making a groove $\frac{1}{16}$ inch deep. Then the three ovals were marked out, drilled and tapped where required and then the sides milled to shape and the ends rounded.

I turned a piece of bronze $1\frac{1}{8}$ inch diameter and drilled

and tapped it $\frac{3}{8}$ inch BSP. The three pieces were clamped together and silver soldered. I did need my big burner for this job. Once the assembly was cool, I drilled the cross hole to create the steam passage. The completed unit was placed in position on the tender side and the holes marked through and then drilled and the unit held in place by two M6 bolts. An Enots tube connector was fitted to the round section; this was $\frac{3}{8}$ inch BSP on the male end and took a $\frac{1}{2}$ inch tube in the other. The mounting could then be connected to the steam take off assembly by the block. The $\frac{3}{8}$ inch BSP bronze valve was screwed into the oval flange, and the flange bolted to the mounting, and then a $\frac{3}{8}$ inch tube feed down to the top of the injector and was connected using the fittings supplied with the injector.

The injector clack was soon fitted and a $\frac{3}{8}$ inch copper pipe taken from the injector

Drawings, castings and
machining services are
available from A. N.
Engineering: Email:
a.nutting@hotmail.co.uk



Injector position.



Full size steam valve.



Injector steam valve.



Steam valve.

up to the clack. This has to be clipped back to the frame as it is relatively long.

The steam feed to the injector and water lifter is taken from the side of the block from the regulator steam space. I again made an oval bronze fitting to mount on to the side of the steam chest and this led to the bronze steam valve which isolates the steam altogether from injector and water lifter, as shown in **photo 572**.

The outlet from this valve feeds the injector valve block from a Tee piece, with the tube running back behind the gears and being clamped just in front of the guards. The other branch of the Tee feeds the steam valve sitting atop the water lifter casting (**photo 573**).

By manipulating all these valves, the steam can be

isolated completely or directed to the water lifter and/or the injector where a separate valve can be used to raise water or inject it into the boiler.

Photograph 574 shows the water lifter which again is fitted to a brass oval secured to the top of the belly tank.

That completed everything that was to be piped outside the engine apart from the drain cocks and these were soon dealt with, using $\frac{3}{16}$ inch copper pipe. I silver soldered the pipe nipples to the ends of the pipes and routed the pipes as shown in **photo 574**. The pipes were clamped at the bottom of the belly tank using clamps already made and sitting ready on the bottom of the tank each side.

The lubricator is perhaps worth a mention at this point. This had already been on for a



Water lifter and valve.

trial assembly but not piped, so it was time to remedy that. The lubricator is mounted on the right-hand side of the engine on the top of the LP steam cylinder. The governor is on

the other side of the block. The operating lever is connected to a lever clamped to the valve rod. The lubricator pump was made with a commercial lubricator element which was



Drain cock pipes.

provided with a 4mm push in fitting. This was lucky as I had some $\frac{5}{32}$ inch copper pipe which is within a 'gnat's ...' of 4mm, so I was able to use this. The oil inlet to the block is on the opposite side and was tapped $\frac{1}{8}$ inch BSP. I like to fit a steam isolating valve between the block and lubricator, so if there is a problem with the lubricator it can be isolated and the fault dealt with while the engine was still in steam. I had already had a root in my odd valves bin and found a small needle valve which would do the trick so this was fitted directly into the block and the pipe from the lubricator fed to it. **Photograph 575** shows the lubricator in position and **photo 576** shows the valve at the oil entry port.

There were a few more oil cups to fit; two are bolted to the front of the belly tank and feed oil to the ends of the steering chain shaft and another fits to the back of the belly tank and feeds oil to the steering shaft itself. The oil can run down the shaft and onto the steering worm and wormwheel.

I started on the spectacle plate next and began with the four lubricators that feed oil to the cannon shaft ends and the axleboxes. These were fitted on a couple of angle brackets carrying two oilers and piped down to the shafts using $\frac{3}{16}$ inch copper tube and standard $\frac{3}{16}$ inch compression fittings at each end. The two

pipes for the axleboxes were made overlong and a bend introduced which would allow the tubes to flex a bit as the axleboxes could move up and down slightly. **Photograph 577** shows the four lubricators.

I departed from the design when it came to mounting the pressure gauge which I wanted on the face of the spectacle plate so it could easily be removed for testing as this is now part of the steam test procedure. I made a housing which bolted to the spectacle plate and allowed the gauge to be piped from the water gauge top turret. I achieved my objective in making this easy to remove, but at the expense of the spectacle plate layout which is not symmetrical. There are a lot more controls on this engine, being a compound, and everything is useable but it is not as pretty as it might be. Originally I had two pairs of lubricators, one each side, but I had to move one set as they interfered with the pressure gauge. There are also the drain cock and blower controls which pass through the spectacle plate. I will leave the layout as shown in photo 577 for the time being - at the time of writing this the engine has been steamed a dozen times for test purposes and rallied for a weekend, so it is a bit early to decide whether to change it back or stick with it.

The next items to go on were the water gauges; the top end screws to the swan necked



Lubricator.

casting that ends up above the cannon shaft and the bottom end to some bronze pillars that extend out from the back of the boiler. The water gauges have to be disassembled to fit them, as it is not always possible to turn the bottom bodies around to screw them in with the taper cocks still fitted. At the top end the two bodies are very close together and I had to get the left-hand one in position, then back it off a touch so it stood upright, to allow me to screw the other one in.

Once they were in position I used a piece of 10mm round bar to line them up, thus making sure the bars could slide freely into position. Once that was done - after some adjustments - I left the steel bars in place while I tightened the locknuts on the bodies which locked them to the top

and bottom mountings. Then the taper cocks were fitted, followed by some gauge glasses and the nuts, using sealing rings made from soft neoprene tubing. I have had success with these rings once I learned to cut them square in the lathe. (I slide the tubing onto a piece of brass bar and then part them off using a Stanley knife blade as a parting tool.) When the gauge glasses were in place, the commercial plugs shown were all fitted using aluminium washers to seal them.

I used commercial fittings to fit the two drain pipes down below the back axle. These just dangle free but will take the vented steam when blowing down out of harm's way.

Once the glasses were installed, the gauge glass protectors were added and the



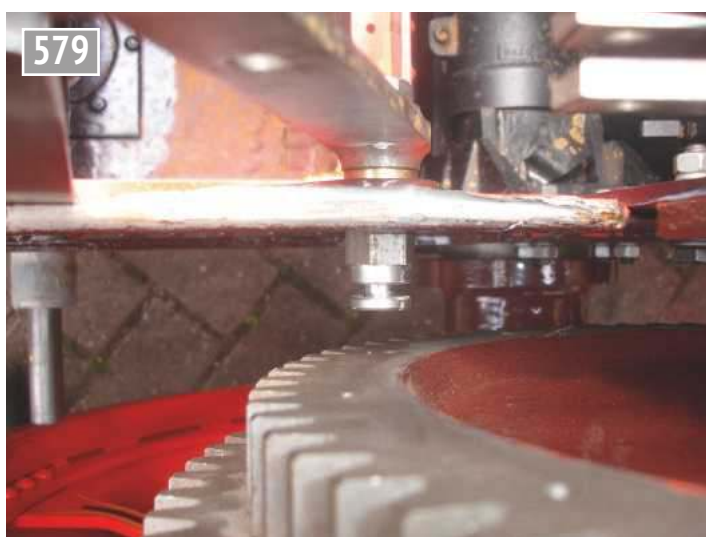
Lube steam valve.



Back axle lubricators.



Water gauges.



Damper latch.



Damper handle.

steel plates with the chevron markings were slid into place and held there by some magnets in the corners of the protector ends, as mentioned in the instalment describing the manufacture of the protectors (**photo 578**).

I should mention that I did change the position of the two thumbscrews which retain the gauge glass protectors at this stage. Once I had steamed the engine a couple of times, I needed to tighten the gauge glass nuts up a bit and this had the effect of raising the bottom of the gauge glass protector a little, so the screw was impinging on the corner of the nut. I realised after a while, however, that the top end is always in the same place in relation to the gauge glass nut, so if I moved the thumbscrew to the top it would always hold

the assembly. Photograph 578 shows the protectors after this change had been made.

The jury is still out regarding the use of polycarbonate for the glazing; it does the job in that it seems to stand up to the temperature but the one feature I did not consider is that I think the plastic generates or holds a static charge and this attracts the small ash and coal dust particles, as the glazing seems to get dirty fast. It is not difficult to nip them off and give them a wipe though. In this scale and with the chevron backing, I find the gauge level easy to read.

The safety valve assembly was re-fitted, having been removed for the hydraulic test, and the spring tightened just a little as I needed to set the spring properly. The

regulator rod was made with an extra joint in it so it could be easily removed and fitted and adjustments made whilst in steam.

The drain cock operating rods were fed through the motion and connected using a small clevis, again making for easy installation and adjustment.

I had to fit the damper operating lever and I described earlier how I decided to fit this on the right hand side rather than the left. This was due to the addition of the pump gear shifter being placed right where the damper rod would have been. I decided I could use the pivot of the reversing lever as a latch pin for the damper rod, so made a special nut as shown in **photo 579**.

The end of the lever was fitted with a brass handle at

right angles so it is accessible from the tender (**photo 580**). So far I do not seem to have had a problem operating this despite the rather congested area in which it is located.

This picture also shows the two working position arrows fitted to the reversing stand, something I had spotted on the full size engines I had photographed. These had been castings in full size, whilst these examples are engraved.

The tender top plates were slathered with Blackjack on the underside and were fitted using stainless screws.

This just about completes the main part of the final assembly; it would seem, therefore, to be a good stopping point. Next time I will carry on with the final details.

●To be continued.

The Middleton Double Sided Beam Engine

PART 4

Rodney Oldfield constructs another of Bob Middleton's stationary engines.

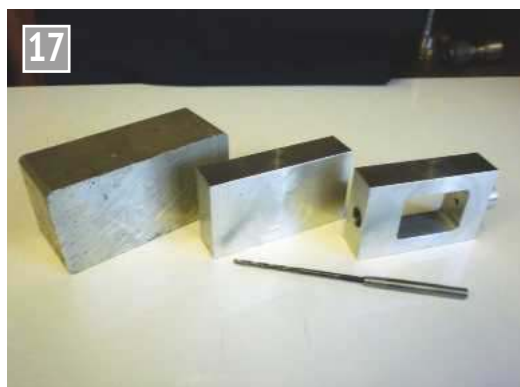
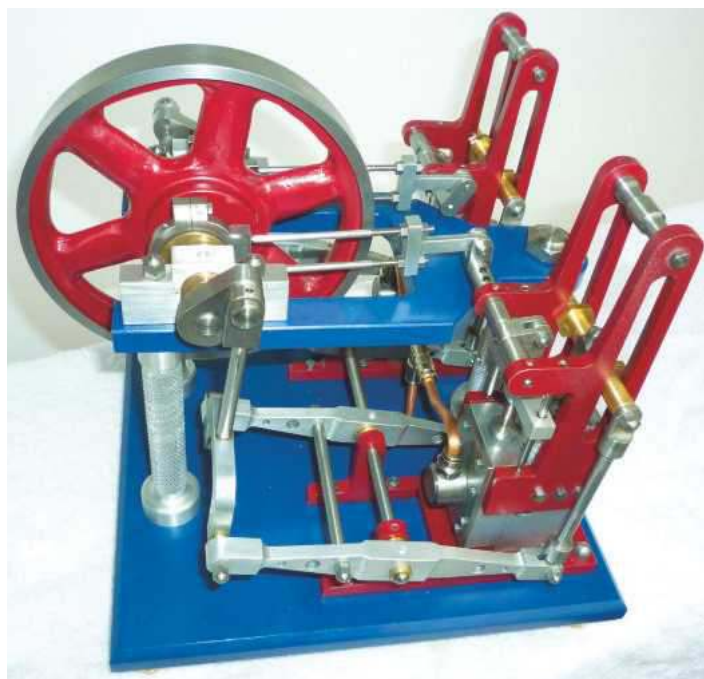


Continued from p. 290
M.E. 4632, 14 February 2020

Steam chest

These are shown as cast iron but I made mine out of aluminium - they are only distance pieces anyway (**fig 10**). Machine down to size $2\frac{5}{8} \times 1\frac{1}{2} \times \frac{5}{8}$ inches (I did mine in a four jaw chuck) and turn a boss on the bottom $\frac{1}{4}$ inch deep (**photo 17**). Remove from the chuck and on the other end mark out the centre of the $1\frac{1}{2}$ inch side and $\frac{3}{8}$ inch in from the face. Centre pop and scribe a circle $\frac{1}{2}$ inch in diameter. Place this in the four jaw chuck and get it running true.

Centre and drill for the valve rod gland. Next drill through 3mm to a depth of exactly 2 inches and ream $\frac{1}{8}$ inch to a depth of 1 inch. While the work is still in the chuck tap it to $\frac{5}{16}$



Steam chest, machined to size.



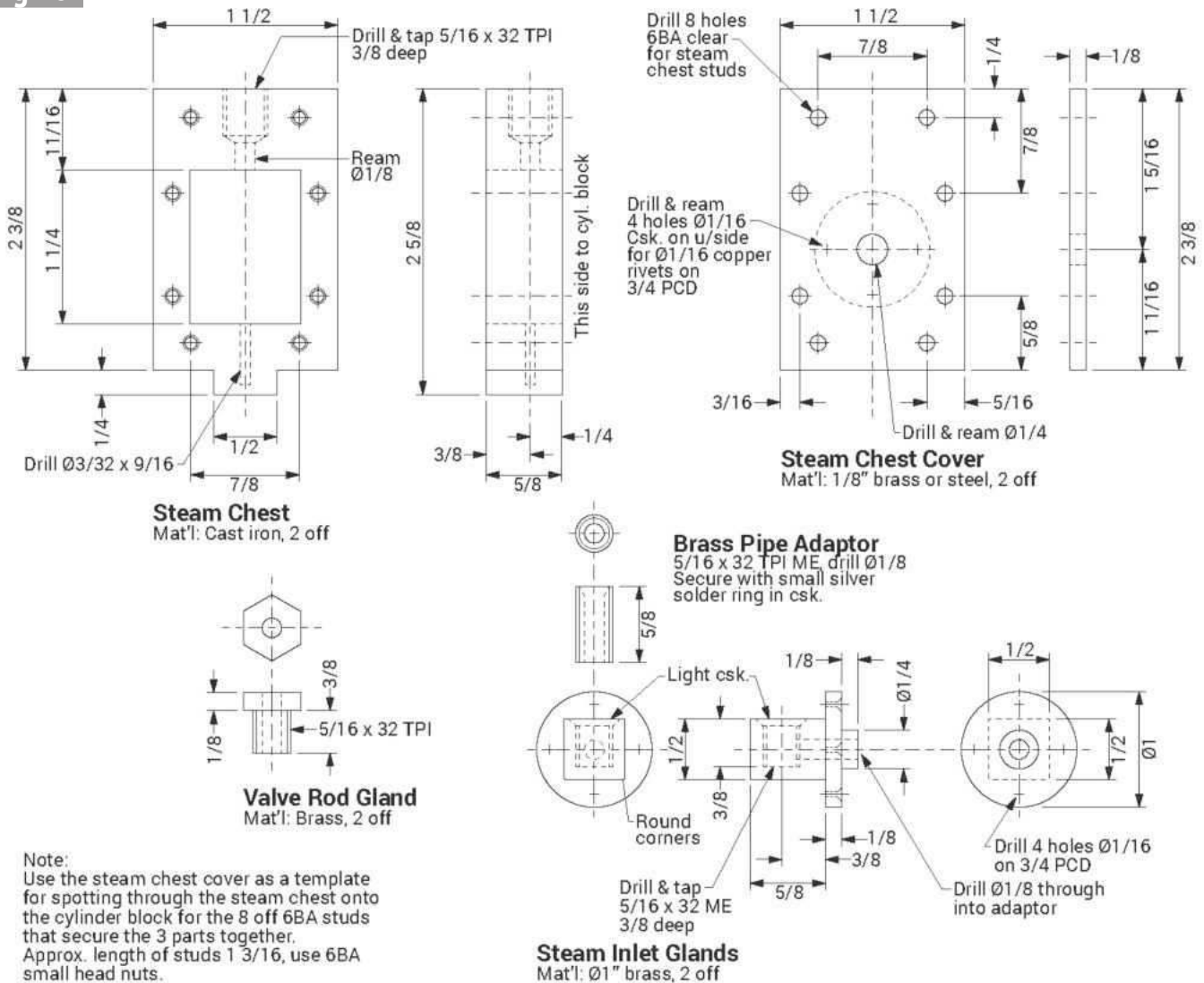
Drilling the valve rod guide.



Steam chest cover, drilled for the steam inlet.



Turning the steam inlet gland.

Fig 10

inch x 32 using the tail stock to keep the tap square and turning the chuck by hand.

Move the work to the milling machine and mill out the inside according to the drawing. Do not bother about square corners. This should leave a shallow 1/8 inch diameter dimple, drilled previously. When this is done hold it by hand in a pillar drill and carefully drill the 3/32 inch hole to a depth of 1/16 inch (**photo 18**) using this dimple as a guide. This way you have a much better chance of not breaking the drill. The 3/32 inch drill I had was not long enough so I had to drill a 1 1/2 inch long piece of 1/4 inch diameter bar, drill it 3/32 inch by 1/8 inch deep and solder the drill into it.

The steam chest cover is a simple cutting and marking out exercise, following the dimensions in the drawing.

Steam inlet gland

Deviating from the drawing, I found it easier to turn the boss down from some 7/8 inch diameter bar and to fasten it onto the steam cover using three small countersunk screws as shown in **photo 19**. Mark these out on the cover, drill and countersink, positioning the top two holes so that they will miss the tapped blind hole in the boss. Part off a 3/4 inch long piece from the 7/8 inch diameter bar, drill and tap a blind hole about 0.300 inch deep in from the face. I used a 1/8 inch BSP thread here and a commercial



Set of parts for the steam chest cover.

pipe fitting, rather than 5/16 inch x 32 thread (as specified in the drawing), but that is personal preference.

Place in the chuck and turn down a 1/4 inch diameter boss about 0.100 inch deep to be a good fit into the steam chest

cover. Centre drill a 1/8 inch cross over hole into the 1/8 inch BSP hole (**photo 20**). Press the boss into the plate and back mark the three holes, drill and tap, then countersink the plate. Cut out the gaskets and assemble (**photo 21**).



Spotting through to the steam chest.

Drilling the cover onto the steam chest

Place the drilled steam-cover onto the steam chest, making sure it is the correct way up and onto the right face, clamp the cover and the steam chest together and drill through, making sure that it doesn't move (photo 22). Split and mark face to face. Clamp the cover onto the cylinder, AGAIN making

sure it is the right way round, spot through two holes, part, drill and tap for 6BA screws (photo 23). Now screw the plate onto the cylinder, check all is square, spot through and then drill and tap the other 6BA holes. Split and mark the steam chest to the cylinder (I do not mean to labour over these points, but over the years I have made some silly mistakes).



Spotting through to the cylinder.

If you have trouble lining up your studding or bolt holes do not be afraid to open up the offending holes as it is only a distance piece.

Chamfer the cylinder

This is a fairly straightforward job. Scribe a line $\frac{1}{4}$ inch down on the back face, place on the milling machine on a vee-block with a $\frac{3}{4}$ inch diameter bar

through the bore, nip down either end of the bar, then mill down to the line. Repeat on the two faces.

●To be continued.

NEXT TIME

We make the slide valve.

No.292

MODEL ENGINEERS' WORKSHOP

Look out for the April issue, number 292:



Stew Hart explains how to make and use a 'sine protractor' for setting accurate angles.



Graham Meek introduces his special attachment for tapping small threads.



David Smith makes a set of holders for a Myford M lathe.

On Sale 20th March

Steam Turbines

Large and Miniature

PART 24

Blade manufacture and safety

Mike Tilby explores the technology, history and modelling of steam turbines.



Continued from p.304
M.E. 4632, 14 February 2020

Safety concerns

As was mentioned in part 22, the high rpm needed for good efficiency in model steam turbines means that rotor discs will be highly stressed and so there will be a risk of disc failure. In the largest steam turbines, such as those in power stations, rotors weigh many tons and if one were to fail at speed, the fragments released would have very high levels of kinetic energy and could not be contained by any practical casing. In fact, on the rare occasions when such a rotor has failed, the resulting explosions have wrecked whole buildings and caused loss of lives.

In gas turbines of aircraft, rotors are generally smaller and lighter than in large steam turbogenerators but rotational speeds are higher. Again, major failure of a whole turbine disc is assumed to be non-containable. (For a fascinating technical analysis of such a failure see [ref 89](#).) For both these classes of turbine, every precaution is taken to ensure that such major rotor failures cannot happen.

In model steam turbines, the very small mass of a typical rotor disc means that far less kinetic energy will be associated with fragments released after a failure. Nevertheless, their velocity will be very high and they could do serious harm to anyone nearby. Also, if they damaged a nearby boiler the effects of a rotor failure could be greatly amplified.

Over-speeding

One potential cause of rotor failure is the rotor exceeding its maximum design speed. In a typical full-size steam turbine, significant amounts of power are delivered via an output shaft while the turbine rotates at its correct speed. If power off-take were to be suddenly removed, such as through fracture of the output shaft coupling or disconnection of the electrical load from a generator, the turbine would rapidly accelerate to an unsafe speed unless control systems were in place to prevent this.

In contrast, the model steam turbines that have been described have often been run initially without any power off-take and their speeds were then limited purely by internal friction and by the maximum steam flow rate through the nozzle. The low efficiency of these turbines and/or the low steam flow rate meant that they could not attain speeds that caused rotor failure and, when called upon to do external work, their speeds decreased markedly. Such turbines were inherently safe from over-speeding. However, if a future turbine had greater efficiency and/or had a greater steam supply, then there could be a risk of dangerous over-speeding.

Failure at normal (design) speeds

As was discussed in part 6 of this series, it is possible to estimate the stresses that arise in a spinning disc and

if the maximum stress levels are below the tensile strength of the metal from which the disc is made, then one might think that everything would be fine. Of course, there is always the possibility of errors in the calculations and variation in the actual strength of the metal from its theoretical value, so limiting the maximum stress to a value well below the tensile strength seems sensible. However, metallurgy is a complicated subject and the simple analysis referred to above assumes that the disc will fail as the result of so-called 'ductile fracture' where the metal stretches and permanently deforms before rupturing completely.

Brittle fracture

Unfortunately, it may not be appropriate to assume that things are that simple because metal can also fail by what is known as 'brittle fracture'. In this case the failure can be sudden and without any forewarning. The likelihood that a metal will undergo brittle fracture depends on many factors such as its composition, temperature, shape and usage. For example, the presence of lead in a brass alloy makes it more readily machinable but also makes it more prone to brittle fracture.

In the early days of turbine development at Parsons' works when rotor blades were made of brass, it was discovered that brass containing a small amount of lead exhibited brittleness at about 250°C. This phenomenon is now

known as 'intermediate temperature embrittlement'. Yield strength (i.e. the maximum stress that does not cause permanent deformation) seems a better property than ultimate tensile strength upon which to base the safety assessment of a rotor.

Another factor is the presence of stress raising features such as sharply angled internal corners and small machining marks. At such locations local stresses are magnified and small cracks can propagate undetected during repeated uses of the turbine until, one day, disaster strikes. Corrosion is another consideration and this can be enhanced when a metal is highly stressed, particularly if chloride is present in water.

Lastly, when two different metals, each alone resistant to corrosion, are in contact with each other and also are wet, there is the possibility of electrolytic corrosion. Therefore, metals in contact with each other should be chosen to avoid this problem through having similar anodic indexes (e.g. brass and stainless steel).

Minimising risk

Bearing in mind the complexity of metallurgy, it seems that, at best, an amateur can only make a crude estimate of the maximum safe rpm for a rotor disc. Also, there seem to be no established methods, accessible to amateurs, for reliably predicting the thickness and strength of a turbine casing in order for it to contain a rotor failure. So, one can only design a turbine as carefully as possible, and take into account previously reported models.

I have not read of any accidents caused by rotor failure in a model steam turbine but the absence of incidents is a poor basis for assessing risk when so few model steam turbines have been built and operated extensively. Nevertheless, it seems sensible to look at the materials, diameters and speeds of previously described

Author and year	Ref	Material	Diameter (in)	Maximum normal operating speed (rpm)	Maximum speed over short periods (rpm)
Elkin 1946	90	Presumed to be brass	1.25	54,000	106,000
Bamford 1951	91	Al alloy	3.125	60,000	-
Rose 1964	92	Brass	0.982	50,000	54,000
Rose 1969	93	Brass	1.5	50,000	-
Jeggli 2008*	94	Brass	1.18	42,500	67,500 & 83,300
Stride 2008	95	Al alloy	1.97	30,000	105,000
Stride 2008	95	Al alloy	1.575	40,000	90,000

*Werner Jeggli's rotor disc had a central bore but a stainless steel shaft was silver brazed into it. The values for maximum speeds are from a personal communication.

rotors. The examples for which I have found relevant data are summarised in **Table 12**.

Guidance

The lack of certainty regarding safe design of rotors makes it particularly important to operate steam turbines in ways that minimise the risk of harm should failure occur. Two sources provide relevant guidance.

Firstly, in the world of 'full-size engineering' there are at least three situations where high speed rotors are required to meet a minimum standard:

- a)** Following the catastrophic failure of a large steam turbine rotor in Shanghai in 1922, one of the tests that became standard for new steam turbines was that they should withstand rotation at 120% of their normal maximum operating speed.
- b)** I thank Jörg Hugel for directing me to a standard produced by the European Committee for Electrotechnical Standardization. That requires (with a few specific exceptions) rotating electrical equipment to withstand a test at 120% of the maximum operating speed.
- c)** I thank Arthur Rowe for directing me to the European Aviation Safety Agency documentation which specifies that rotors for jet aircraft engines withstand at least 120% of their maximum speed

(providing the control systems can prevent rpm exceeding that limit).

The ability to withstand a 20% over-speed in all these examples may not seem a very stringent test but stresses increase with speed-squared. Therefore, during the test, stresses in the rotor will actually be 44% higher than normal.

A second source of guidance comes from the world of model gas turbines. In recent years much experience has been accumulated in running these engines and I thank James Hill, Chairman of the Gas Turbine Builders Association (GTBA) for providing information and advice. The use and operation of model aeroplanes powered by gas turbines are covered under the model flying insurance policy of the British Model Flying Association (BMFA), providing the rules in the BMFA handbook are followed. These rules (**ref 96**) were originally produced by the GTBA and have been adopted by the BMFA.

For model gas turbines there are a number of well-established designs with high power outputs and proven safety records - unlike the situation with model steam turbines. There are several aspects of operating model gas turbines that raise safety issues and only those points relevant to turbine disc failure are mentioned in the following discussion.

Points from the GTBA guidelines

1) Turbine discs should be made of an appropriate alloy.
For gas turbines this generally means Inconel since it maintains strength at very high temperatures. This material is very difficult to machine and most discs are made commercially and are often examined for flaws by X-ray. For model steam turbines resistance to such extreme temperatures is not necessary and, if miniature blades are to be milled in a home workshop, life is made easier if an alloy is chosen that is reasonably easy to machine. Brass and even aluminium alloy have been used successfully in the past but the grade of brass was not recorded.

2) The outer casing of the engine should be designed to guarantee containment in the event of disintegration of the rotating parts.
Compared to full-size turbines, fragments released from miniature rotors will have proportionately small levels of kinetic energy and turbine casings can be relatively thick. Therefore, containment of rotor fragments seems a realistic possibility. However, since it does not seem possible to reliably estimate how strong the casing needs to be, so the only way to demonstrate containment would be by destructive testing. Therefore, the principle adopted is to over engineer and err on the side of caution.

For example, James Hill has told me that, in the gas turbine-powered locomotive built by Tim Coles, the turbine is surrounded by a steel shield half an inch thick. It is seemingly impossible that any fragments from a burst rotor that escaped the main turbine housing would be able to penetrate such a barrier. In Peter Southworth's steam turbine-powered locomotive *Turbo* the turbine was positioned below the boiler, between the frames and its plane of rotation was horizontal. Therefore, if the heavy rotor were to disintegrate, the fragments would tend to escape horizontally rather than upwards and into the boiler. Also, the frames would help stop fragments from reaching anybody in the vicinity.

3) Fail safe mechanisms such as electronic protection systems should be fitted to cut off the fuel supply.

Such systems are widely used in model gas turbines where it has been found important to design them such that failure of the electronics can only lead to shut-down of the fuel pump. The installation of electronic speed measurement and an electronically controlled valve to cut-off steam to the turbine are features I plan for my turbine (if I ever get that far) and are probably the main way by which the risk of over-speeding can be minimised for an efficient steam turbine.

4) Electronic sensors can fail so engine development should be directed at removing reliance upon electronic protection systems.

In the gas generating core of a gas turbine, speed limitation can be achieved by setting a maximum possible rate of fuel supply but, in a steam turbine, the steam supply and hence normal power output, would have to be limited. Clearly, it would defeat the objective of making an efficient turbine if it were always run with a minimal steam supply.

Another approach to prevent over-speeding that works well for model gas turbines is to adopt a small clearance between the tips of the turbine blades and the casing. Over speeding leads to expansion of the disc as a result of increased stress and the wheel starts gently rubbing the casing. However, my calculations indicate that, for a brass steam turbine disc 1.25 inches in diameter spinning at 50,000 rpm, the increase in diameter will be much less than 0.001 inch until the speed attains over 100,000 rpm so it seems that this precaution might only be practical with the alloy, speeds and temperatures found in gas turbines.

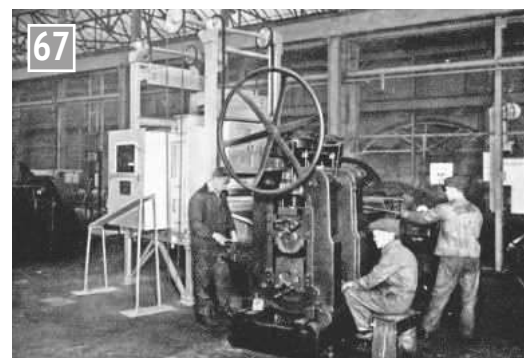
5) All engines must be rigorously tested before operation in public and any demonstration in public should be at no more than 90% of the maximum power achieved during testing.

6) All engine running must be conducted at a safe distance from non-essential personnel and no person should be allowed close to the side of a running engine i.e. in the rotational plane.

Manufacturing methods

The ever-increasing size of Parsons turbines together with the fact that they exhausted to a high vacuum meant that very large volumes of steam had to be handled in the later stages and this necessitated the use of very long blades. Then, as now, it was the design of the low pressure stages that presented the greatest challenges to designers of large turbines. Even back in the 1920s blades of low-pressure stages of large turbines could be several feet long. The very high centrifugal forces experienced by such blades meant it was necessary to develop different methods for manufacturing them and for attaching them to the rotor compared to those described in part 21.

Other complications are that the outer part of a long blade has significantly higher linear



*Rolling integral blades at Parsons works, Heaton.
The white box behind the rolls is the furnace.*

Integral rotor blade from a low-pressure stage of a Parsons turbine. Length overall is about 16 inches.

velocity than the inner part and the density and velocity of the steam also show significant variation between the inner and outer regions. These factors make it desirable that the shape of large blades should vary along their length such that they appear twisted and even have a changing profile. This complicates both design and manufacture.

A further complication is that the blades are more likely to experience pronounced physical vibration which leads to metal fatigue and blade failure. Therefore, these days, computer-based analysis of the frequencies at which a blade will resonate has become a standard part of turbine blade design. Fortunately none of these complications seem relevant for miniature steam turbine blades.

An example of a relatively small 'long' blade of the type just described is shown in **photo 66**. It has a substantial root which is shaped so that

it is held very securely when slid into a matching slot in the body of the rotor. The root is integral with the rest of the blade which was made by a hot rolling process developed at Parsons' works.

In this, a suitably sized billet of stainless iron or steel would have been heated to red heat in a furnace and then quickly placed between a pair of specially shaped and hardened rolls (**photo 67**). The profiles of the rolls were such that, as the billet was squeezed between them during several passes through the machine, it was lengthened, thinned and given the finished curved profile of the blade. The two rolls were geared together and cunningly, at one point on each of them, there was a suitably shaped hole. This allowed one end of the billet to remain full thickness so as to form the root. In a later stage of manufacture, the work was held by the blade while the root was machined to the correct profile.

Another interesting feature of this blade is the strip that has been brazed along its leading edge. This is made of either hard steel or stellite and was provided to protect the blade from the damaging effects of water droplets that form in steam by the time it has expanded and reached the low-pressure stages. Impacts between water droplets and blades, both moving at high velocities, can cause severe erosion of the blade material.

Hollow blades

Another interesting phase of blade manufacture resulted in long blades that were hollow. ➤

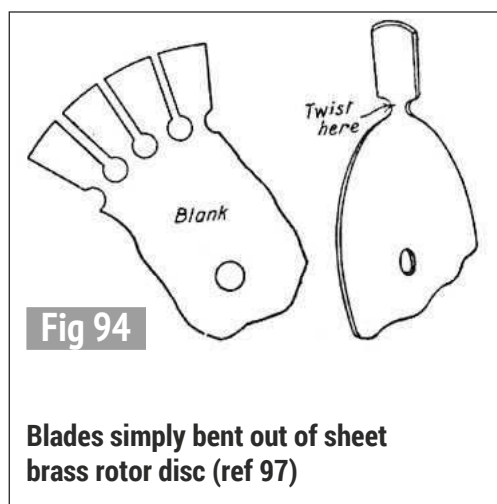
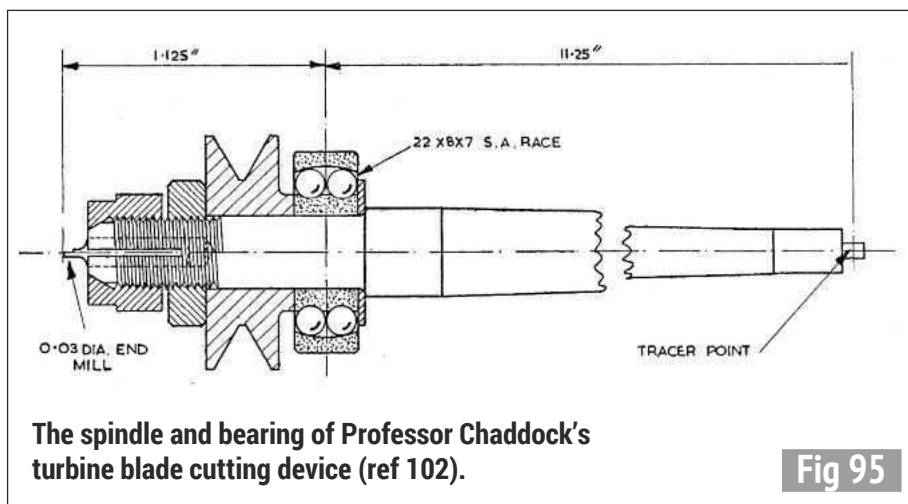


Fig 94

Blades simply bent out of sheet brass rotor disc (ref 97)



The spindle and bearing of Professor Chaddock's turbine blade cutting device (ref 102).

Fig 95

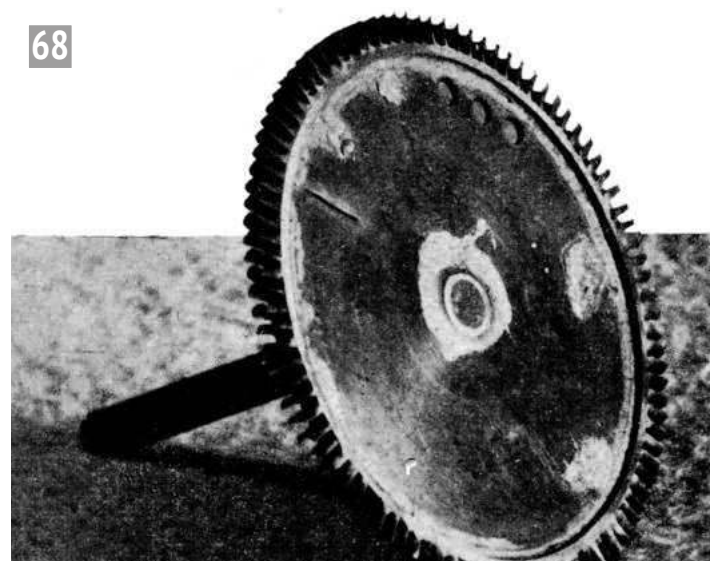
This reduced their mass and so reduced centrifugal stress on the root of the blade and on the hub of the rotor. To produce hollow blades, a hole was bored in each stainless steel billet and a tight-fitting mild steel plug was inserted into it and tacked in place by welding. The assembly was then heated and rolled as for a solid blade. During this process the mild steel plug rolled out to a profile similar to the outside of the blade, so the result was a stainless steel blade with a mild steel core. It was then immersed in an acid bath where the iron core was etched away to leave just the acid-resistant stainless steel.

Model turbine blades

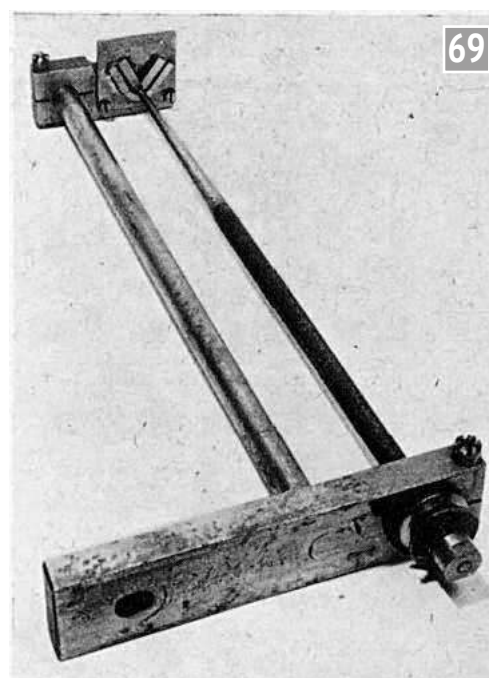
The first model steam turbines to be made involved making

rotor discs and blades out of thin brass sheet. In one simple method, short slots were cut into the periphery and blades were bent in one piece with the disc (**fig 94, ref 97**).

In another method, individual blades were soft-soldered into slots around the periphery of a disc, as in this example of impressive workmanship (**photo 68**). Each of the 100 blades ($\frac{1}{8} \times \frac{3}{32}$ inch) was curved over a $\frac{1}{16}$ inch diameter former before being held in a jig for soldering to the 2 inch diameter disc (**ref 98**). However, attachment of numerous blades to a disc in a manner able to resist high centrifugal force and the effects of hot steam is challenging. Mr Burnett (**ref 99**) described how he brazed small blades to the periphery of a disc.



One hundred sheet brass blades soldered around the periphery of a brass disc, built by Mr. Scott (ref 98).



69

Professor Chaddock's device for cutting turbine blades (ref 102).

However, as discussed in part 11, in theory, blades made of sheet metal are not ideal for efficient steam flow. Therefore, later model engineers devised ways of cutting profiled blades into the periphery of rotor discs, analogous to the approach taken by Charles Parsons in his very first turbines (see part 21). The main challenges facing anyone attempting this are the need to cut a curved shape accurately and to do this on a tiny scale. Therefore, it is easy to see the attraction of adopting the so-called Stumpf type of rotor where the pockets can be cut with standard milling equipment, as was discussed in part 23.

The first model engineer to publish a report about cutting

properly profiled conventional blades seems to have been Mr. Elkin (**refs 90 and 100**) (see part 6). He provided no details about the procedure used to cut the blades except that he used a 'Taylor-Taylor and Hobson' pantographic engraver. This is a specialised piece of equipment, not available to most amateurs, in which a small milling cutter was guided by an enlarged template.

Mr. Gordon (**ref 101**) described a small turbine and wrote that, to cut his blades, he 'made a 'non-Duplex' pantographic engraver'. However, I do not know what he meant by that description.

Other people have devised various home-made set-ups to do the job. One of

the most ingenious devices was invented by Professor Chaddock (**photo 69** and **fig 95**) (**ref 102**). He used home-made $\frac{1}{32}$ inch diameter cutters held in a collet on one end of a home-made spindle. This ran in a spherical ball race which allowed the orientation of the spindle to be varied so that the other end could be moved around a template while the cutter was being rotated by a belt drive over a small pulley. The distance from the template to the bearing was ten times the distance from the bearing to the end of the cutter. As the long end followed round the template, the path followed by the cutter was exactly the same as the template except it was inverted and ten times smaller. At least two other people have copied this device (**refs 93, 103**).

Mr. Bamford devised an alternative method (**ref 91**) which involved a curved shaper-type cutter that could only cut simple arc-shaped blades. The cutter could not rotate fully because it would damage other blades and therefore it was made to oscillate around a short arc (**photo 70**).

An alternative to moving the cutter around the blade is to move the workpiece around the cutter. This approach was described by Mr Blackmore (**ref 104**) who described a device in which the turbine wheel was mounted on a table that was pivoted on gimbals so it could be tilted both horizontally and vertically. A rod was attached to the table and the end fitted in a groove shaped as a template for the blade. As the end of the rod followed the template the workpiece moved relative to an end-mill cutter mounted in a fixed milling spindle. As with Professor Chaddock's device there was a 10 to 1 decrease in movement between the template and the workpiece at the point of the cutter.

Werner Jeggli also devised a method in which the blade shape was generated by moving the rotor relative to an end mill. In this case the rotor was held in a jig with an

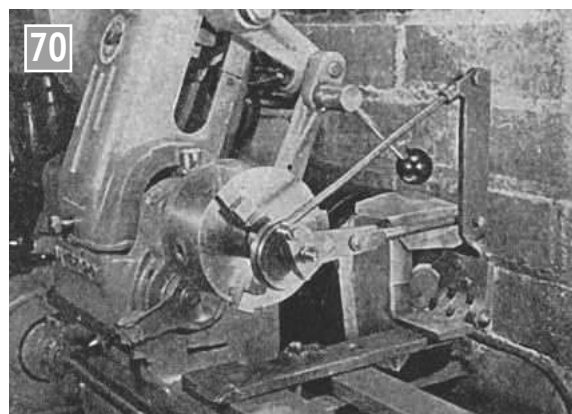
indexing arrangement and that was held in a swivelling vice on a vertical mill. This arrangement formed parallel-sided arc-shaped inter-blade gaps and straight entry and exit paths were formed by using the mill's cross-feed (**ref 94**).

Modern production technologies

Examples are starting to appear where hobbyists have used CNC milling machines to cut turbine blades. So far, I've only seen examples of relatively large blades being cut (**ref 105**). Also, Werner Jeggli has experimented with 3D printing for creating small rotors (**ref 106**). It is interesting to see that industry is also using that technology for both small rotors (**ref 107**) and for large blades (**ref 108**) including those for the next generation of large jet engines (**ref 109**).

Conclusion

Other topics not covered in these articles are relevant to model steam turbines, such as choice of bearings, design



Oscillating blade cutter by Jim Bamford (**ref 98**).

of speed reduction gearing and the art of balancing rotors. However, these seem less central or specific to understanding the theory and history of turbine development. So, my keyboard can now have a rest since this article brings the series to an end.

Acknowledgements

The articles in this series have greatly benefited from information provided by a number of people. I thank Fredrick Graham, John Gilroy and Arthur Rowe,

all professional turbine engineers, for putting up with my many questions about steam and gas turbine turbine design and production. I thank James Hill and Werner Jeggli for comments on a draft version of this article and, along with Norman Billingham, Jörg Hugel and Byron Hanchett, for very helpful discussions and suggestions. Lastly, I thank Alan Wragg and Roger Backhouse for encouraging me to submit these articles for publication.

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REFERENCES

89. www.youtube.com/watch?v=8TQTGORE42g&feature=youtube
90. Elkin, W. H. (1946), *Small Turbines, an Appreciation and Constructive Criticism*. Model Engineer, 94 (2350): 518 – 521.
91. Bamford, J. A. (1951), *An Experimental Steam Turbine - parts 1 and 2*. Model Engineer, 105 (2629): 474 – 477; 105 (2630): 507 – 510.
92. Rose, T. B. (1964), *Experimental Steam Turbine*. Model Engineer, 130(3259): 758 – 761.
93. Rose, T. B. (1969), *Model 'Hunt' Class Destroyer*. Model Engineer, 134 (3356): 1057 – 1060.
94. Jeggli, W. (2008), *A Steam-Powered Turbo Electric Intercity Train - part 2*. Model Engineer, 200 (4320): 274-277.
95. Stride, M. (2008), *A Steam-Turbine Powered Model Launch*. Model Engineer, 200(4328): 737-738.
96. Code of conduct for GTBA: www.gtba.co.uk/codes/codedoc.php and appendix to code of practice: www.gtba.co.uk/codes/codeappx.php
97. Harrison, H. H. (1903), *Model Steam Turbines. How to Design and Build Them*, Percival Marshall/MAP.
98. Scott, A.E. (1946), *A Small Steam Turbine*. Model Engineer, 95 (2364): 213–215 and 217.
99. Burnett, T. (2007), *Model Steam Turbines*. Model Boats (July): 52 - 54.
100. Elkin, W. H. (1947), *Small Impulse Turbines*. Journal of the Society of Model and Experimental Engineers, No 73: 633 – 638.
101. Gordon, D. G. (1962), *Small Scale Marine Power Unit*. Model Engineer, 126(3174): 592 – 593.
102. Chaddock, D. H. (1950), *An Experimental Steam Turbine Plant*. Model Engineer, 103 (2588): 966–969.
103. Mapplebeck, R. H. (1957), *A Super-Speed Steam Turbine*. Model Engineer, 116 (2925): 848 - 853.
104. Blackmore, L. K. (1957), *Turbine Blade Cutting*. Model Engineer, 116 (2906): 166-167.
105. Amateur CNC milling of turbine blades: www.youtube.com/watch?v=Rkmy7zBPSw ; www.youtube.com/watch?v=pQ20hmdfN7Y
106. Jeggli, W. (2017), *About Miniature Steam Turbines*. SMEE Journal (August), 25 (4): 35 - 38.
107. www.ge.com/reports/honey-i-shrunk-the-steam-turbine-and-it-makes-clean-water
108. press.siemens.com/global/en/feature/additive-manufacturing-siemens-uses-innovative-technology-produce-gas-turbines
109. 3dprint.com/11266/3d-printed-lpt-ge9x-777x

Rob Roy Rally 2019

Rex Hanman reports from the Andover Model Engineering Society, hosts of last year's rally.



Peter Wood's Blue Rob Roy.

With no overseas visitors this year's rally was a UK only event. Nevertheless, there was a good turn out with nine locomotives 'on shed'.

As usual there was a good spread of engines, from part built, nearly finished, complete and, in the author's case, just about worn out and overdue for a 'heavy general'!

Peter Wood from Northampton brought his model. Already sporting a nice shade of blue paint this

engine's build is progressing well (**photo 1**). Hopefully, Peter will be able to attend again in 2020 so that I can quiz him about the unusually short safety valve!

Regular attenders of the rally, Ian and Jane Horsfield from Bromsgrove, once again showed their support. As I have said before, Ian's efforts are producing one of the finest *Rob Roys* that I have seen. Ian has made good progress since last year, with much of the plumbing now complete. The

quality of his workmanship can clearly be seen in **photo 2**. The high standard continues - the cab really looks the part (**photo 3**)! For sheer attention to detail, check out Ian's cab steps (**photo 4**). Ian is hoping to have his locomotive running for the next rally... more on that later. To give him some encouragement (that he doesn't need!) he was sent off for a run round the Andover track with Chris Orchard's engine (**photo 5**). Chris and Yvonne Orchard's



Ian Horsfield's very neat plumbing.



Ian's engine is nearly there!

regular attendance is always appreciated. Every year Chris's engine runs as well as it looks.

Richard Weatherby from St Neots, Cambridge, arrived with his part built locomotive. It was interesting to see his superheaters mounted on a jig to aid construction (**photo 6**).

Another regular attender is Bryan Mellum from Wales (**photo 7**).

Support from the host club came from Bev Stephens, Pete Brown and Stan Full. There was, of course, the traditional end of day line up (**photo 8**).

They say a change is as good as a rest so the 2020 *Rob Roy* Rally will have a new venue! For a couple of years the Bromsgrove club has expressed a desire to hold the rally and this year their wish comes true. Like the Andover track, the Bromsgrove one has quite a steep slope. Concerned that *Rob Roys* would be unable to tackle their version of the Lickey Incline the author made a test visit. Result... no problem! Even with the club's very heavy passenger coach he almost got round - only lack of adhesion let him down. To prove the point Ian had a go and sailed round quite happily (**photo 9**).

The 2020 *Rob Roy* gathering will be held at the Bromsgrove M E S site on the 28th June. Bromsgrove Society of Model Engineers' track site is situated adjacent to Avoncroft Museum of Historic Buildings, Bromsgrove. (A great place to visit! Please note that there is no access to the museum from the track site... you still need a ticket!) If you have sat. nav., the post code for the museum is **B60 4JR**. The museum is situated off the A38 Bromsgrove bypass.

The club's website is www.bromsgrovesme.co.uk/home Contact me on 01980 846815 or at hanmanr@yahoo.com for general information or, for more specific enquiries regarding the Bromsgrove club, contact Ian Horsfield at meadowsend03@btinternet.com

Please note that the Bromsgrove track features



Ian's cab steps.



Richard Weatherby's superheaters.



Bryan Mellum prepares 'Haggis'.



Chris Orchard gives Ian a few words of advice before he sets off with a heavy load! (Photo by Jane Horsfield.)



The end of another great day. (Photo by Jane Horsfield.)



Ian sets off from the Bromsgrove station to test the track. (Photo Jane Horsfield.)

an anti-tip rail. It would be advisable to check that your driving trolley will clear it!

Ian raised a good point, "It seems that a lot of model makers start with a *Rob Roy*

and move onto larger models. Thus, *Rob Roys* seem to be left on a shelf to collect dust. Perhaps we ought to appeal to them to join us whether or not their models are able to

steam." Hopefully the change of host club will enable new attendees to bring their examples of this great little locomotive.

ME

The London Model Engineering Exhibition

PART 2

John Arrowsmith reports from Alexandra Palace.



Continued from p.357
M.E.4633 28 February 2020



A rare example of Edgar T. Westbury's 1831 Railway locomotive 30cc engine displayed on the Blackheath MPBC stand.

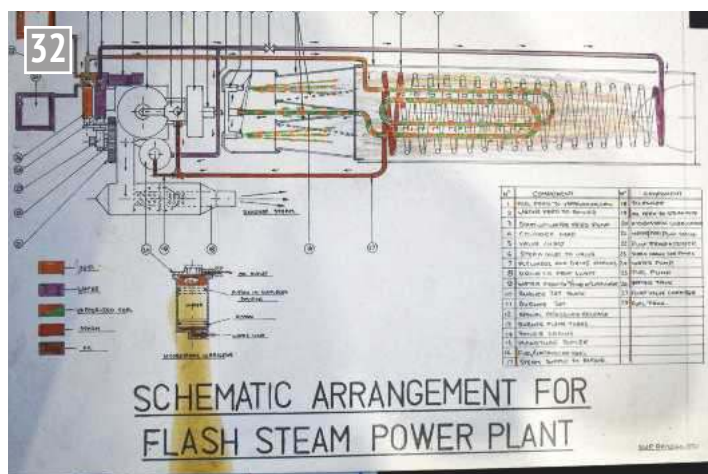
There is always a good marine element to this show and again this year the display of models was excellent. The **Blackheath MPBC** had a good selection of craft on their stand, complemented by a rare

model of an engine designed by Edgar T. Westbury in 1941. This model was for the 1831 rail locomotive and was a twin cylinder four stroke petrol engine of 30cc capacity which fed a friction drive for the locomotive. The model was

built in 1942 and was reported in Volume 84 of the *Model Engineer* magazine of that year (**photo 30**). A large display of high speed craft was a feature on the **Model Hydroplane Club of Great Britain** stand (**photo 31**) and the schematic drawing of a Flash Steam Boiler (**photo 32**) showed visitors how these machines generated their power. The sectioned and working model of an engine was also a useful addition. The **Moorhen MBC** presented a good selection of craft with a couple of powerful looking tugs on display along with a well made small fishing vessel (**photo 33**). A modern destroyer as the centre piece really stood out (**photo 34**). There was a fine array of naval power on the **Surface Warship Association** (**photo 35**) stand with many types



The Model Hydroplane Club of Great Britain's colourful display stand.



A schematic Diagram of a flash steam power plant.

of warships on show. Frigate F 371 was originally *HMS Wye* and built with a steam power system and this was displayed alongside the ship. The rebuild is now battery powered (**photo 36**). The **Welwyn Garden City SME** also had a selection of naval craft on display with a fine example of destroyer *HMS Manchester* built by Paul Chilcot taking centre stage (**photo 37**). Derek Atree's half track personnel carrier and German anti-tank gun was an excellent piece of model engineering (**photo 38**). The **Gauge 3 Society** display



Impressive naval power on the Moorhen MBC display.



A great selection of warships on the Surface Water Association stand.



The original steam plant alongside the ship it used to power.



HMS Manchester was part of the Welwyn Garden City SME display.



This German half track and anti-tank gun was built by Derek Atree.



An attractive presentation by the Gauge 3 Society.



On the Harrow and Wembley display was this smart looking 0-4-0 locomotive.



The interactive 'Drive a Train' screen part of the Transport for London stand.



Topping up the tank on the Polly Owners' portable track locomotive.



demonstrated clearly the scenic side of 2½ inch gauge railways with some beautifully made and presented models with a Great Western theme this year (photo 39). A varied collection of models was a feature of the **Harrow & Wembley SME** display with a fine Mississippi stern-wheeler accompanied by some quality locomotives (photo 40) and stationary engines. A selection of

leaflets publicising the club's operating days was a useful guide for visitors.

Demonstrations and activities are an important section of this exhibition and this year a couple of new displays are worthy of note. The interactive display by **Transport for London** provided a good hands-on component to demonstrate a simple signalling system which anyone could try, similarly the



An interesting scene on the 16mm Ridgmont layout.

In BR Blue livery this OO Gauge steam powered A4 makes light work of its train.

small shunting yard was lots of fun for younger visitors and the not so young! This was combined with an interactive screen and control panel where driving a train on the simulator could be enjoyed (photo 41). A display by the **London Transport Museum** was part of the Tfl stand and combined well with the display.

In the Activity Zone a number of groups provided plenty of visual movement to

entertain everyone. Regular contributors to this part of the exhibition are the **Polly Owners Group** who operate their portable track giving rides for everyone behind a steam locomotive. That beloved smell of hot oil and steam just adds that extra bit of atmosphere to the hall (photo 42). The smaller gauge railways are another major part of the exhibition and provide plenty of railway



You can almost smell the hops as the Brewery on the G1MRA layout starts the days production.

interest in a number of different gauges. This gives both the serious modeller and the casual visitor a real chance to see what is involved in such activities. On the **OO Gauge Live Steam Club** layout the railway demonstrated the way these models can provide an authentic looking and operating steam train. An operating workshop was also part of their display (photo 43). Steam operation was also to be found on the **16mm Group Ridgmont Railway** layout as a selection of locomotives were put through their paces on the scenic layout (photo 44). Regular operators at the Exhibition are the **Gauge 1 Model Railway Association** who demonstrate the capabilities of this gauge on their large 'Invicta' layout. If mainline prototypes and rolling stock are your interest then this was the place to be. Always busy with lots of

interest. The working brewery was a nice touch (photo 45). The **Buckinghamshire Garden Railway Society** brought their White Leaf Light Railway layout to entertain and here again lots of colour and interesting features kept many people absorbed in the operations (photo 46). There was no flying zone this year but the introduction of some excellent large scale model aircraft made a major impact of the displays. The **Large Scale Model Association** provided a rare model of a three-engine Beardmore Experimental Bomber (photo 47) which was included with a half scale model of a Tiger Moth (photo 48) which had been designed and built by John Greenfield. Both were exceptional models and attracted a lot of attention as visitors were able to get quite close. Adjacent to this display the **British Model Flying**



The fully quipped maintenance train on the White Leaf Garden Railway layout.



The three engine 1928 Beardmore Experimental Bomber on the LMA display.



A half scale Tiger Moth displayed on the LMA display.



A range of information leaflets and colourful aircraft on the BMFA display.

Association had a colourful stand (photo 49) displaying many types of aircraft and fittings. They had their usual simple aircraft building table and many budding pilots took advantage of this activity.

Continuous activity was a feature of the **Tamiya Trucking** area, where numerous r/c vehicles were driven, loaded, parked, unloaded and used on the extensive road layout that had been constructed by members (photo 50).

A large display of static models enabled spectators to see the finer detail of these quite large scale models. On the **International Plastic Modellers Society (IPMS)** displays were a large range of many different prototypes from road vehicles to warships. Each depicting a particular prototype, they were well made and finished in authentic colours and attracted a lot of spectators (photo 51). A new group to me was the **London AFOLS** which translates as the London Adult Fans of LEGO society who had a large demonstration stand with numerous working models, all connected together to form a large conveyor machine transporting small, marble sized balls, from one end to the other, which were collected by a small automatic train and delivered back to the starting point to keep everything moving (photo 52). Another new group were the Alexandra Palace 'Little Inventors' group, which is a collaboration between Middlesex University and the 'Red Loop Design Centre' to encourage young people to build models of whatever they like. For example, one young seven year old had drawn up a Robotic Bunny and the engineering students at MSU had built a model of the youngster's ideas. I hope to develop this in a separate article but that's all for now. That also completes my thoughts on this year's London Exhibition. My thanks as always to all the clubs, societies and demonstrators



The extensive road system for the Tamiya Trucking enthusiast always drew good crowds of spectators.



Part of the IPMS group of display stands.

- without you there would be no exhibition at all. I hope to see you all again next year with another great selection of models for everyone to enjoy.

ME



London's Adult Fans of LEGO produced this complicated conveyor system for the exhibition.

The Barclay Well Tanks of the Great War

PART 59

Terence Holland describes and constructs two appealing, century old locomotives.



Continued from p.319
M.E. 4632, 14 February 2020

This constructional series addresses Andrew Barclay 0-4-0 and 0-6-0 narrow gauge locomotives supplied for use in the First World War. Built without the use of castings, the 0-4-0 design is described as two versions; as-built for the British Admiralty in 1918 and as rebuilt and currently running on the Talyllyn Railway as their locomotive No.6, *Douglas*. The 0-6-0 engines described were built in 1917 and operated on 60 centimetre gauge track at the Western Front in France. These were small, spartan machines of which only 25 were supplied and none have survived into preservation.

Front 'U'-beam

The front U-beam (fig 187) is made from two pieces of $\frac{3}{4} \times \frac{1}{8}$ inch steel angle iron, welded or brazed together, with two more pieces of $\frac{1}{2} \times \frac{7}{16} \times \frac{1}{8}$ inch angle riveted on for attaching to the front frame plate. The square hole in the beam takes the squared shaft on the end of the buffer assembly and stops the buffer from rotating.

Centre buffer/coupling

Photograph 279 shows the assembled buffer/coupler mounted on the front beam, along with the rear buffer/coupler, dismantled to show the components. Note that the buffer plates etc. are made from stainless steel – totally unnecessary of course, as mild steel would have been more appropriate, but they did



Centre buffer/coupling.

look nice. In fact, in the past, I've used stainless steel for a lot of components on the backhead of a locomotive, where the lack of oxidation keeps them bright and shiny in places difficult to keep clean – for example firehole doors and operating levers.

It's always best to use BA threads where possible, as BA taps and dies are normally made from high speed steel, whereas ME taps and dies are made from the less durable carbon steel.

The components of the buffer/coupling are detailed in fig 188.

Cylinder displacement lubricators and tallow cocks

The displacement lubricators fit in the centre of the steam chest covers and are exactly the same as the unit fitted to the external regulator – see photos 203 to 205, 278 and figs 129 and 130 (issues 4598, 26th October 2018 and 4632, 28th February).

The tallow cocks, which are fitted to the centre of

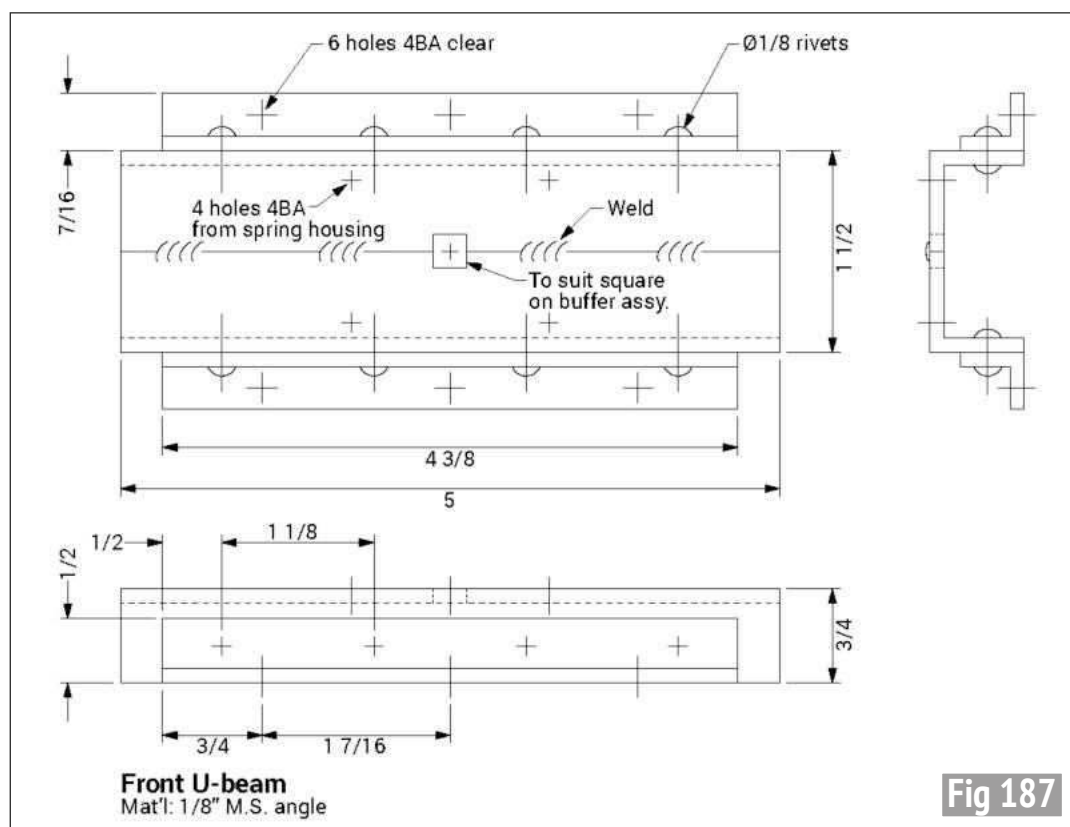


Fig 187

I haven't produced a drawing because I'm not sure of how they work – and, as is often the case, the internet didn't really help. Any information would be gratefully received!

Mechanical pump

The original locomotives were not fitted with mechanical oil pumps, but *Airservice Constructional Corps No. 1* (ACC No. 1) would no doubt benefit from being supplied with the pump specified for Douglas.

Barclay combination lever arrangement

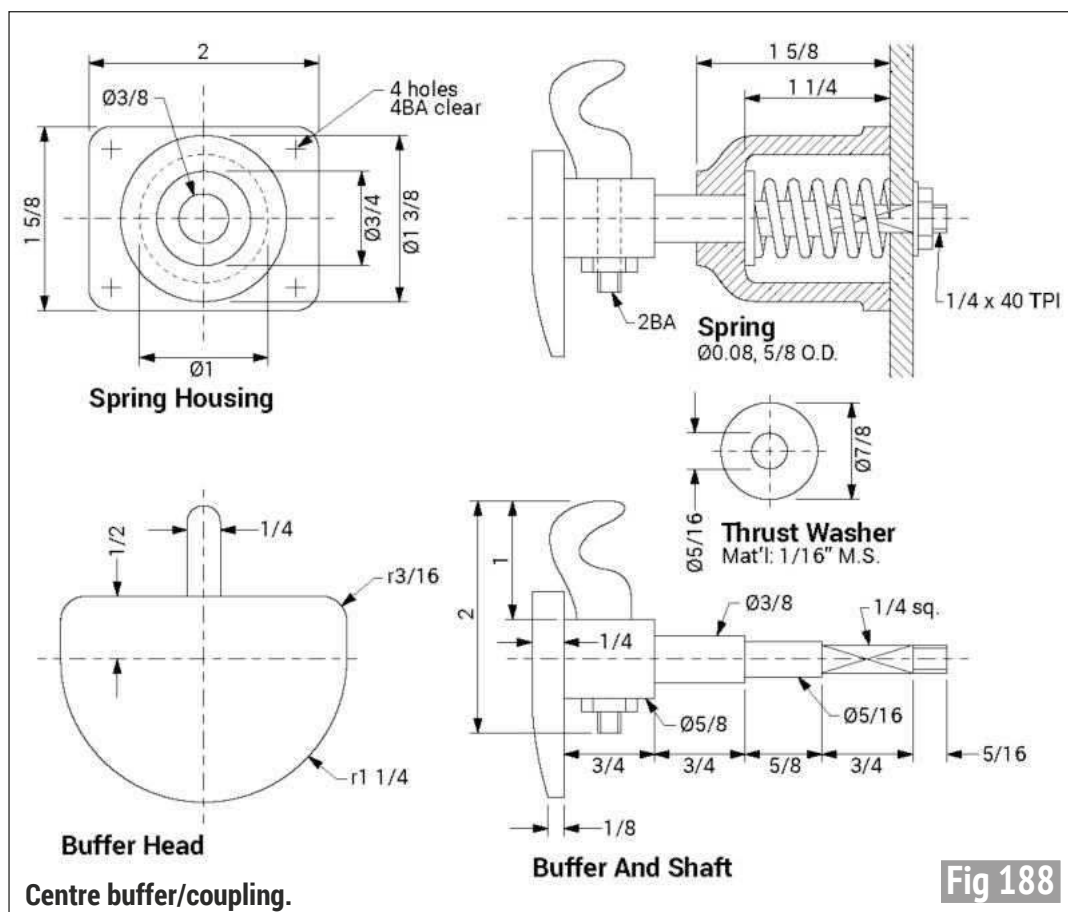
Without the running irons, the top of the combination lever is much more visible, so it might be a good idea to replace the classic design with the specific Barclay design. See this on *Douglas* in **photos 280 and 281**. These two photos give some idea of the simplification that took place to the design over a period of some 30 years – in fact, on the BnM engines built in the 1950s, the ends of the valve rod and the radius rod appear to be simple forgings. In these photographs the combination



Barclay combination lever on Caledonia.



Barclay combination lever on BnM No. 2.



lever is made from two plates of steel and, on the BnM engines, the ends were not rounded off.

The modifications necessary to the combination/valve rod arrangement etc. are shown in **fig 189** and are fairly straightforward. The valve rod is extended slightly, the end is reduced in diameter and threaded $\frac{1}{8}$ inch x 40. It is then fitted with a banjo end, which fits inside the fork of the combination lever – thereby eliminating the forked end of the valve rod, which fits over the smaller fork.

The banjo can be silver soldered on the end of the rod to make a more permanent, stronger job.

Ensure that there is clearance between the end of the valve rod and the end of the radius rod in the fork of the combination lever, to allow the radius rod to lift up and down.

Note that this modification can also be applied to *Douglas*. Also note that the flat on the end of the rod is to prevent a hydraulic lock in the front boss of the steam chest and a flat for the grub screw is not shown.

Simplified cab

The cab detail for ACC No. 1 is shown in **fig 190**.

Round firehole door

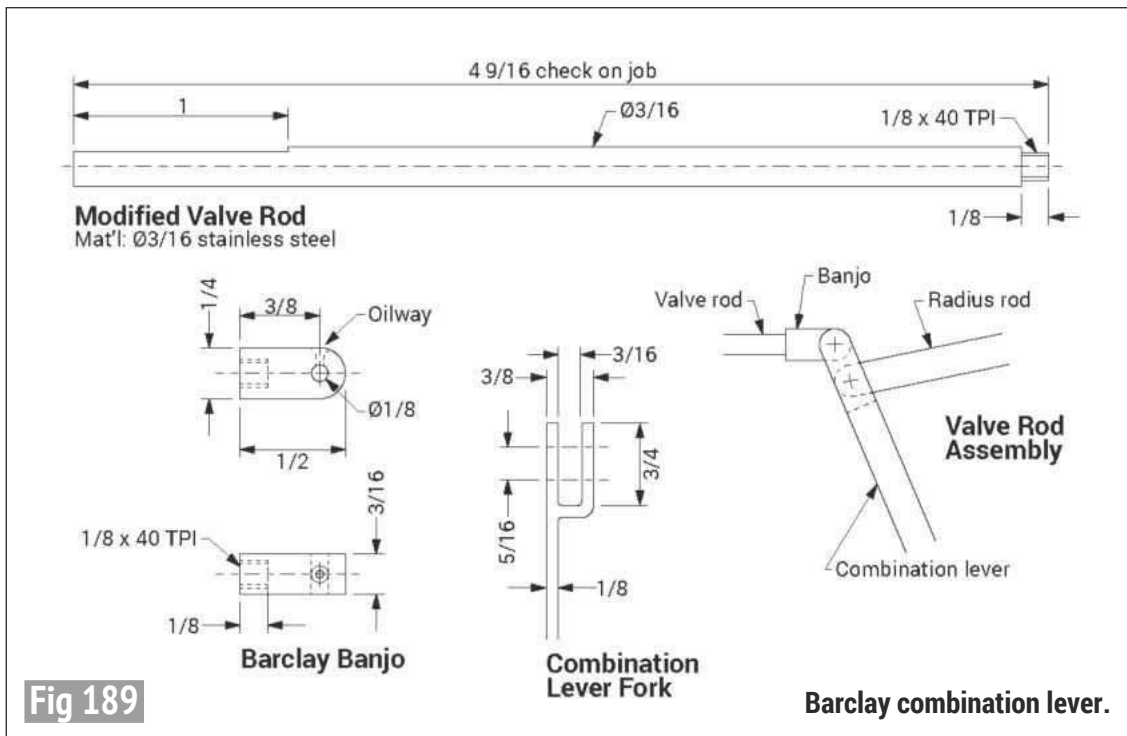
The construction of the original, round door has already been addressed - see figs 146 (issue 4608, 15th March 2019) and 190. Figure 190 shows the door and its fixings screwed directly into the boiler plate, whereas fig 146 details a backplate which fixes to the four boiler bushes used for the sliding door.

Fireman's bunker

No door is required on the coal bunker opening and therefore extra space is not required and the bunker can be made the same width as the driver's – see fig 190.

Brake gear

The braking arrangements on the original locomotive are extremely basic and much less of a problem to construct than those for *Douglas*. Just a single pair of brake blocks on the front wheels only, no steam brake and no



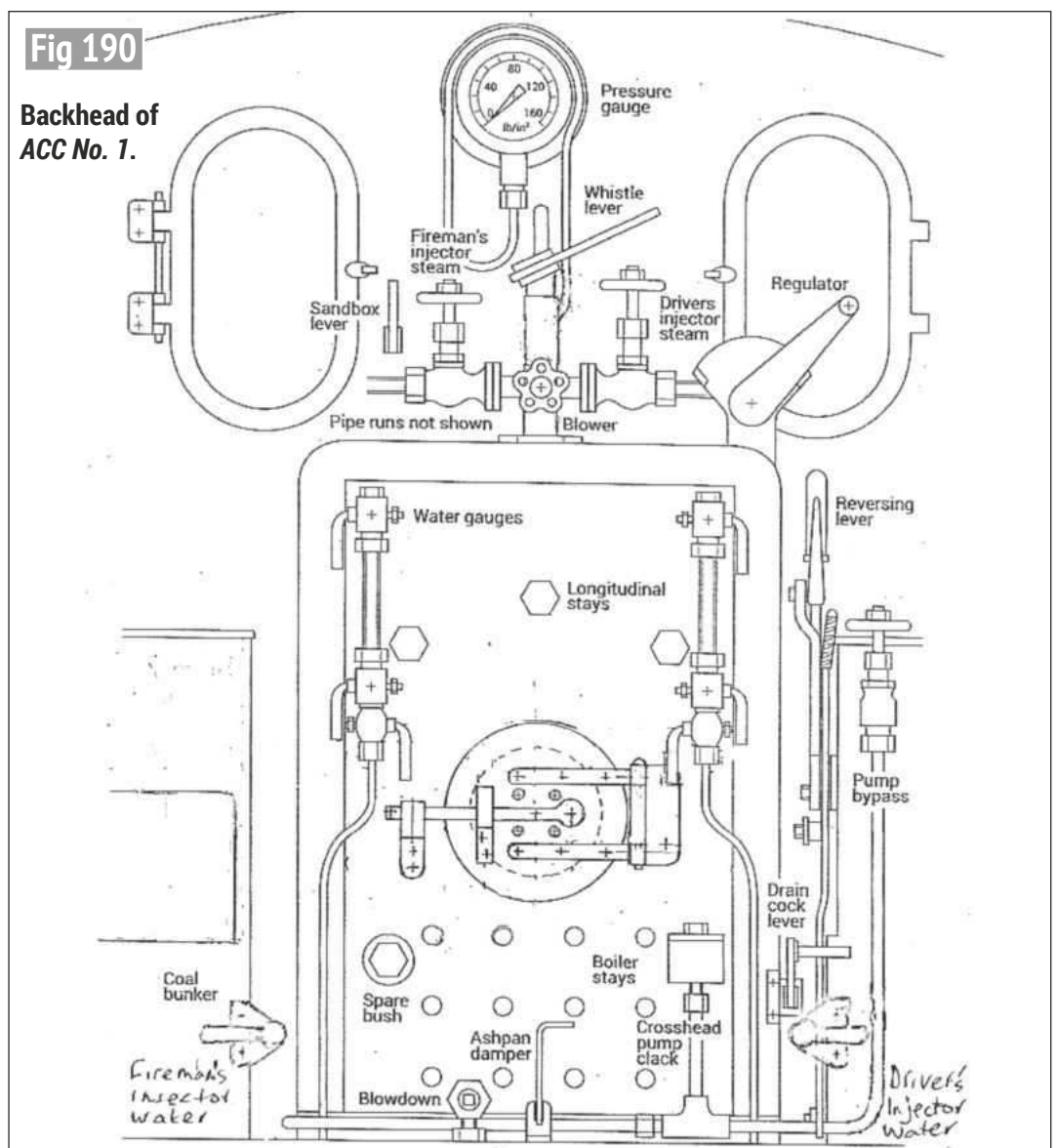
corresponding control gear/plumbing in the cab. The operating gear for the hand brake is a bit more complex however.

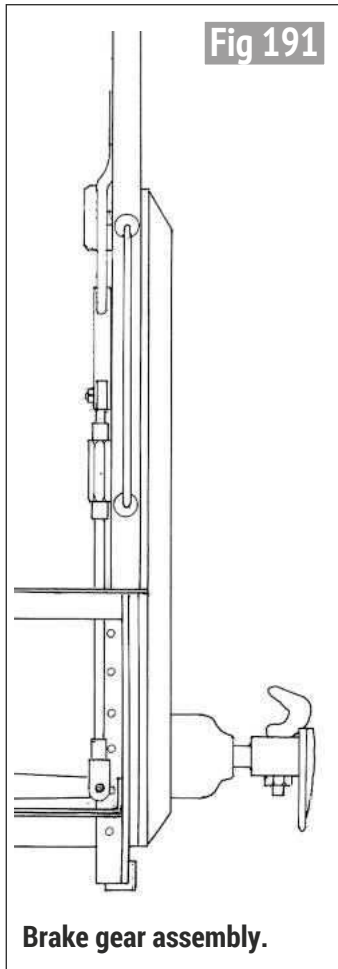
Point lever-type brake lever and rear reinforcing angle

For the operating gear see **figs 191, 192 and 193** and **photo 282**, which shows the operating components viewed from the rear - jury-rigged to show their approximate position.

Note that the curved ratchet and pawl are made from high carbon steel (gauge plate), although mild steel would be quite adequate. Due to the position of the removable centre section of the rear cab plate it is not possible to anchor the right-hand end of the ratchet segment to the cab backplate and, therefore, a separate support is necessary which fixes to the inside reinforcing angle. The gear attaches to the brake system via a turnbuckle, which allows for adjustment.

Photograph 282 shows the top thread of the turnbuckle assembly – unfortunately I seem to have lost the rest of it! However, small turnbuckles are commercially-available as small as 4mm and marine



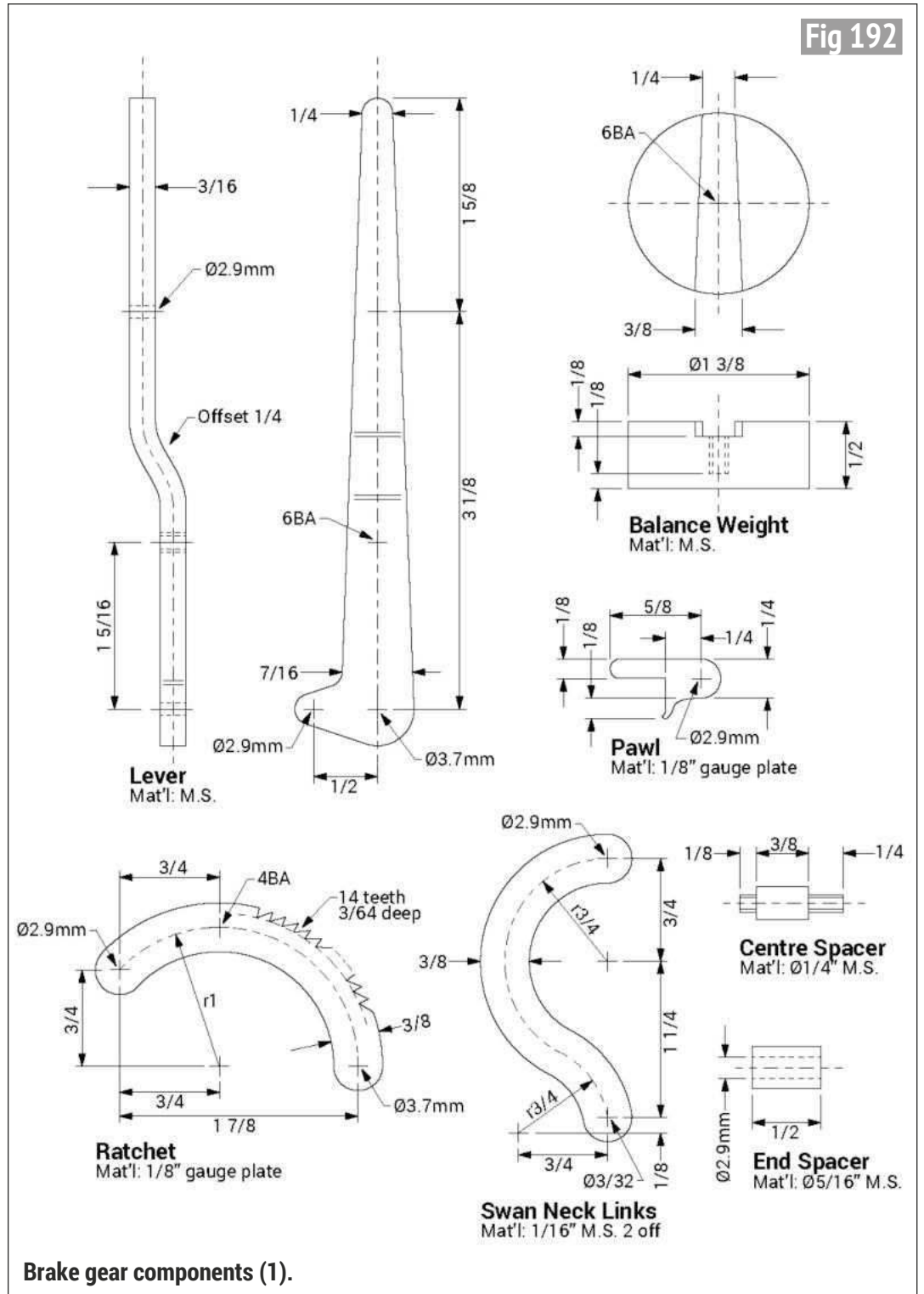


Brake lever.

versions are available in stainless steel.

The brake lever and turnbuckle are shown in position on the locomotive in **photos 283 and 284**. Figure 191 shows how the parts in **figs 192 and 193** fit together.

Photograph 285, of the rear of the locomotive with the centre panel removed, shows how the brake lever assembly fits on the rear cab plate and



how it connects with the rear, reinforcing angle. The reinforcing angle stiffens the assembly, as it is bolted to both the cab backplate and the rear beam.

● To be continued.

NEXT TIME

We start work on the tender.

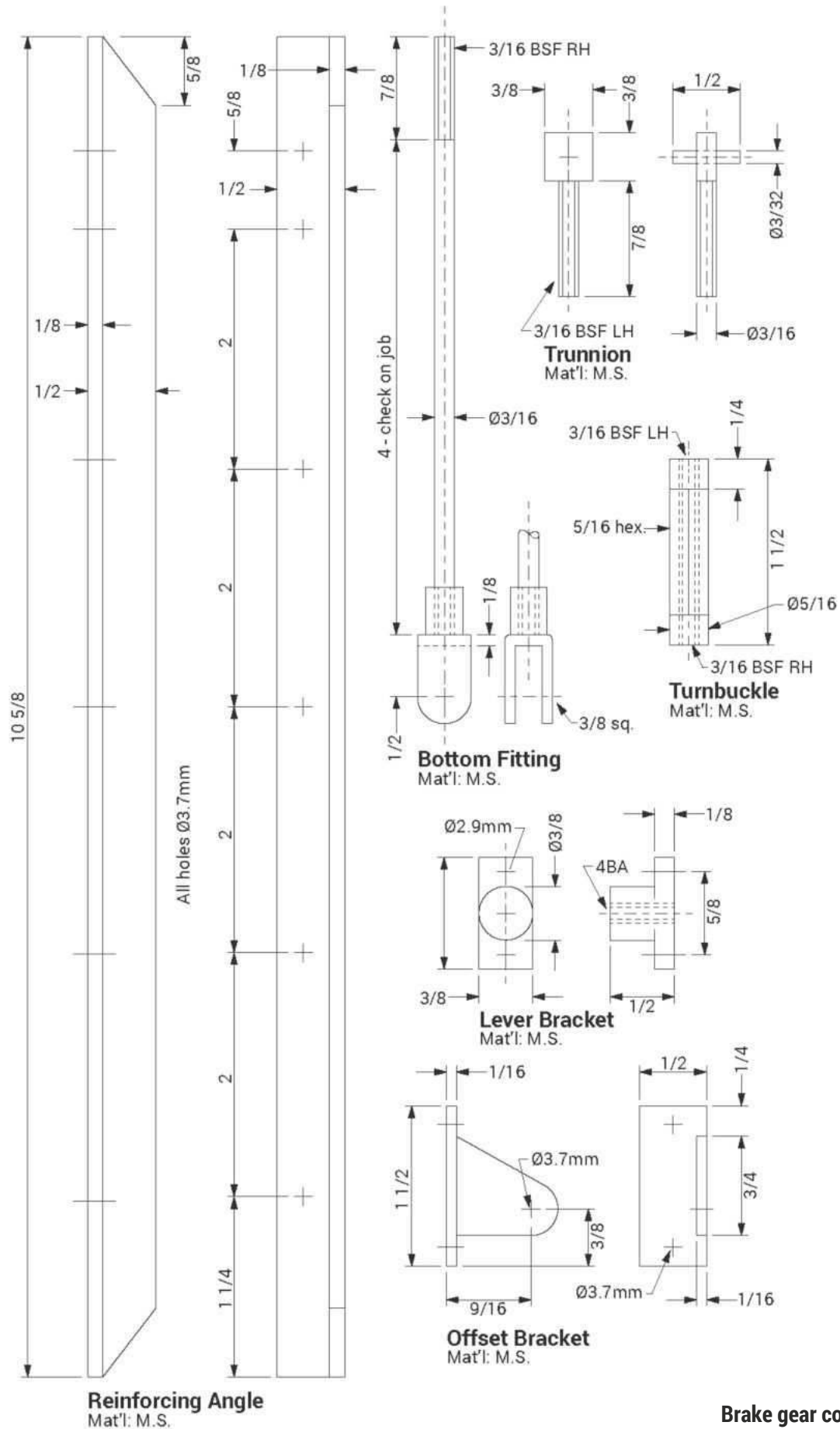


Turnbuckle.



Brake lever assembly on cab.

Fig 193



Brake gear components (2)
and reinforcing angle.

Magdalen Road Revisited

Jeremy Buck invites us back for a further tour of the Magdalen Road garden railway.



Continued from p. 363
M.E. 4633, 28 February 2020

The boiler and finishing the platework

By contrast, with the travails encountered with the chassis, the boiler presented relatively few challenges. I have no paperwork on its origin, but it looked to be well constructed with, as far as I could tell from external examination, good penetration of the silver soldered joints. It had no difficulty in maintaining 160 psi under hydraulic test (**photo 76**) with no apparent elastic or plastic deformation. The inner firebox incorporated a fusible plug, which would have been inaccessible for inspection in the completed locomotive - a situation I thought to be unacceptable. I replaced it with a plain plug. I was not happy about the main steam pipe



Boiler under test. 160 psi was sustained with no weeps or detectable deformation.

cantilevering off the front tube plate with no other support for the regulator valve so I introduced (before testing the boiler) a bracket bolted to the barrel just forward of the dome to provide additional support (**photo 77**). Incidentally, photo 77 shows four of the five silver

soldered longitudinal stays, all of which were buckled, i.e. not straight and taut, to varying extents prior to pressure testing. On completion of testing, no change was noted, indicating that there had been no permanent deformation of either the tubeplate or the backhead under pressure. Given the proximity of the longitudinal stays to the tube bank and the barrel it is not surprising that these stays apparently carry little load when the boiler is under pressure.

I replaced all of the boiler fittings, except the regulator which is a shortened commercial stainless steel, lever operated ball valve (**photo 78**), followed by a further hydraulic test to 120 psi after everything had been piped up to check for, and rectify, leaks at the bushes and pipe fittings.

I replaced the original brass regulator handles with new steel handles pinned to the cross shaft and working within sector plates to give positive closed and open positions. The crude mechanism for converting rotation of the cross shaft to forward/aft translation of the regulator rod at the stuffing box was replaced with the much better arrangement, as on the Clarkson A3. The three bearings that support the cross shaft are mounted on a single baseplate to ensure the alignment is maintained and



Regulator valve. A retaining pin was installed at the 'big end' after installation in the boiler.



View through dome bush with regulator removed showing bracket installed to support main steam pipe. Note how the longitudinal stays are anything but straight. Testing at 160 psi made no detectable difference.



79 Regulator assembly. I found that three bearings were essential for smooth operation. The subframe also serves to support the blower valve.



81 View from the Driver's seat. The vacuum brake valve is prominent. Steam chest pressure gauge on the left, boiler pressure on the right.



80 The bucket seats have been upholstered since this photograph was taken.

removal, if required, is easy (**photo 79**).

I put a lot of thought into laying out the backhead controls (**photos 80 and 81**) and, although it cannot be described as close to scale, I think it is a very passable representation of the Gresley layout. Tucked away on the driver's side in the tight space between cab and firebox sides is the vacuum ejector, arranged in identical fashion to the ejector in the A3 cab. This exhausts correctly along the boiler side to the chimney as shown in a later photo.

The superheater should probably be more accurately described as a steam dryer, comprising, as it does, a single return $\frac{3}{8}$ inch diameter copper non radiant element, in each of

two $1\frac{1}{16}$ inch internal diameter flues. The challenge here was to come up with a solution for installing and removing the elements through the smokebox, the front of which is much shallower than is normal for a boiler of this size. After much head scratching I came up with a solution that allows the superheater to be split so that the elements can be removed independently of the wet header (**photo 82**). This solution overcame two problems, the second being the excessive shielding of flue tubes due to $\frac{3}{4}$ inch diameter 'wet' and 'dry' headers, one directly above the other. As modified, there is no dry header, as such, but a single cross connecting pipe is necessary to feed the middle



82 Reconfigured superheater; it can be installed and removed through the smokebox door – but it is necessary to remove the chimney and top of the smokebox to get at the nuts. See also photo 84.



Before the streamlined casing was fitted, the underlying pipework including the snifting valve behind the chimney is visible.



With the superheater installed, space is at a premium in the smokebox. The threaded hole in the top of the wet header is for the snifting valve. The hole in the side of the smokebox is for the vacuum ejector exhaust pipe.



Ashpan assembly inverted showing hopper doors and control linkage for front damper.



Ashpan installed showing grate. Outer sections are fixed; centre section can be dropped through the hopper doors.



Smokebox near side showing operating valve and feed to whistle.



View from the other side showing where the whistle steam is Tee'd off to the dummy in front of the chimney. The photograph also shows the upper connection of the 'cod's mouth' door operating mechanism.



Operating mechanism for the upper door of the 'cod's mouth'.

I put a lot of thought into laying out the backhead controls and, although it cannot be described as close to scale, I think it is a very passable representation of the Gresley layout.

cylinder. The wet header is a simple boss on the main steam pipe where it enters the smokebox and this has a feed to a snifting valve located behind the chimney (**photo 83**). Tightening up all the pipe unions in the smokebox was a challenge (**photo 84**).

The ashpan, as supplied, was unbelievably flimsy albeit integral with a very robust stainless steel grate, including a drop section that had no means of control. Because it is quite a complex shape, I retained the sides, but extended them, and made new front and rear sections incorporating air holes (rear) and damper (front). I cut out the bottom and made and fitted drop down doors with a retaining pin (**photo 85**). The fixed side sections of the original grate were retained, but the whole grate was raised to give increased clearance to the shallow sides of the ashpan (**photo 86**). The new central section of the grate can be removed through the drop down doors.

I obtained a very large (for 5 inch gauge) chime whistle from Reeves and the only place that I could find for it was above the bogie in front of the middle cylinder. This is operated by a prototypically correct cable operated valve on the side of the smokebox, fed with wet steam from a connection high up on the smokebox tubeplate. When piping this valve to the whistle via a (unfortunately overscale) pipe outside the casing just above the nearside nameplate then inside and down in front of the smokebox, I could not resist a connection to the non-working whistle in front of the chimney (**photos 87 and 88**).

Most of the platework had been executed during the first phase of the build but a few finishing off tasks remained to be completed. These included the making and fitting of the access hatch doors, complete with retaining catches, cover plates on the firebox casing for the washout plugs and manholes and the operating mechanism for the upper door



'Cod's mouth' doors in the open position.

to the smokebox streamlining. The door is opened and closed using an Allan key from a position just in front of the offside cylinder (**photo 89**) by a simplified version of the bevel geared arrangement used on the prototype. Fortunately, in this scale, support of the door is required on one side only

as indicated in photo 87. The smokebox door hinges and whistle pipework take up the corresponding space on the other side. The lower casing door is supported on chains when open (**photo 90**).

●To be continued.



Geoff Theasby reports on the latest news from the Clubs.



I just bought a small motor and gearbox for only a few quid and on testing it nothing happened. The motor drew about 3 amps at 12 volts, sending the power supply into current limiting. Dismantling it bit by bit, testing at every stage, I found the motor locked solid. Hmmm! The motor itself is widely available and I collected all the salient details online.

Removing the end cap, I found that a small plastic spacer had not been pressed down sufficiently, interfering with the brush holders. Rectifying this freed everything off. That's what you get for buying cheap – a lack of final inspection. Reassembling the device, I was met with a satisfying whine, controllable by a PWM speed adjuster.

I wonder if I can claim it is turbine-powered?

In this issue: the virtues of CAD, therapy, online security, a digression, a Gaumont-Kalee? And wheelchair escapades.

The current edition of *The Journal*, from the **Society of Model & Experimental Engineers**, is a bumper issue, fast becoming an annual event. After the usual 'notices', it begins with Jake Sutton writing about a new direction he is taking. After many years of making locomotives, he has started on an 'English regulator' clock. Not enamoured of the soulless and perfect appearance of CAD programs, he is learning about hand engraving of the dial. Gareth Hughes discusses the (questionable?) merits of having a computer in the workshop. David Alexander gives us the lowdown on autonomous vehicles, being professionally involved in the subject. Duncan Webster writes on radial valve gears, beginning with the Hackworth. Radial gears are a simple design, deriving their valve events from a single crank or eccentric.

W. www.sm-ee.co.uk

Criterion, December, from **High Wycombe Model Engineering Club**, has Ian Clark, who spoke on the

pre-setting of Stevenson's valve gear eccentrics in an October meeting, writing up his remarks for posterity. Andrew Hopper bought a *Simplex*, which was not quite as stated and which took weeks to get to an acceptable standard. Nevertheless, he now thoroughly understands the locomotive and learnt much in the process.

W. www.hwmecc.co.uk

The Model Engineers Society (NI) *Link*, January, prints an item concerning model engineering societies and mental well-being, as in the 'Men in Sheds' movement and similar. This was put together by Secretary David Heatley at the request of Irish Vintage Scene (classic cars, tractors etc.). He observes that members of these groups tend to live longer and have more fun and interest in their lives. Maybe it's therapeutic, as I once said in a job interview, to which the retort was, "Do you feel you need therapy?" (I didn't get the job...)

W. www.mesni.co.uk

Ashpan, autumn, from **Ickenham & District Society of Model Engineers**, has an interesting item on the Fullerphone. This was devised in WWI to attempt secure communications in the trenches without using wired telephones, which could be easily 'tapped'. Graeme Vickery builds a model of the IoM 2-4-0 locomotive from a nickel silver kit and an Oxford Diecast model, whilst Graham Findlater writes a short biography of the founder of Martin Baker, of ejector seat fame, Capt. Valentine Baker. His talk on this subject will follow, appropriately, on Valentine's Day.

W. www.idsme.co.uk

St Albans & District Model Engineering Society Newsletter, January, has picture of a paper ship by Japanese artist Atsushi Adachi. An interesting concept. Each model is clad in newsprint from the press of the period. See www.thisiscolossal.com/2019/12/atsushi-adachi-newspaper-sculptures Secretary Roy Verden has

a donated, clockwork boat, about 85 years old. It has been fitted with radio control. He wonders if members have anything older at home. (Be very careful...!) Ten years ago the society newsletter carried an item on Sir Francis Pettit 'Screw' Smith, the inventor of the marine propeller. The mystery object in the previous issue was taken completely 'off topic' by one reader who criticised the electrical wiring in the background of the picture. I think I know the answer to the current puzzle - we shall see. In www.youtube.com/watch?v=cD3QIR98-A&feature=youtu.be is another cannonball run*. This neatly coincides with Roy's fascination with marble runs.

W. www.stalbansmes.com

Ryedale Society of Model Engineers' December Newsletter has little to report and so prints a longish article on the construction of the track some 20 years ago, starting with the earthworks.

W. www.rsme.org.uk

The Whistle, January-March, from **British Columbia Society of Model Engineers** sees the welcome return of Paul Ohannesian as editor, now restored to rude health. *The Whistle* will now be published quarterly and of about 12 pages.

W. www.bcsme.org

Plymouth Miniature Steam's Goodwin Park News, winter issue, reveals that passenger numbers are up by 8% over last year with 6,000 carried. This was at a cost though as locomotive *Hernia* failed, needing major repairs. Rob Hitchcock praises the success of the society's apprentice scheme, now running for 25 years. Past apprentices have had successful careers with notable companies. Some presented their models at job interviews as evidence of their skills. Aiden Hall goes into the design of a rolling road, one finding being that the rollers are best located about 1/3rd the diameter of the drive wheels apart.

W. www.plymouthminiaturesteam.co.uk

Halesworth & District Model Engineering Society's winter *Newsletter* starts with half a ship, i.e. a vertical slice through a wooden ship, showing a vertical boiler, by way of introduction to the exhibition, LOWMEX, held in the autumn. Exhibits ranged from the conventional locomotives and traction engines to an automated biscuit dunker and two Daleks. (**Elucidate!!! Elucidate!!!**) Editor Julie Williams explains about the ship. 'The photo is of the complete model, a cross-section of a trawler, showing Ian Elliot's steam capstan, boiler and donkey pump. A detailed close-up of just the capstan is here (**photo 1**). Ian (not yet a member of H.D.M.E.S.) made this 1/6 scale model from a schematic design by his great, great grandfather William Elliott and it is his first model. The original full-sized steam capstan, nicknamed "The Fisherman's Friend" revolutionised the fishing industry in the late 1800's by providing an efficient, quick and safe way to haul in nets on trawlers and drifters.' The capstan is described by Kevin Rackham. 'Ian Elliott displayed his first ever model, a 1/6 scale steam capstan, displayed on a cross section of a trawler complete with boiler and donkey pump. The capstan was designed and patented by William Elliott, of Elliott and Garrood, (Beccles) in 1884 and Ian is his great, great grandson. A brilliant first model, we look forward to seeing his next model of another Elliott & Garrood design, a "monkey" triple.' The report is illustrated by 50+ photographs, taken by various members, of the exhibition spread over several halls at Ormston Dene Academy in Lowestoft. Jamie Haywood's video of this event is viewable on YouTube, under 'Lowmex'. Subsequently, a cheque for £654 was presented to S.O.L.D. (Special Objectives for Local Disabled), the



Steam capstan, by Ian Elliot (photo courtesy of Brian Sinfiel).

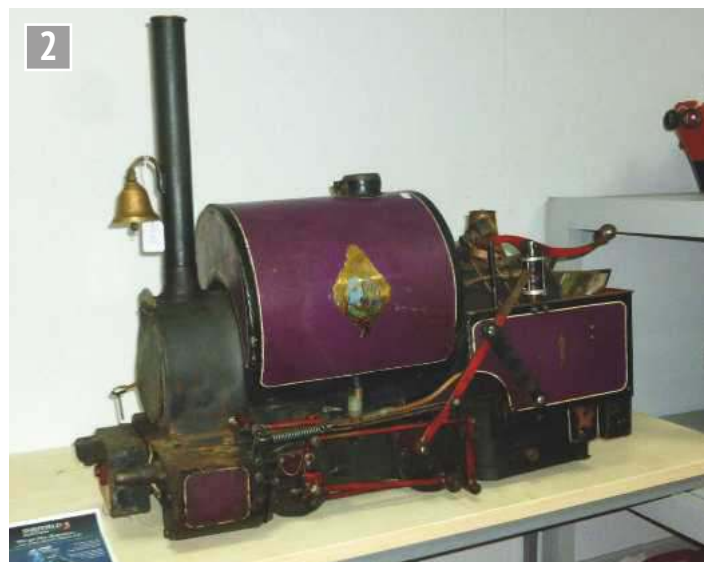
society's preferred charity. *Model Engineer* editor, Martin Evans, attended and was interviewed on model engineering in modern times. I was amused to learn that he found the steampunk room great fun. Finally, Derek Barker writes on 'The joys of registering a steam lorry'. It took 6 months, including a lost file, erroneous answers, unnecessary questions, spurious information and then, at long last, a proper registration (not a 'Q' plate). Three months later, the lost file was returned - 'Rejected'. Fortunately, the right department sorted it out for him.

W. www.hdmes.co.uk

This Quarry Hunslet *Alice* came under the hammer at Sheffield auctions. Rather than describe this model and its livery in my elaborate and circumlocutory style, I shall allow it to gladden readers' eyes with its purple pose (**photo 2**). Also at that establishment was this Fowler type showman's engine, in need of full restoration. It did not sell (**photo 3**).

Model & Experimental Engineers Auckland, November *Newsletter* (delayed due to ill health) says that the Auckland Society of Model Engineers celebrated its 60th Anniversary and, to celebrate, an exhibition was organised by Dave Housley and others, and held in the basement of the club. There were 53 exhibits from 18 modellers, including 17 from five MEEA members. The *Newsletter* has member

Graham Quayle reporting on his ST twin compound engine, including explaining at length the vicissitudes of building it. Numerous errors have been exposed and rectified, including the drawings, some of which are clearly wrong, as discovered when assembling it. Murray made an electric motor about six inches high, when he was 9 years old, using his father's 1915 round bed Drummond lathe. The plans were in a small book, no longer available - a pity, as it was a fine motor and still works on 6 volts. Numerous awards have been made for various outstanding models but I will mention only one, the Beginners Medallion for the best-improved beginner, which went to John Lankow for his 3½ inch gauge tank engine from a Martin Evans design, built in 3600 hours spread over 9 years and slightly modified to resemble a NZR locomotive. A model Doxford engine brought back memories for Murray, who had sailed with Port Line ships equipped with twin Doxford engines. There is a large website dedicated to this manufacturer but when I looked there were several, one of which, *The Motorship*, I greatly enjoyed, although it may not be the one referred to in the *Newsletter*. The *Newsletter* for December continues the erroneous plans revealed by Graham Quayle for his twin compound. Michael



Quarry Hunslet at Sheffield Auctions.



A neglected Royal Chester, again at Sheffield Auctions.

Cryns has a 250 year-old clock, parts of which he showed, drawing attention to the beautiful 'copperplate' writing on the 'works', which were, **Nota Bene**, entirely hand made. The Auckland Steam Engine Society (ASES) also celebrated its anniversary, in this case its 50th.. Stuart Junge began building a Foden 'C' steam wagon, serialised in *Model Engineer* 1972-3 but never finished. He has donated it to the society. After the AGM a fine meal was provided, cooked by Sean Hamilton and his wife Beverley, with the aid of Sean's trailer mounted steam plant. Another member's trailer contained several old steam engines, which were connected to the ASES Cochran (of Zimbabwe) boiler and demonstrated.

Bournemouth & District Society of Model Engineers, *B&DSME News*, January, has a new website at www.littledownrailway.org.uk. At the December meeting a film show was given via a real cinema projector, owned by the brother of a member, who was a projectionist. Unlike his work location, however, he only had the one machine, so members enjoyed tea and snacks (popcorn? - Geoff) whilst the reels were changed. Editor Dick Ganderton wonders if anyone has a home IMAX cinema or,

better still, a fully illuminated Wurlitzer rising from the depths? (An organ that goes up and down in a blaze of coloured lights??? - Geoff)

Port Bay Express, January, from **Portarlington Bayside Miniature Railway**, pictured Santa visiting the railway in seasonal bright sunshine (!). It was the railway's 4th birthday under the present regime and 560 passengers were carried on the day. This is followed by a glossary of management terms, translated into everyday English. Urgency – Panic; Extreme urgency – Blind panic; Frank and Open discussion - Flaming row... The usual monthly statistics continue showing a large and consistently growing number of passengers month on month.

W. www.miniaturerailway.com.au

From **Welling & District Model Engineering Society's** Open Day, here is NLSME's George Cannon's 5 inch gauge De Winton 'Coffee Pot', which attracted editor Tony Riley's eye (photo 4).

W. www.wdmes.co.uk

Grimsby & Cleethorpes Model Engineering Society's, *The Blower*, January, celebrates the life of Mick Askwith, who died on 29th December. His life was full of steam-powered vehicles, from full size to tiny models, and though he

was lately affected by MS, his enjoyment of life went on undiminished. Once, pushed in his wheelchair by John Britton, approaching the Doncaster exhibition hall down a slope, a shout of "Let him go" was heard. Fortunately - 'Open Sesame' - the doors were whisked open just in time for Mick to make a spectacular

entry... At another time, Mick expressed a desire to 'inspect the plumbing' and, following a light-hearted comment to a security guard, his chariot was whizzed off to a cry of "Gangway, Emergency!" John Selway is building a vertical-boilered 'Shay', the entrails of whose boiler came from a domestic water heater.

W. www.gcmes.com

After reading a conversation on the *Model Engineer* website forum, I found a series of tutorials on YouTube, about machining for beginners, by a young lady whose *nom de plume* is *Blondihacks*. I found it well explained and very informative.

And finally, from Roger Backhouse: "The other day I met someone in Poppleton whose girlfriend was a lapsed Mormon. Presumably this means she was a latter, latter day saint."

*Pachelbel's Canon...

Contact:
geofftheasby@gmail.com



George Cannon's 'Coffee Pot' at Welling & DMES (photo courtesy of Tony Riley).

MARCH

- 13 Tiverton & District MES.** Club meeting at Old Heathcoat Community Centre. Contact Chris Catley: 01884 798370.
- 14/15 The Midlands Garden Rail Show,** Warwickshire Exhibition Centre. See www.meridienneexhibitions.co.uk
- 15 North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.
- 15 Guildford MES.** Public Open Afternoon 2-5pm. Contact Mike Sleigh: pr@gmes.org.uk
- 17 Nottingham SMEE.** AGM. Contact Tony Knowles: 01623 795242.
- 17 Romney Marsh MES.** Products of the winter workshop, 7.30pm. Contact Adrian Parker: 01303 894187.
- 18 Bristol SMEE.** Spring auction. Contact Dave Gray: 01275 857746.
- 18 Leeds SMEE.** Meeting night – 'Some Unusual Locomotives' – John Charlesworth. Contact Geoff Shackleton: 01977 798138.
- 20 Rochdale SMEE.** Members' projects and problems, 7.30-9pm, Castleton Community Centre. Contact Rod Hartley 07801 705193.
- 22 North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.
- 22 Tiverton & District MES.** Running day at Rackenford track. Contact Chris Catley: 01884 798370.
- 24 Romney Marsh MES.** Members' social afternoon, 2pm.

- Contact Adrian Parker: 01303 894187.
- 26 Sutton MEC.** Club night – new and interesting items. Contact Paul Harding 0208 2544749.
- 28 Romney Marsh MES.** Track meeting, noon onwards. Contact Adrian Parker: 01303 894187.
- 29 North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.
- 29 Portsmouth MES.** Public running, 2-5pm, Bransbury Park. Contact Roger Doyle: doyle.roger@sky.com
- 31 Romney Marsh MES.** Track meeting, 11am onwards. Contact Adrian Parker: 01303 894187.
- 31 Wigan DMES.** 'Free and Easy' night. Contact: wigan_mes@aol.com

APRIL

- 1 Bradford MES.** Spring auction (only members may bid), 7.30pm, Saltaire Methodist Church. Contact: Russ Coppin, 07815 048999.
- 1 Brandon DSME.** Meeting at The Ram Hotel, Brandon, 7.45pm. Contact Mick Wickens: 01842 813707.
- 1 Leeds SMEE.** Meeting night – trophy night. Contact Geoff Shackleton: 01977 798138.
- 2 Sutton MEC.** Bits and pieces. Contact Paul Harding 0208 2544749.
- 3 North London SME.** Talk: 'Fantastic Journeys by Traction Engine' – Prof. Timothy Watson. Contact Ian Johnston: 0208 4490693.
- 3 Portsmouth MES.** Club night – 'Microscopic

- Examination', 7.30pm, Tesco Fratton Community Centre. Contact Roger Doyle: doyle.roger@sky.com
- 4 Bristol SMEE.** Members' night – 'On the Table'. Contact Dave Gray: 01275 857746.
- 4 Tiverton & District MES.** Running day at Rackenford track. Contact Chris Catley: 01884 798370.
- 5 North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.
- 5 Plymouth Miniature Steam.** Public running, Goodwin Park (PL6 6RE), 2 – 4.30pm. Contact Rob Hitchcock: 01822 852479.
- 5 Portsmouth MES.** Public running, 2-5pm, Bransbury Park. Contact Roger Doyle: doyle.roger@sky.com
- 5 Stockholes Farm MR.** 'Wakey, Wakey Day' and AGM, from 10am. Contact Ivan Smith: 01427 872723.
- 5 Welling DMES.** Public running at Falconwood, 2-5pm. Contact Martin Thompson: 01689 851413.
- 11 Bradford MES.** BMES/Friends of Northcliffe Easter Bunny event, 12.30-3pm. Contact Russ Coppin: 07815 048999.
- 11/12 North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.
- 12/13 Portsmouth MES.** Public running, 2-5pm, Bransbury Park. Contact Roger Doyle: doyle.roger@sky.com
- 12 Sutton MEC.** Sunday track day from noon.

- Contact Paul Harding 0208 2544749.
- 13 Stockholes Farm MR.** Open day, 11am-5pm. Contact Ivan Smith: 01427 872723.
- 15 Leeds SMEE.** Meeting night – 'Ten Years a Designer' – Jack Salter. Contact Geoff Shackleton: 01977 798138.
- 17 Rochdale SMEE.** Talk: 'Arosa Line' – Roy Holt, 7.30-9pm, Castleton Community Centre. Contact Rod Hartley 07801 705193.
- 17/19 North Wiltshire MES.** Public running, Coate Water Country Park, Swindon, 11am-5pm. Contact Ken Parker: 07710 515507.
- 19 Bradford MES.** Public running 1.30-4pm at Northcliff. Contact: Russ Coppin, 07815 048999.
- 19 Guildford MES.** Public Open Afternoon 2-5pm. Contact Mike Sleigh: pr@gmes.org.uk
- 19 Plymouth Miniature Steam.** Public running, Goodwin Park (PL6 6RE), 2 – 4.30pm. Contact Rob Hitchcock: 01822 852479.
- 19 Portsmouth MES.** Public running, 2-5pm, Bransbury Park. Contact Roger Doyle: doyle.roger@sky.com
- 19 Tiverton & District MES.** Running day at Rackenford track. Contact Chris Catley: 01884 798370.
- 19 Welling DMES.** Public running at Falconwood, 2-5pm. Contact Martin Thompson: 01689 851413.
- 21 Nottingham SMEE.** The New Build GCR 567 – Progress to Date', Andrew Horrocks Taylor, 7.30pm. Contact Tony Knowles: 01623 795242.



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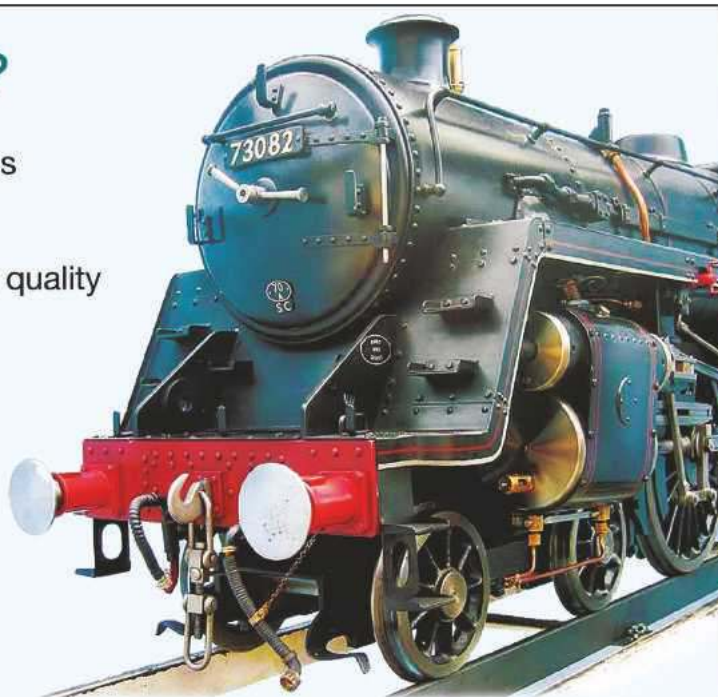
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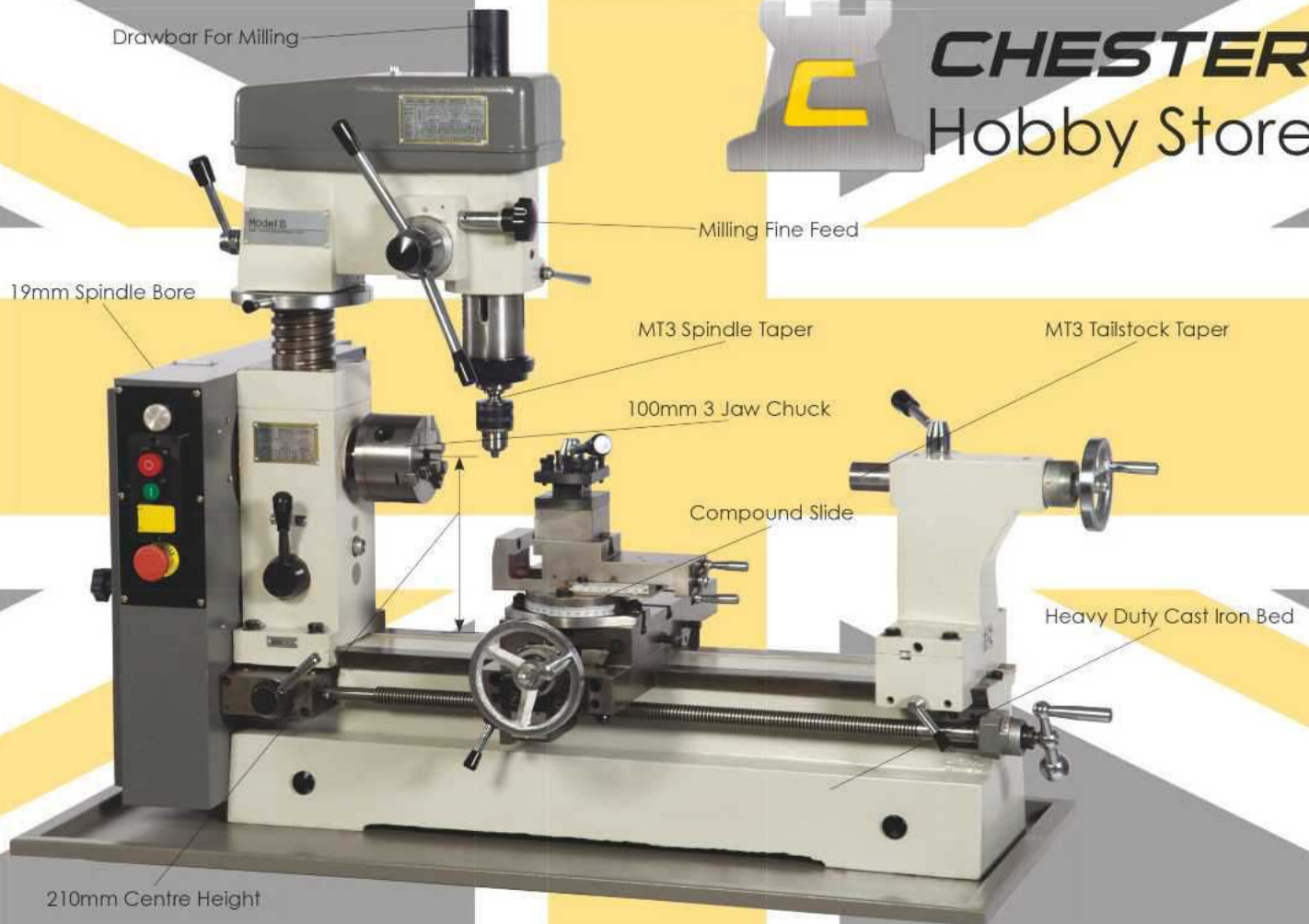
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- Compact space saving design

STANDARD ACCESSORIES

- 3 jaw self centring chuck with internal and external jaws
- MT3 steel centres
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- Change gears
- Set of 5 carbide lathe tools
- Allen keys
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- NVR switch gear
- 4 position indexing tool post
- Lathe chuck and drill chuck guards
- Manual and parts list

Centre Height	210mm
Swing Over Bed	420mm
Swing Over Cross-slide	130mm
Between Centres	520mm
Width of V Bed	139mm
Tool Size	12mm
Spindle Bore	20mm
Spindle Taper	MT3
Spindle Speeds	Lathe:160-1360rpm Mill:117-1300rpm
Metric Threads	0.2-3mm
Imperial Threads	8-120TPI
Copound Slide Travel	80mm
Cross-slide Travel	185mm
Tailstock Quill Travel	80mm
Tailstock Taper	MT3
Headstock Bearing	Tapered roller
Max. Swivel of Compound Slide	360°
Longitudinal Leadscrew Pitch	4mm
Cross-slide Leadscrew Pitch	3mm
Milling Table Size	300x150mm
Chuck Mounting	Plain back
Drive	V belt
Motor Power	3/4kW (0.5hp)
Power Supply	240v
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Dimensions	930x690x1090mm
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