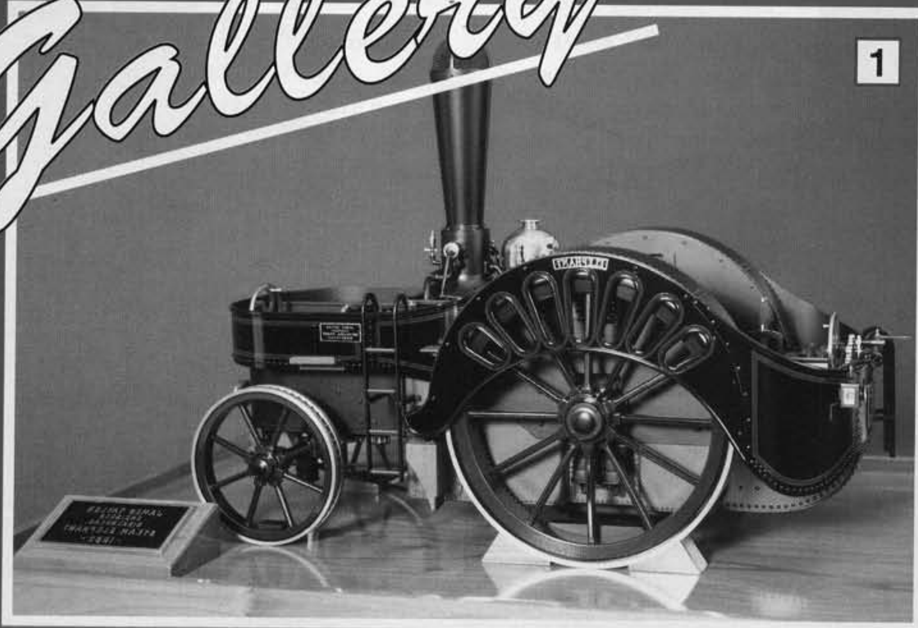
Gallery



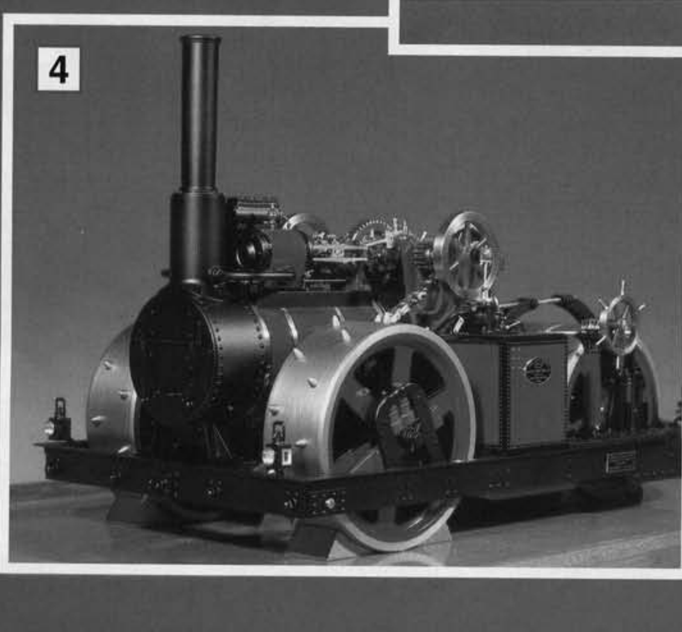
1 - Taylor's Patent Steam Elephant of 1862 built by Cherry Hill.

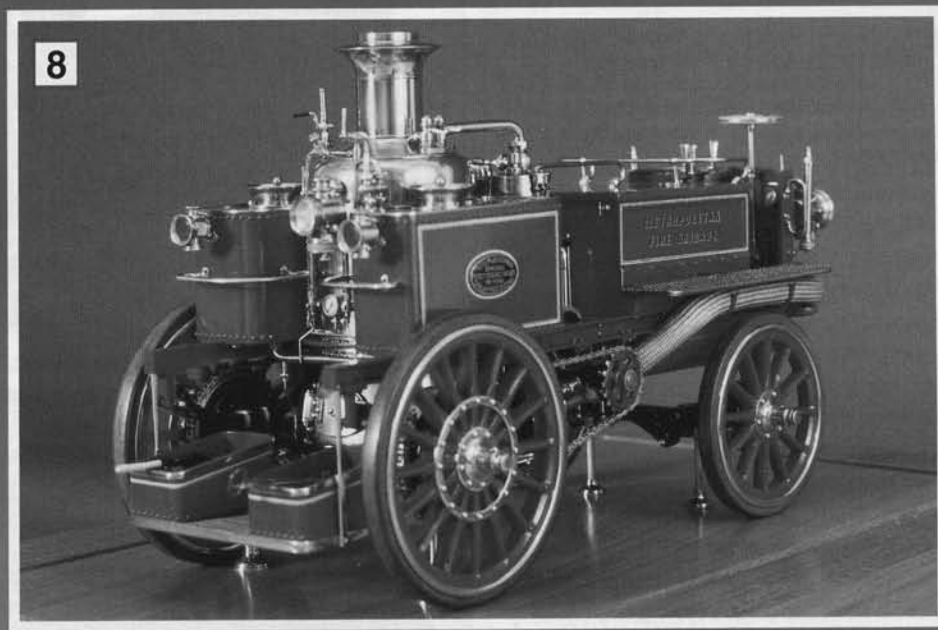
2 - A fine example of the Clayton Undertype Wagon and trailer.

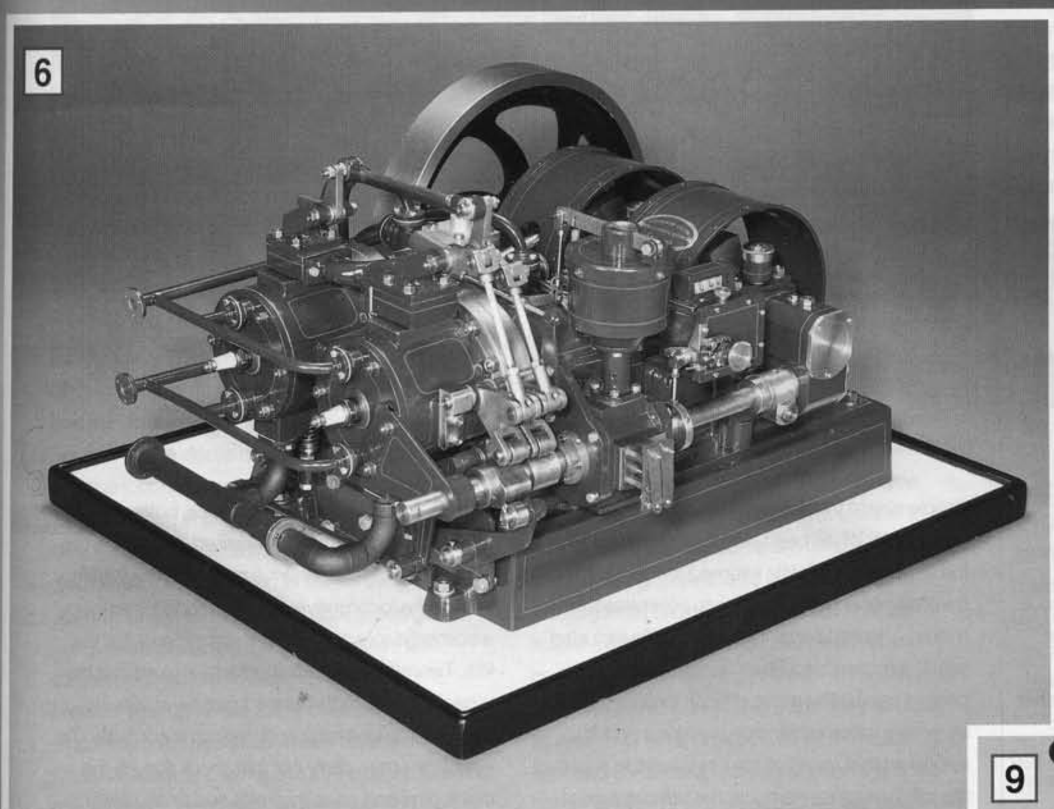
3 - This Galloping Cockerels Roundabout, to 1/12th scale, was made by Dr. John Middlemiss.

4 - Cherry Hill's 1/16th scale model of the Batho Steam Roller.

5 - A Southern Railway Adams 02 class 0-4-2 in 5" gauge.





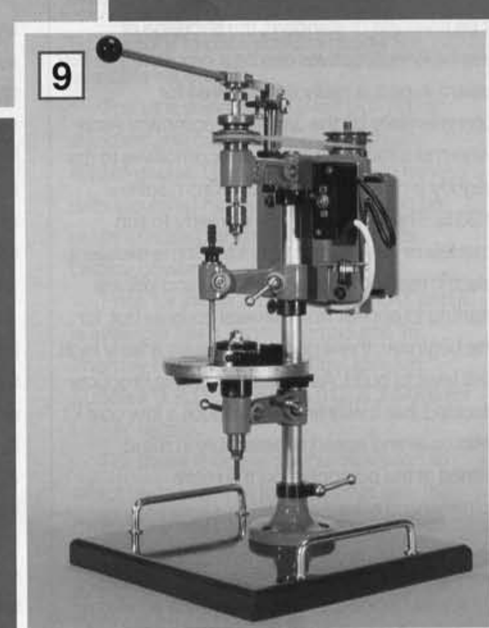


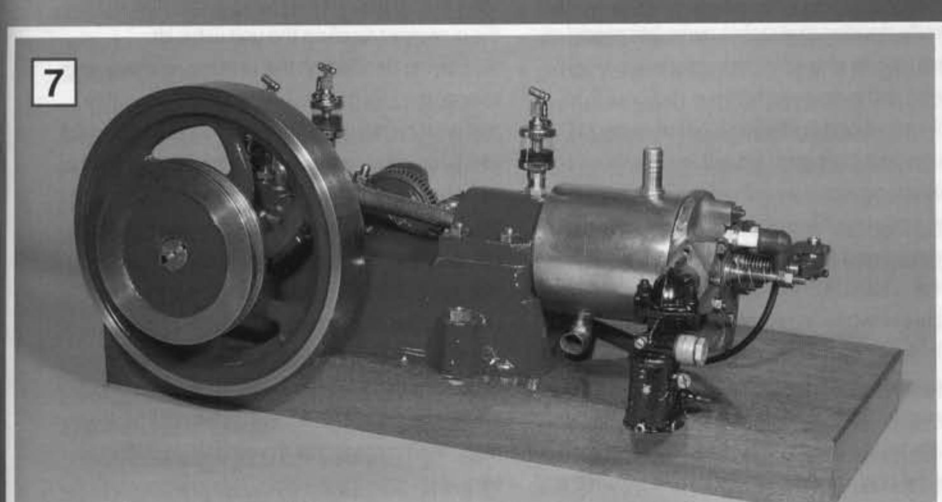
6 - A freelance twin cylinder fenland pumping engine by Sid Hamon.

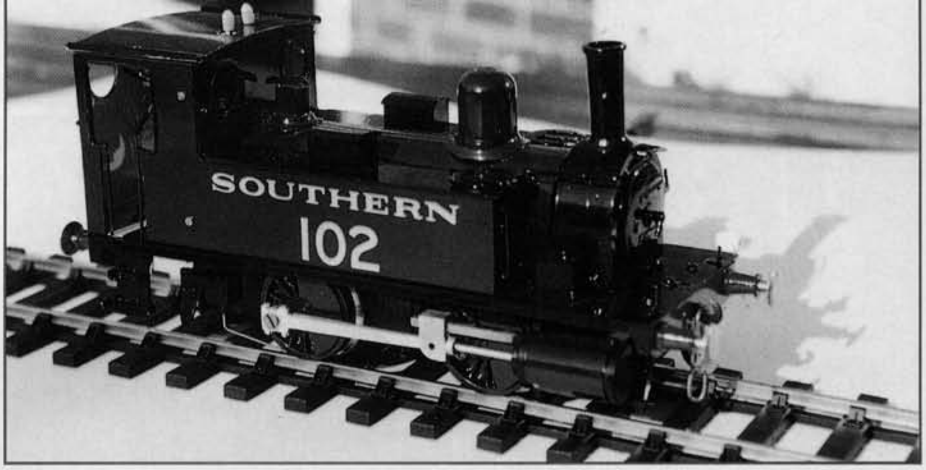
7 - The R&B Gas Engine was serialised in Model Engineer in 1985.

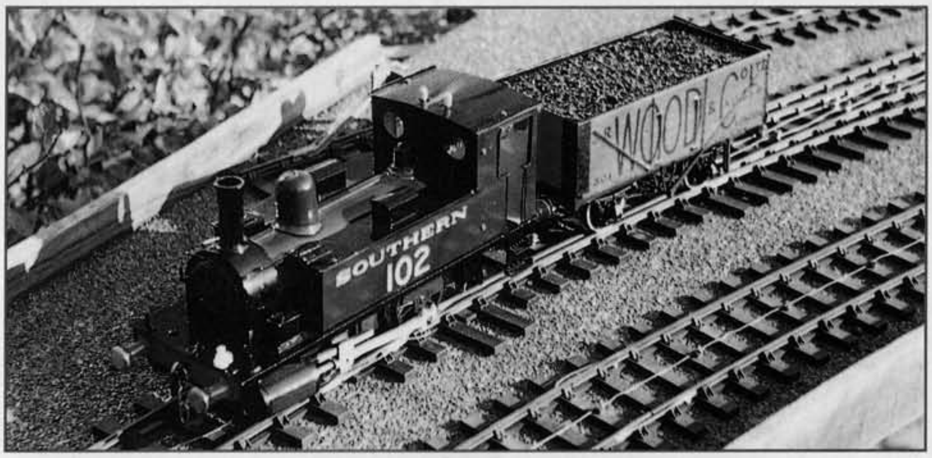
8 - This Steam Fire Engine is another of Cherry Hill's superb models.

9 - A nice example of the Pillar Tool designed by the late George Thomas.









This new, low cost, Gauge "1" locomotive kit from Tenmille Products would make an ideal beginner's project and would give the modeller a fine looking runner in a short space of time...

Despite the current growing interest in 10mm scale Gauge "1" railway modelling, the availability of steam and electric locomotive kits - especially those aimed at the beginner - has been sadly lacking. Gauge "1" is one of the few model railway scales that bridges the boundary between the larger live steam scales and the world of model railways, this seems to be where the two sides meet head on.

The model engineering aspect of Gauge "1" is generally dominated by outdoor garden railway live steam enthusiasts with coal, methylated spirits or gas fired locomotives but there is also a dedicated following for the traditional method of 24 volt electric pick-up using centre stud contact. Over recent years there has also been a growing interest in Gauge "1" finescale modelling. This probably has a leaning towards indoor electric model railways bringing 12 volt two rail pick-up and high levels of detail in the models. There also seems to be

Building a L.S.W.R. B4 LOCOmotive IN GAUGE "1"

by Terry Hines

evidence that some "0" gauge (7mm) scale modellers are moving over to Gauge "1", possibly due to the growing availability of reasonably priced parts, trackwork, rolling stock kits and accessories. These also now include some modern rolling stock.

For those starting out in Gauge "1", whether it be finescale or standard, the shortage of available locomotives can be a problem. The live steam aspect is really only catered for commercially by the Japanese company Aster who manufacture a range of locomotives to the slightly smaller scale of 1:32. (10mm scale = 1:30.5). These are available as ready-to-run models or as self assembly kits. Some excellent electric ready-to-run locomotives and kits are starting to appear from several sources but, for the beginner, these generally require a fairly high skill level to build. As a result, Tenmille Products decided that it was time to produce a low cost kit with ease and speed of assembly in mind, aimed at the beginner and the more experienced alike.

Design Considerations

It was decided, at first, to produce an electric version only but with the considerations that a simple steam version could become available at a later date. It had been noticed that nearly all of the existing electric kits seemed to require the purchase of additional items to complete the model. The additional items generally included suitable motors and gears which, for many people, can be the more difficult to obtain and assemble into a satisfactory working unit. It appeared that many of the kits available supplied the relatively easy parts but the difficult items were still left to the customer. As a result, Tenmille decided to supply a complete model as standard. This should include nearly every item of detail and even a ready to run motor unit, all within a final cost (including VAT) of under £200 - a tough target but, they felt, achievable.

Attention was drawn from the start to the Playmobile unit, Tenmille have supplied this unit for many years for scratch-building purposes and have also used it in a previous Gauge "1" Sentinel kit which is, unfortunately, no longer available. They had always been very impressed with its performance, reliability and low cost which again made it ideal for their requirements. This four-wheeled unit was then to be the basis of the new kit. It arrives from the manufacturer as a ready-to-run power unit with wheels and two rail pick-up shoes, both of which can be easily removed if required. It also has the advantage of internal drive to both axles which allows the locomotive coupling rods to perform a cosmetic role only. Prior to sending out in the kits, Tenmille carry out checks to ensure that the wheels are set to the correct gauge, quartered and that the unit runs and performs correctly. To enable them to carry out this check they fit the crank pins and coupling rods and finally carry out a bench test. This is then the condition that the customer receives the unit in his kit.

Having decided on this unit the next task was to scan the locomotive books to find a suitable real prototype to go with this chassis. This would ideally be a four-wheeled tank locomotive with a 7ft. wheelbase (70mm being the wheelbase of the Playmobile unit). After some deliberation the L.S.W.R./S.R. B4 dock tank was decided on. It was felt that this was a very attractive locomotive and also had the benefit of lasting a good number of years in service. This would suit modellers of the early railway company periods and also later B.R. periods. The B4 dock tank also had the advantage that the wheels consisted of very large balance weights. This feature was very useful as it enabled the rather toy-like wheels supplied with the Playmobile unit to be disguised. For this reason the unit, as supplied in its standard form, would not be very suitable for finescale modellers although, as mentioned, the wheels can be replaced if required.

Prototype History

Two full size B4's have amazingly survived into preservation - one at the Bluebell Railway, Sussex and the other at the Bressingham Steam Museum, Norfolk. This class of locomotive was designed mainly for shunting duties by Mr. Adams, the Chief Mechanical Engineer of the London & South Western Railway. Twenty locomotives were built at Nine Elms works in two batches of ten between 1891 and 1893. Later, during Mr. Drummond's reign, a further batch of five were built during 1908, No. 84 being the last locomotive to be built at Nine Elms. These powerful 0-4-0 tank locomotives had outside cylinders (16in. x 22in.) coupled to driving wheels of 3ft. 9.3/4 in. diameter. The boilers had a working pressure of 140 p.s.i. and the water tanks held a total of 600 gallons.

Some locomotives used at dockside locations had their cabs cut away to improve visibility and some also received names. Coal was stored at cab floor level under each side tank, resulting in very cramped working conditions for the crews. Despite this, the locomotives were well liked. During the lifetime of these locomotives they received a number of liveries - fourteen of the class were transferred to Southampton docks during L.S.W.R. ownership and the locomotives were painted "Invisible Green". Later, at grouping, they were painted dark green with red lining. The remainder of the class after 1893, allocated to the running department, were painted in dark green goods livery. After grouping the S.R. painted these eleven engines black, lined in red with an "E" prefix to the numbers. Engines attached to the docks were named after French towns or Channel Islands. During the B.R. period, all were painted black with cabside number and B.R. crest on the tank side.

Details of the Kit

During the design stage of the kit a number of ideas regarding body design were investigated but it was decided that an etched brass body seemed to be the best and only satisfactory solution. Normally, the drawback with etched brass kits is that they require soldering during construction, Tenmille wanted to avoid this in order to keep the assembly skill level fairly low. So it was decided to design the body parts so that they required screwing together instead of soldering. During assembly of the kit this is therefore carried out using M1.6 brass nuts and bolts which are supplied in the kit. The body panels are supplied on a sheet with etched holes for the screws, the panels require folding at the indicated half-etch positions. Small items and cast detail can be glued in place using one of the Super Glues, this is best done after the brass has been washed and cleaned with fine wet/dry abrasive paper or wire wool. Tenmille have found that this method works very well and results in a very strong joint.

The boiler supplied in the kit is not etched brass as this would require folding, but is a length of 28 thou. brass tube pre-cut to the required length. Clearance pieces have also been cut out to clear the top of the motor unit which is required, and is also unseen in the area between the tanks. The cylinders are also brass tube cut to length, onto which detailed cylinder end caps are fitted.

The detail parts supplied in the kit are mainly whitemetal castings and these include a boiler backhead, regulator handle and pressure gauge. Other items supplied include brass turned sprung buffers, handrail knobs and also coupling hooks and chain. The location of some items is indicated with locating holes and spigots as an aid to positioning.

The finished model is suitable for two rail pick-up without any extra work and can operate on any 45mm gauge railway with insulated running rails. For on-board battery power the pick-up shoes should be removed, this is easily carried out, and appropriate wiring installed. As part of the testing trials Tenmille constructed a prototype model and ran this fairly extensively over one season of Gauge "1" meetings and also all day at one exhibition. The prototype model has seen a number of conversions to and from battery power. Currently, for simplicity, it is fitted with eight "AA" size (MN1500) nicad rechargeable batteries and a simple battery holder installed in the cab. The batteries and holder came from a High Street Tandy electrical shop but are also available from other sources as well. This does require care when installing as exposed contacts could short out on the brass body - to avoid this it is suggested that the battery holder is mounted on a piece of plastic cut to size. Due to the Playmobile' s efficient power consumption, this simple arrangement provides around 1.1/2 hours running and also provides a very handy instantaneous self-contained model which can be just put on the track, switched on and run. As mentioned, the batteries are mounted inside the cab but these could actually be hidden more discreetly inside the boiler if preferred.

Finishing Touches

The demonstration model is also fitted with a very simple speed control arrangement which is provided by two small toggle switches, also available from Tandy. These are mounted so that they just protrude through the cab roof, one switch selects all or half of the battery voltage and the other reverses the polarity giving reverse and forward running. This very simple arrangement has proved very successful and demonstrates that expensive speed controllers are not always required.

The model, which hauled a heavy fourteen coach train at one Gauge "1" meeting, is painted in Southern Railway green livery which was painted using a tin from the excellent Cherry's paints range. This is best applied using an air brush or spray method if possible, the application of a varnish coat is also recommended after the transfers have been applied. Transfers for S.R. or B.R. periods are the only item not supplied in the kit but are available at a very low cost from Tenmille Products if required.

Finally, the fitting of small finishing details makes the locomotive a very attractive model, these include sand feed pipes which can be constructed and fitted using the brass wire supplied.

The total cost of building the L.S.W.R./S.R. B4 0-4-0 kit works out at approx. £205.00, including transfers and paint which are available separately so that the modeller may finish the model to his own preferred period. ■

Kit Specification

L.S.W.R./S.R. B4 0-4-0T Locomotive Kit in Gauge "1"

Etched brass bolt-together body (no soldering required); brass tube boiler and cylinders; brass couplings, handrail knobs and screws; turned brass sprung buffers; cast whitemetal detail components. Powerful 12 volt 4-wheel ready-to-run motor/gearbox module fitted with 2-rail pick-up as standard.

Adhesive, paint and transfers for S.R. or B.R. periods to complete the model are available separately.

The kit is supplied for 2-rail pick-up as standard and could be operated on any 45mm gauge, Gauge "1" or G-scale railway with insulated running rails. It can also be easily adapted for on-board or remote battery power.

Price for the kit is £195.00 incl. VAT and it is available from Tenmille Products, 18 Thorney Road, Capel St. Mary, Ipswich, Suffolk IP9 2LQ. Tel. or fax. 01206 299006 for further details.

For those modellers who may wish to adapt parts of the kit for their own use, the motor/gearbox module, the brass etched body sheet and cast detail items are also available separately - phone for further information and prices. ■

MODEL WHEELWRIGHTING

by Barré Funnell

The ancient craft of the wheelwright is kept alive today by the modellers who use the same techniques in miniature. Barré Funnell lets you into the secrets of making model wheels ...

A beginner is well advised to start model horse-drawn vehicle modelling with a farm cart or waggon. (A cart has two wheels, a waggon hasn't, it has four!). The late John Thompson published plans of many farm vehicles and implements, as well as all manner of road-going horse-drawn vehicles. Especially recommended are his plans labelled "Model Wheelwright Plans", they are uncomplicated in that largely there are no compound curves in these models. In other words, there will be some curved components in the model, but they curve one way and are flat the other. Also the Model Wheelwright plans are all provided with pattern sheets to help the modeller to cut his pieces of wood to size and shape.

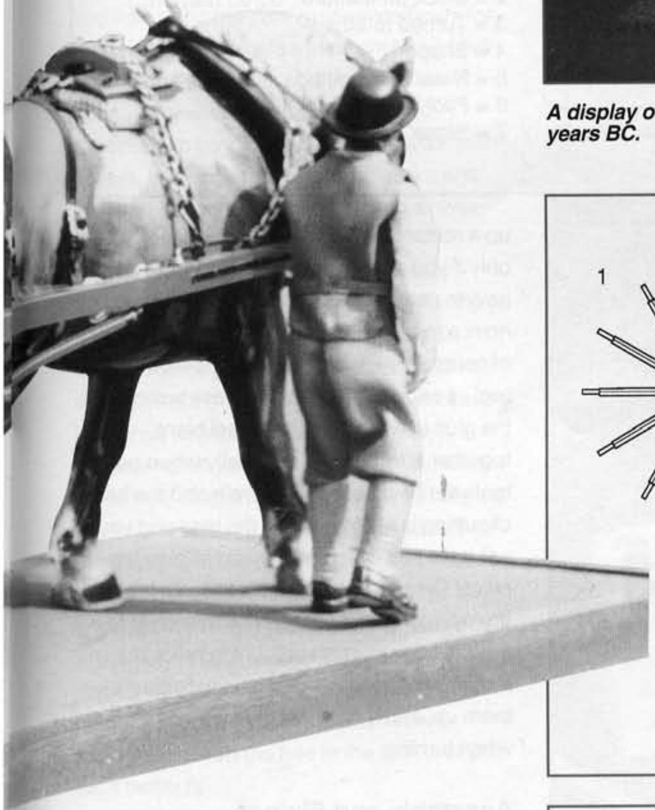
The fundamental technique to be mastered is how to make a wheel. Get that bit right and the rest is easy by comparison. There are many different kinds of wheels. The earliest were solid wooden wheels, Tutankhamun's burial chariots had four-spoked cast bronze wheels and there is a surprising variety of spoked wooden wheels still to be seen in museums and even at county shows. For the purpose of this article, I have taken the most common type of wheel seen on farm vehicles until tractors and rubber-tyred trailers took over.

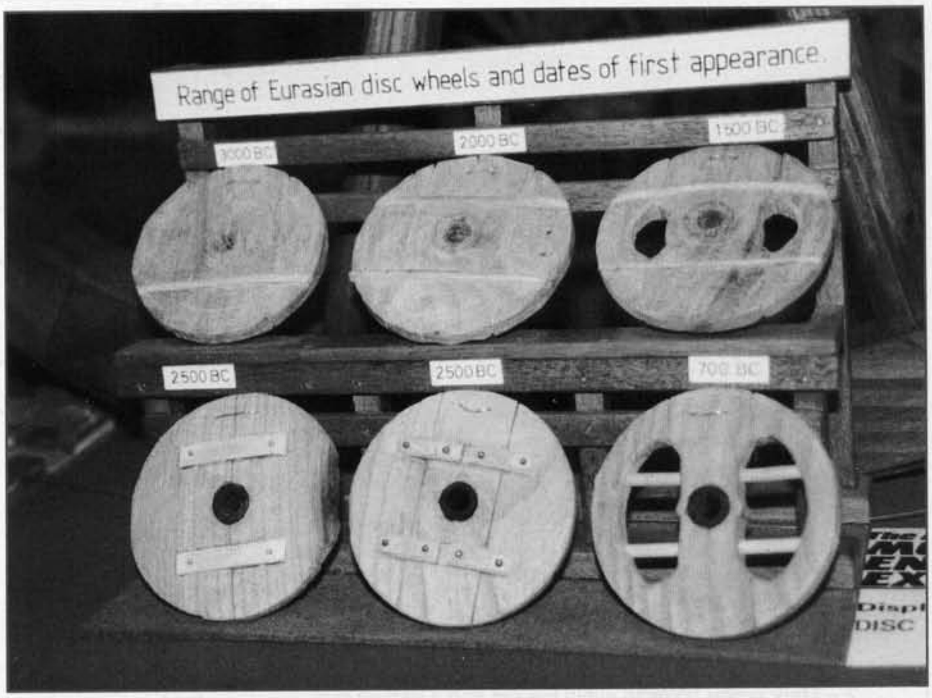
This photograph shows a fine example of a Farm Tip Cart which was made from the "Model Wheelwright Plans" produced by the late John Thompson. This would make an ideal model for a beginner's first project.

Making a wheel

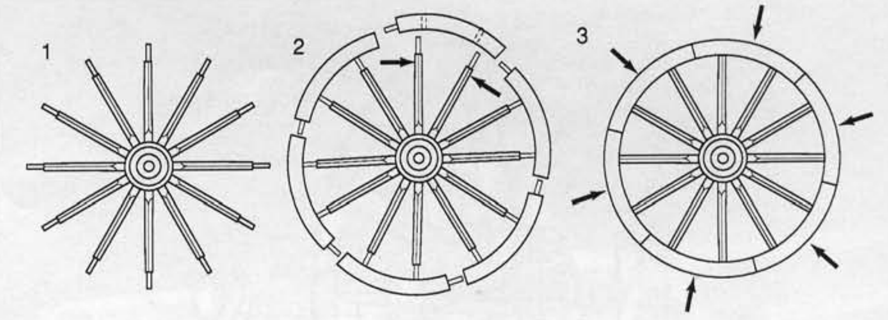
Having mastered the skill of making a wheel, the novice has then to learn how to make two wheels! And of course they will have to match. John published a number of books which include methods of wheel-making, and indeed he also condensed that information in the form of an instruction sheet. The wheelwright's traditional method of building a full sized long-lasting, load-bearing wheel has a built-in problem of geometry. Each felloe (=section of the rim, rhymes with "jelly") houses the tongue-end of two spokes, which are of course protruding from the hub at a diverging angle. In order to fit the felloe onto the spokes they have to be pulled together with a thing called a "spoke dog" so that the tongues (sometimes square, sometimes round) fit into their mortices in the felloes. Then as the felloe is driven down to its final position the spokes will ease back to their correct angle. The trouble is, because the felloes are jointed to one another with dowels in the ends, you can't drive the felloes down onto the shoulders of the spokes one at a time. If you do, the last one will not go unless you leave out the last dowel. The only way to assemble a wheel is to get all the spoke tongues just into the felloes, as shown in the diagram, and to drive them all down simultaneously.

Some purists say that the only way to make a wheel is the proper way. Most modellers cheat just a teeny little bit. What they do is to turn a hub in the conventional manner, and make and fit spokes in the proper fashion, except that they don't put tongues on the ends of the spokes. They just trim the spoke ends for a flush fit into a ring of felloes which has been made separately. Then all that is needed is to pin or dowel the spokes into the rim from the outside. Like all model making jobs, making a wheel is not all that difficult, but it will take a bit of time and experience before you can expect to be up there with the best!

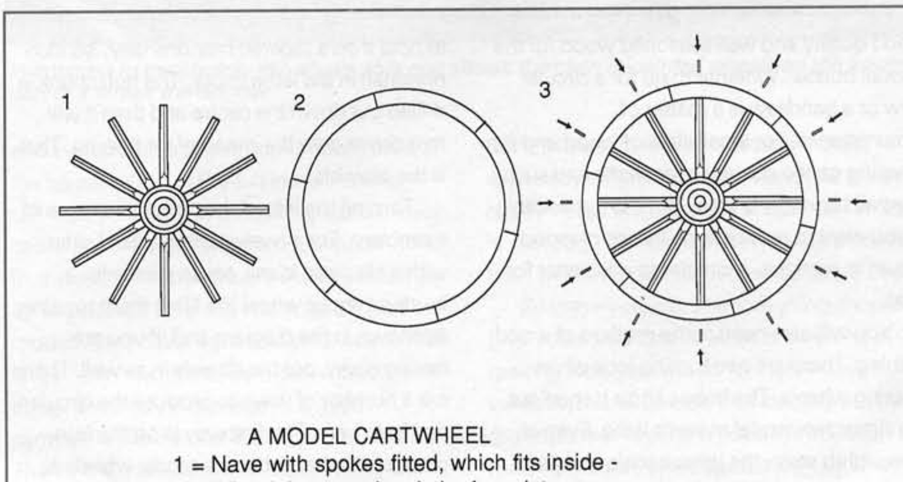




A display of model wheels showing early examples of the wheelwright's craft circa 700 to 3000 years BC.



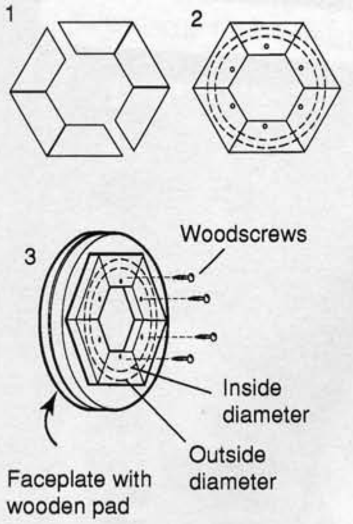
A FULL-SIZED WHEEL
1 = Spokes (with tongues) driven hard into mortices in nave
2 = Pairs of spokes squeezed together to accept a felloe
3 = When felloes and the interconnecting dowels are just located all felloes must be driven down simultaneously.



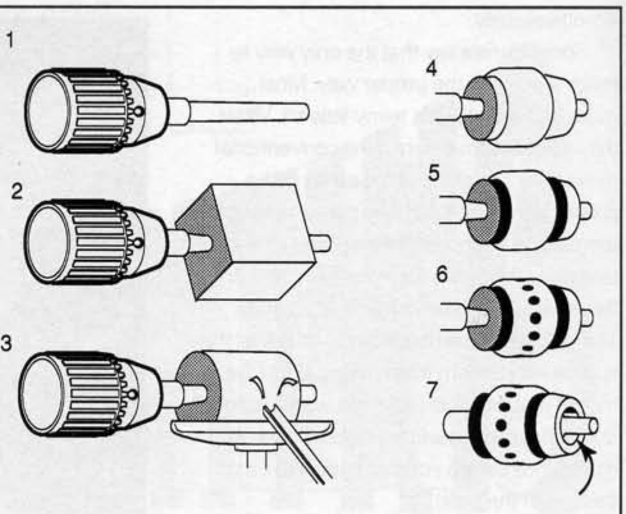
A MODEL CARTWHEEL
1 = Nave with spokes fitted, which fits inside -
2 = Wheel rim turned on lathe faceplate.
3 = Spokes pinned or dowelled through from the outside

Equipment Needed

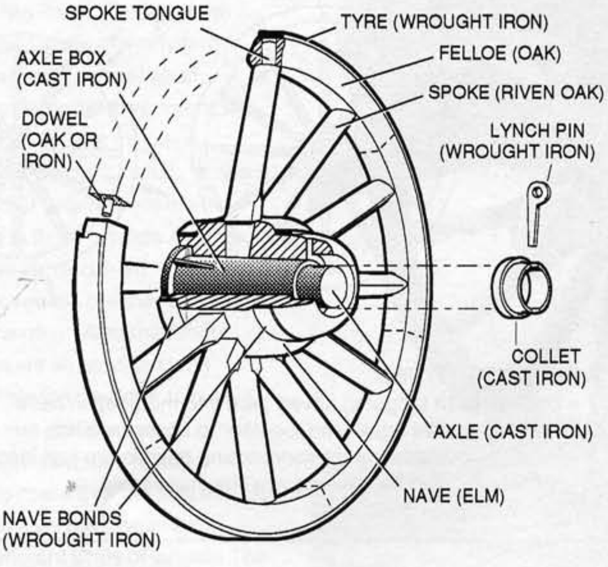
So what equipment will be needed to start into this field of model building? Some would say a kitchen table and a pen-knife, but that is a bit masochistic for most of us! Getting wood from model shops and timber suppliers is convenient, but it is also the most expensive way of getting it. Having your own power saw opens a lot of options. You can then buy a block of wood from the local timber merchant (Yellow Pages, look for one who deals in hardwoods), and you will be able to cut wood to the exact size, rather than taking the next size up and planing down to thickness. With a power saw you will be able to make use of any old timber you can scrounge; old furniture and the like can yield



1 = Make up wheel-rim in segments - 6 for 12 spoked wheel etc. First glue up in two halves, then glue two halves together
2 = Mark screw holes to avoid the rim and a parting tool
3 = Screw to padded faceplate, centred. Turn outside dia. and part off at inside dia.



1 = Chuck with tapered mandrel
2 = Block on mandrel, bored (say 3/8")
3 = Turned to size
4 = Shaped
5 = Nave bonds fitted
6 = Pilot holes for spokes
7 = 'Nose' hollowed out



good quality and well seasoned wood for the model builder. Whether to go for a circular saw or a bandsaw is a matter of circumstance. For small sizes of wood and for shaping gentle curves as for shafts and such, a small bandsaw is ideal. But it is not suitable if you want to reduce large lumps of wood down to sections. A circular saw is better for that.

You will also need some method of wood turning. There are two turning jobs when making wheels. The hubs can be turned out on almost an model maker's lathe. Even at one-eighth scale, the largest scale normally used, hubs seldom come bigger than one and a half inches in diameter. The best way to hold a chunk of wood for turning into a hub is to hold it on a tapered mandrel (say, 3/8 inch nominal) in the lathe chuck. The hub chunk is drilled out down the centre and then it will ram down onto the mandrel for turning. That is the easy bit.

Turning the wheel rims might be more of a problem. For a twelve spoke wheel, start with a six-piece blank, seven pieces for a fourteen spoke wheel etc. Glue them together as shown in the diagram and, if you are feeling cocky, put the dowels in as well. There are a number of ways to produce the circular rim from here. The first way is on the face-plate of a lathe, but some model wheels at eighth scale can be eight or nine inches in diameter, and it is a fair sized lathe that can provide a throw like that. It is possible to rig up a router to cut circles, but consider that only if you possess a router and you know how to use it! It would not be advisable for a novice to buy one solely for that purpose. Or, of course, you could use the time-honoured tool - a coping saw. With all these techniques, the glue used to hold the wheel blank together is important, especially when power tools are being used. The strain and the heat of cutting is apt to weaken the glue and you will have sections of wheel rim all over the place! Cascamite is good for this job. It is a dry powder glue and it can be mixed up to a thick, stodgy consistency which holds the sections together without having to clamp them up, and it does not give way very often when turning.

Assembly and Fixings

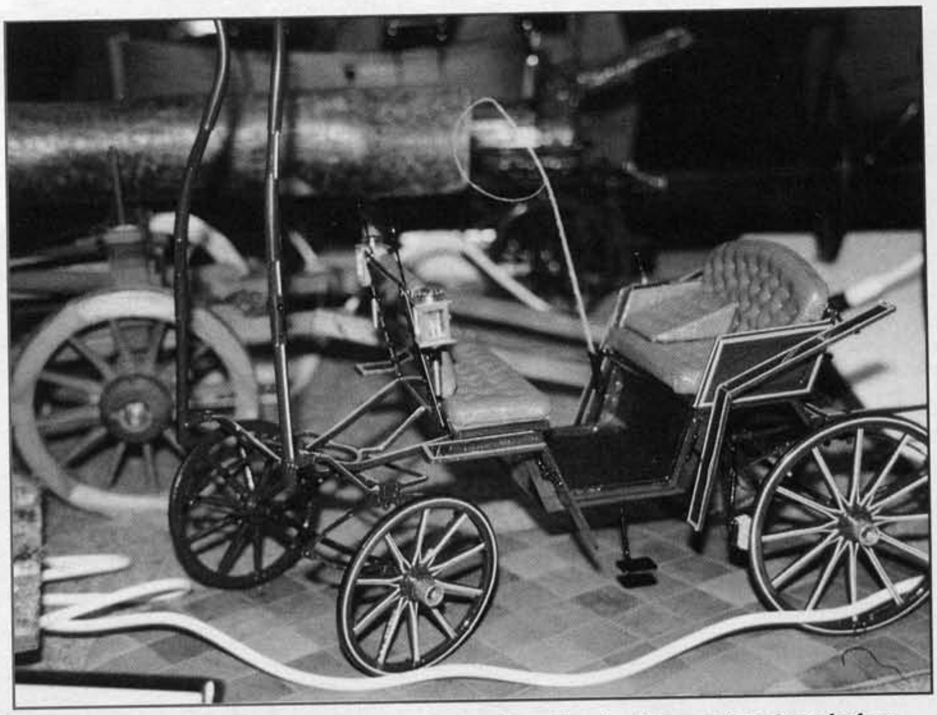
All you have to do now is to assemble the wheel as previously explained. But beware, the ends of the spokes need to be trimmed to fit. A lot of care and great accuracy is required to get this bit right. Not only must the spokes fit snugly into the rim, but the hub must remain in the centre of the circle. The final test of a cart wheel is to put it on an axle and give it a spin. Many horse-drawn vehicle models you see are fixed down onto a base-board: that is so that no-one can try the wheels for concentricity!

There is plenty of metalwork on these models, but most of it is quite simple in character. Blacksmith-made fittings, brackets, struts, tie-bars etc. can all be fashioned out of metal strips and rods. The "proper" engineering comes in where the axles are concerned. Some folks get away with using a nail as the axle, but now we are getting back to the "gift shop approach". In real life cart wheels were usually hung on iron cart arms, with a wedge-shaped tail bolted onto the wooden cross trees and a tapered round "stub axle" onto which the wheel with an iron bearing was hung. The wheel is kept on with a lynch pin. If the model wheel hub was turned on a mandrel, it will have a largish hole down the middle, typically 3/8" (10mm) diameter. This will accommodate a brass bush which can be made to fit a turned steel cart arm fitted into the cross tree. A metal turning lathe is called for here.

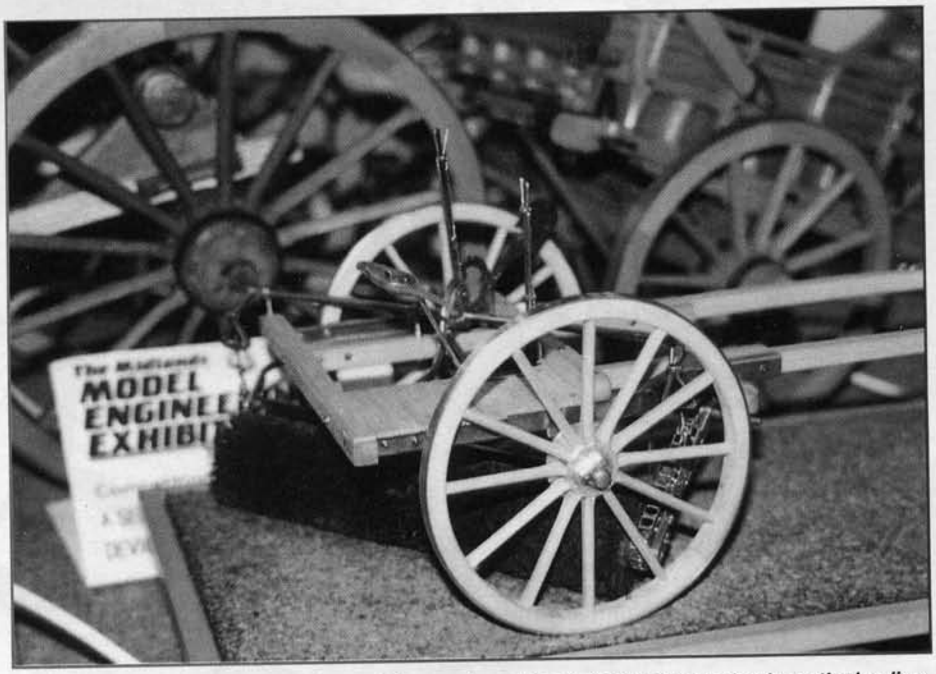
Of course most of the fixings on a horse-drawn vehicle are coach bolts, with square nuts. There are some available from the specialists, but they are made specifically for model makers and are a lot more expensive than off-the-shelf nuts and bolts on the general market. It has been known for modellers to buy hexagon bolts and file them square, but remember there are about one hundred and fifty nuts and bolts on a horse-drawn omnibus!

The judges at model shows get very pernickety about details, and one of the things they look for is the representation of iron fittings. Although metal strip and rod can be used to make these fittings, the originals were blacksmith made, and so the model equivalents should look as if they, too, were made by a blacksmith. Filing and hammering can help to achieve this effect, but often a bit of brazing or silver soldering can be effective.

That brings us to the tyres. Full-sized tyres are forge-welded together and the joins don't show. A tyre for a model wheel can be butt-jointed with silver solder. This is better than brazing because the temperature is not enough to distort the tyre at the join, and you get a better fit.



This photograph clearly shows the ornate paintwork on the wheel rims and spokes of a four-wheeled carriage.



In contrast to the photograph above, this one shows the plain unpainted wheels on the leading part of a timber transporter.

Finishing Touches

Another thing judges at shows look for is the finish of a model. A rough old finish on a model farm cart, which is entered in competition, should not be justified on the basis that the real one was also a rough bit of work. This model is in a competition, and if the original rough old farm cart were entered into a competition at a county show, that would not win either! A paint finish should show no sign of the grain of the wood underneath.

Farm carts, waggons and other horse-drawn implements can look very attractive when finished in plain wood. It is then that the original choice of timber is important. Coarse-grained timbers like oak, elm, ash and sycamore - all common timbers used in the construction of the full-sized vehicles - can look very ugly at modelling scales. Much better are the very fine grained woods - lime, fruit woods and the like are much used; they do not detract from the craftsmanship of the model. A model in light coloured wood, with black "iron" work can be a very attractive thing. But a Royal carriage or a gypsy caravan in plain wood would be ludicrous. The whole point of one of those models is the paintwork! The photograph is of John Thompson's Farm Tip Cart, about the simplest of the "Model Wheelwright" Plans, but it makes up into an effective model, especially when, as shown here, it is given a heavy horse with harness and a man to lead it. Although it does not show in the picture, the cart is even full of 1/8th scale sugar beet!

So there you are. The foregoing should give you some idea of what is involved in making wooden wheels for horse-drawn vehicles. It is often said that starting out by making the wheels is a good introduction to making the cart or waggon itself - so why not give it a try and see how you get on? You might even enjoy it and decide to take up the craft of the model wheelwright! ■

SCALE MODEL PHOTOGRAPHY

by Mike Wade L.B.I.P.P.

Having built your model you will want to take some good photos of it. Here's how to get better results ...

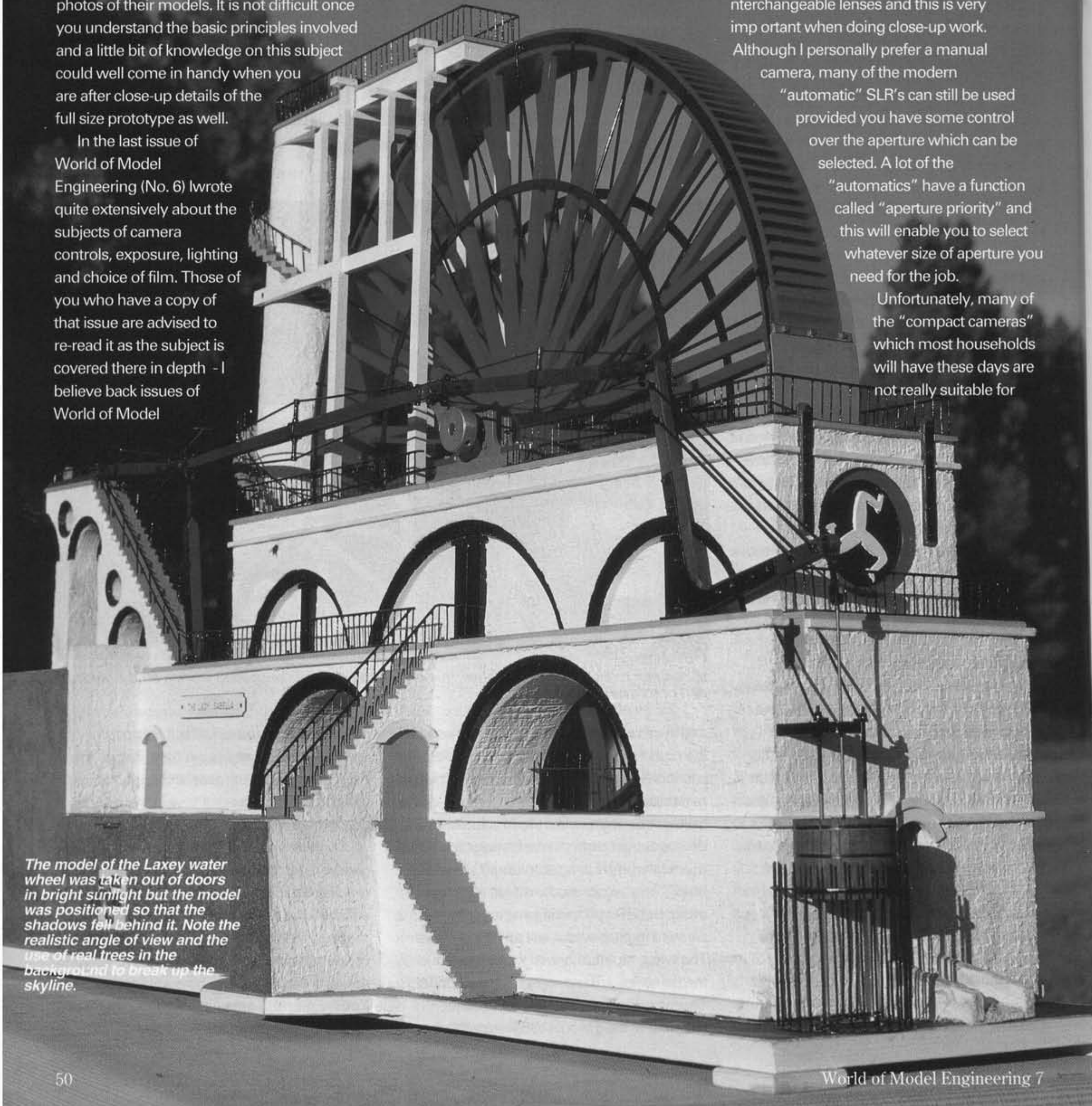
I have received many requests from modellers asking how they can take better photos of their models. It is not difficult once you understand the basic principles involved and a little bit of knowledge on this subject could well come in handy when you are after close-up details of the full size prototype as well.

In the last issue of World of Model Engineering (No. 6) Iwrote quite extensively about the subjects of camera controls, exposure, lighting and choice of film. Those of you who have a copy of that issue are advised to re-read it as the subject is covered there in depth - I believe back issues of World of Model Engineering No.6 are still available from Nexus Special Interests Ltd. (tel: 01442 66551). For the sake of simplicity, and as a knowledge of the basics is essential, I will briefly run through them here.

Suitable Cameras

The most suitable type of camera for most modellers to use for photographing their models is the 35mm Single Lens Reflex camera. The majority of these have nterchangeable lenses and this is very imp ortant when doing close-up work. Although I personally prefer a manual camera, many of the modern "automatic" SLR's can still be used provided you have some control over the aperture which can be selected. A lot of the "automatics" have a function called "aperture priority" and this will enable you to select whatever size of aperture you need for the job.

Unfortunately, many of the "compact cameras" which most households will have these days are not really suitable for



The model of the Laxey water wheel was taken out of doors in bright sunlight but the model was positioned so that the shadows fell behind it. Note the realistic angle of view and the use of real trees in the background to break up the skyline.

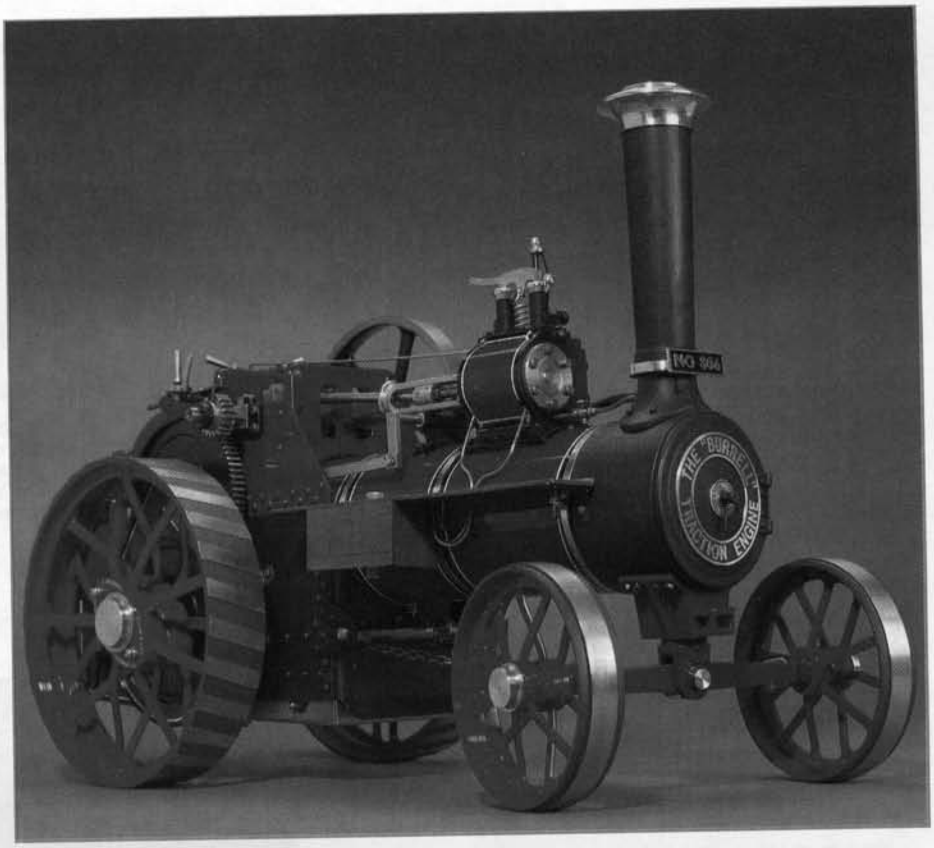
photographing small scale models. The reason for this is that the lenses in "compact cameras" will only focus down to about 3 ft. or 1 metre. A great deal of your close-up work will be done between 3 ft. and 9 in. (1 metre to 2.3 cm) and these lenses will not focus at those distances. There are some ways around the problem but the quality of the resulting photos will not be very good.

A good outfit for photographing your models and doing close-up detail shots would be a 35mm SLR with a standard 50mm lens and a set of extension tubes (or close-up lenses), a flash gun and extension lead (so the flash can be used away from the camera) and a sturdy tripod. A macro lens of around 100mm focal length would be very useful for really close work and a 35mm wide angle lens would be handy (although not essential) if you can afford one.

Camera Controls

There are three main controls on a camera - the aperture, the shutter, and the focusing ring. The aperture controls the amount of light which can reach the film, the shutter controls the time during which light can reach the film, and the focusing ring controls the sharpness of the image on the film.

The film needs to receive a specific amount of light in order to form a correctly exposed image. As you can see from the above paragraph, various combinations of aperture and shutter speed will achieve this "correct" exposure. One of the basic theories that you need to understand is that these controls may be used in different combinations to achieve the same result. Think of it in terms of a tap controlling the flow of water - opening the tap wider will allow the water to flow faster, whereas closing the tap down means the water flows slower. Relating the tap to the aperture of the camera, you can see that opening the aperture allows to you to use a faster shutter speed and closing the aperture means using a slower shutter speed. Understanding this is very important when looking at the "Depth of Field" needed in the photograph.



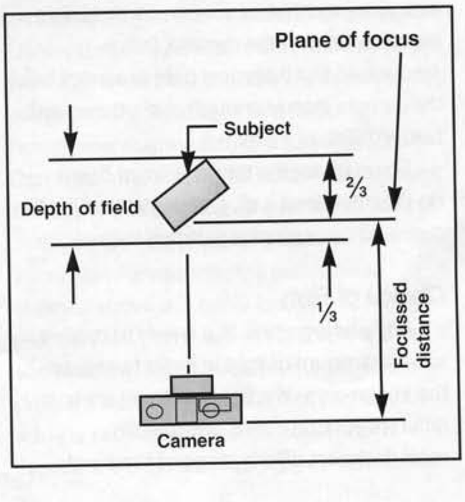
The photograph above was taken in a studio with a 35mm camera and 50mm lens mounted on a tripod. A sky blue background was used and the model was lit with a 'soft box' on the left hand side and one over the top. A white foam board reflector on the right gives the white highlight down the chimney. An aperture of f32 was used for maximum depth of field.

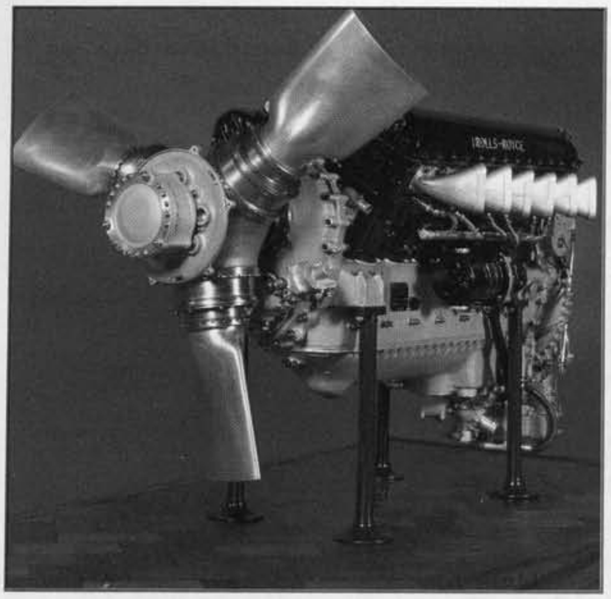
Depth of Field

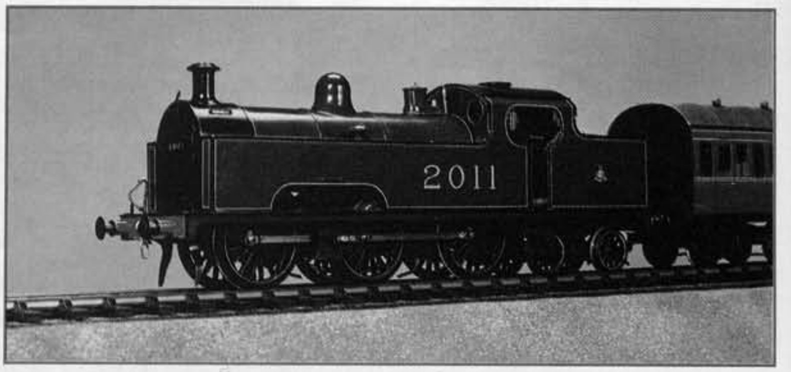
When a lens is focused on a subject, the point at which the lens is actually focused will be pin sharp. But there will also be an area in front of and also behind this point which, to the human eye, will be "acceptably" sharp. That is, it will be appear to be in focus. I don't need to bore you with the laws of optics which govern this, all you need to do is accept that this is the case and bear it in mind when taking your photographs. One other thing that you must accept is that anything that lies on the same plane as the point at which the lens is focused will also be pin sharp and also that this "plane of focus" will always be parallel to the film itself (see the accompanying diagram - No.1). The depth of field is the distance between the nearest and furthest parts of the picture which appear to be in focus. It is important to remember that the depth of field is not evenly placed about the plane of focus - it extends 1/3rd in front of it and 2/3rds behind it. This becomes more critical in close-up photography because, just to complicate matters even further, the depth of field decreases as the lens is brought closer to the subject!

One more piece of theory that you must accept is that a smaller aperture size will give a greater depth of field than a larger aperture size. The size of apertures often gives some photographers a problem because the numbering system used can be a bit confusing at first - just remember that the smaller apertures have bigger numbers and

Equipment suitable for scale model photography :- A 35mm camera and 50mm lens (shown on a table top tripod); a true macro lens of approx. 100mm focal length (left); a set of extension tubes (right); and a cable release for the shutter (bottom).

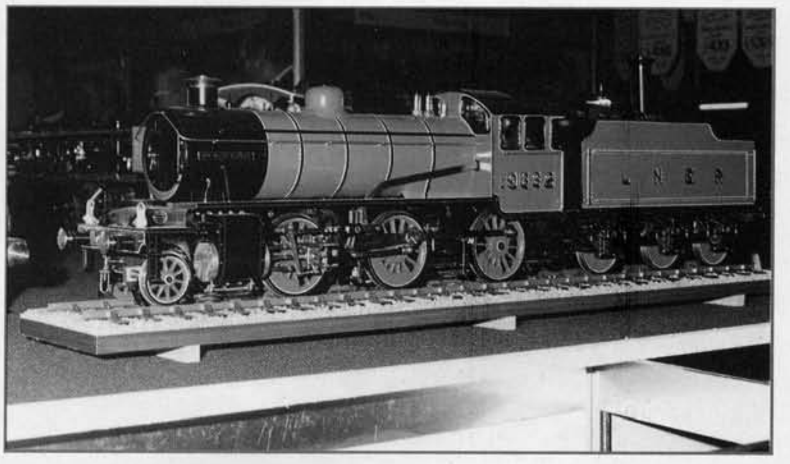






To produce a portrait of this gauge "1" Midland Railway tank locomotive it was set up on a section of home-made "embankment" with a sky blue background and was light with diffused flash overhead and a main light to the left positioned as shown in the diagram opposite. A white reflector board on the right (just out of shot) bounced light onto the carriage and cab side.

Above: The size of this 1/4"scale model of a Rolls Royce Merlin engine posed a few problems when it was taken for a front cover shot. Medium format film (6cm x 6cm) had to be used and the model had to be photographed at an acute angle in order to fit the front cover layout. Stopping the lens down to f22 and very precise focusing was needed to get most of the subject sharp.



Right: When photographing models on exhibition stands, get the camera down low for realism and try to hide the models behind your subject as well. 35mm camera, 50mm lens, tripod, flash gun to left of camera and high up to light front of smokebox as well as the side of the subject.

that bigger apertures have smaller numbers. (i.e. f22 is a small aperture - f4 is a big aperture).

What all this means in practical terms is that photographing scale models, which are relatively small subjects, means that the camera will be used very close to the subject and this, in turn, means we are faced with a shallow depth of field which, in turn again, means we must use smaller apertures. The use of smaller apertures also means using slower shutter speeds to get the correct exposure and that, of course, means using a tripod to support the camera. (It is a recognised fact that most people cannot hold the camera steady enough at shutter speeds below 1/60th of a second).

So much for the theory lesson! If you don't understand it all, just accept that it is the case and carry on as suggested below!

Choice of Film

Any photographic film needs to receive a specific amount of light in order to register the image correctly. Because there are many different lighting conditions, the film manufacturers offer a range of films with various sensitivities or film speeds. Without going into too much detail, I will just say that the slower speed films will give better results but will need quite slow shutter speeds when working with the small apertures we require for scale model photography. Conversely, the faster films will produce quite grainy pictures which will not show your models to the best advantage.

For the average modeller's photography I would recommend the medium speed films of around 100 ISO which are available in black & white, colour negative or colour slide types. These films should give very good results and will show your models off very well. It is, of course, down to each individual modeller's choice as to which type of film is used but you will find that the colour negative films are more forgiving if the exposure isn't quite "spot on" and the modern processing equipment should produce some really good prints from these films.

The Realistic Approach

One of the secrets of good photos of models is to try to make them look as realistic as possible. This isn't too difficult to achieve and all it really needs is a bit of thought and some pre-planning. First of all, consider the full size prototype - at what level is your eye when you look at it? If you think of a railway locomotive, for example, your eye will probably be about level with the footplate (assuming you are standing at track level). This is where the camera lens should be when photographing the model. If the lens is well above the chimney it will make the model look small and toy-like. Conversely, putting the lens at track level will make the model look much too big (although this also has the effect of making it look much more impressive!). So, try looking at the model through the camera from different levels and see what effect it has. In this way you can actually find a more realistic viewpoint.

Now this where the use of a sturdy tripod will make things much easier, once you have found the right viewpoint, you will be able to leave the camera where it is while you sort out all the other problems before taking the picture. Whilst on the subject of tripods, please do think carefully about the rigidity of this very important piece of equipment. It must be solid and provide an absolutely stable support for the camera otherwise there is no point at all in using it. If you are thinking of buying or borrowing a tripod try this simple test on it first - extend the leg sections to their limit and then try to shake the camera platform. If it moves from side to side the tripod is not good enough! Good tripods are not cheap but a poor one is worse than not having one at all.

Backgrounds

Having established a position for the camera which will make the model look realistic, we can now turn our attention to the background and surrounding areas which will appear in the picture. Everyone is aware of the classic "lamp post growing out of someone's head" type of mistake but you should always be on the lookout for anything at all which may be obtrusive or cause a distraction. A wall of full size bricks just behind your model will not make it look very realistic! It is surprising how a small movement of the camera - up or down , or side to side - can be used to avoid distractions in the background. On the other hand, positioning the model about 6 ft. (2 metres) in front of a green hedge or shrubbery would make an ideal background (unless the model is painted green, of course). So think about the type and colour of the background; try to use something which is a different, but complimentary, colour to the model and use something as unobtrusive as possible.

Another thing to keep an eye open for is bright spots of light or reflections in the background. When a lens is focused at close distances, any bright spots will record as bright, blurred areas and will actually look worse when using small apertures. Many people do not realise that what they see in the viewfinder is NOT what they will see in the final picture if they use a small aperture. The reason for this is that all camera lenses remain "wide open" - at a large aperture - until the moment the shutter release is pressed. This is done so as to provide the brightest possible image for setting up and focusing. When the shutter release is pressed, the following sequence happens:- 1) the mirror in the camera body swings up out of the way; 2) the aperture closes down to the setting on the lens; 3) the shutter opens and then closes; 4) the aperture opens up to its maximum position; and 5) the mirror drops back down so you can see through the lens for the next shot. All of that happens in a split second! (That's what I call really good engineering!). So, what you see in the viewfinder before taking the shot is all at the widest aperture. When you take the shot it will be at a smaller aperture.

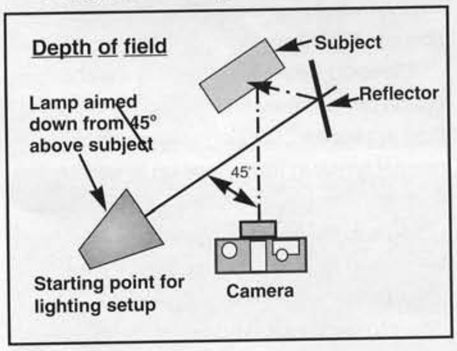
Going back to backgrounds for the moment, a useful idea is to make your own plain background and place the model on that. This is where your ingenuity can run wild! If you are at all artistic you could paint a background on an old sheet or a roll of lining paper. Perhaps a sky blue colour at the top graduating down to a "green grass" or other suitable arrangement lower down behind the model. On the other hand if, like me, you are not too good with the old paintbrush, try using a large sheet of white cardboard (or even a white bed sheet with the creases ironed out) - arrange this in the form of a "scoop" extending from above the model and running down in a curve to underneath the model. This known in the trade as an "infinity scoop". (see photo of model car).

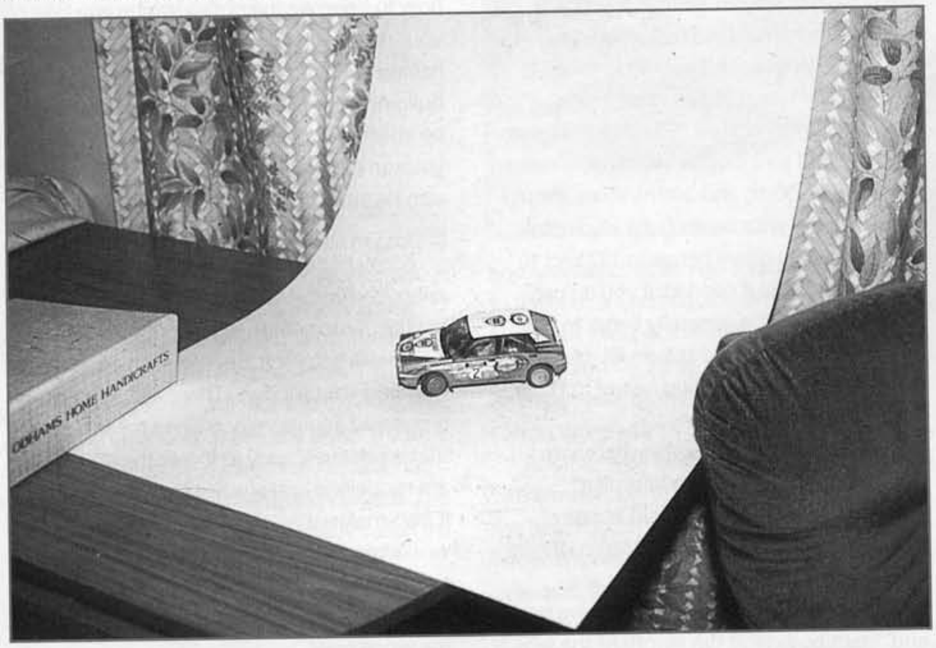
Lighting the Model

Now that we have established a realistic viewpoint and sorted out the background we can turn our attention to the question of the light falling on the model. First of all, we should consider how the full size item would normally be lit. In general terms, most of the prototypes which we choose to model are out-of-doors and would be illuminated by the sun - either directly on a bright sunny day or indirectly, through cloud cover, on overcast days. The sun is usually fairly high up in the sky during the daytime so this gives us a clue as to where the light falling on our model should come from. Whether you are using daylight or flash for the photo, try to provide "sunlight" falling on the model (see diagram - No.2).

Once again, think back to the full size example - where is the sunlight coming from? Usually from above the subject and, when the subject looks attractive, the light is often coming from one side. So, this is where the light falling on the model should come from. If you are using daylight as your light source, position the model in such a way that the sun itself is above and to one side of the model. It is often better to put the "front" of the model on the sunny side and "fill in" the shadows on the other side with a reflector of some sort. Useful items for reflectors are relatively large pieces of white board (polystyrene ceiling tiles are good for this), a copy of a large newspaper opened out, or a white sheet. Don't use anything that is coloured because it will throw a colour cast all over the model!

If you are going to use electronic flash as your main light source, the techniques outlined above will apply just as well. Imagine that the flash gun is actually the sun and put it above and to one side of the model. The problem with using flash is that you cannot actually see where the shadows will fall. Experience is the only real way to learn about ▶





How NOT to photograph your model!! This photo is included to show how a large piece of white card may be propped up to form an "infinity scoop". The idea is to provide a foreground and background with no visible joint lines between them. This will give an uncluttered view of the model with nothing in the picture which may distract the viewer's eye from the main subject - in this case the model of the car. Be careful not to get the edges of the "scoop" in your photo, always look into the sides and corners of the viewfinder before you take the shot.

this but the use of a powerful torch may help you to get some idea of what is happening. In fact, it is not a bad idea to set up your model on a table indoors (if it is not too big) at night and turn off the room lights. Using a powerful torch or an "anglepoise" type of lamp, try lighting the model from different angles and see what the effect is. You will notice how and where the shadows fall and you will soon learn how to control the lighting to create a good effect. Notice that you can "lose" the shadow behind the model and also shorten the shadow by raising the height of the light source. You will appreciate from this exercise that a flash unit mounted on top of the camera will not give the required direction of lighting, so this is where you will have to use the flash gun away from the camera on an extension lead.

As far as exposure is concerned, this will be no problem if you are using daylight because the camera's built-in light meter will give you the readings required. Choose a small aperture (around f11 or f16) and select the shutter speed that the meter tells you will be needed with that aperture. If the speed is slower than 1/60th second you will definitely need to have the camera mounted on a tripod and you should also use a cable release to fire the shutter.

If you are using electronic flash, things will not be quite so simple. Unfortunately the automatic settings on these flash units will not be reliable enough when photographing a subject at close distances. The easiest option is to buy a proper flash meter but, unfortunately, these are rather expensive items. Probably the best method is to use a bit of "trial and error" and experiment a bit (you will be good at that by now if you have already made the model!) . First of all, set the flash gun to its manual mode. Measure the distance from the model to the flash gun (not to the camera!) and refer to the table on the back of the flash unit. Read off the distance against the film speed you are using and that will give you the correct aperture to use. Make sure you end up with a fairly small aperture - move the flash unit closer to the model if necessary. Now you can set the correct shutter speed for flash synchronisation.

It is important to remember that all cameras with focal plane shutters (and that includes most of the 35mm SLRs) will only synchronise with flash guns at, or below, a specific speed. The specific speed often varies from camera to camera but you will usually find it marked in red, or with a flash symbol, on the shutter speed dial. If in doubt, choose a shutter speed of 1/30th second as this will usually be OK.

Lenses Focus Closer

Most camera lenses will only focus down to a certain distance. This distance will vary according the focal length of the lens in question - wide angle lenses will focus closer than telephoto lenses, for instance. As a rough guide, a standard 50mm lens will have a minimum focusing distance of around 2ft. (1.6 metres). This is not too much of a problem when photographing the whole of a 5" gauge locomotive or even a 1" scale traction engine but smaller models and any really close-up details will probably need the camera to be much closer than this. So, how do we overcome the minimum focusing problem?

There are two economical ways to deal with this - either use close-up lenses (which are similar to filters) or put extension tubes between the lens and the body of the camera. The other alternative is to buy a true macro lens but these lenses are rather on the expensive side. Notice that I said a "true" macro lens - there are several so-called "macro" lenses on the market which, in fact will only focus a little closer than an ordinary lens. A true macro lens will be able to focus down to 1/2 life size.

Close-up lenses are probably the cheapest option but you may find them a bit limited in their application. Looking very much like a normal screw-in filter, close-up lenses are like a magnifying glass lens which can be fitted onto the front of any camera lens. They work better with lenses of around 50mm focal length and they will enable you to focus closer to the subject and therefore show more detail in smaller areas. They are available in different strengths and are marked in Dioptres. A close-up lens of +1 dioptre will allow a 50mm lens to focus between approximately 39" and 20" (1metre to 52cm) and a +2 dioptre will range between 19" and 13" (50cm and 34cm), these should cover most of your needs but a +3 dioptre would take you down between 13" and 10" (33cm and 25cm) if needed. If you do use close-up lenses it is generally better to use them at apertures smaller than f8 - but, of course, you will be working nearer to f11 or f16 for scale model work.

Extension tubes are somewhat more versatile but are becoming difficult to obtain these days. Usually sold in sets of three different lengths (around 6mm, 18mm and 25mm long), extension tubes are fitted between the lens and the camera body and, literally, extend the length of the lens when working close to a subject. They can be used individually or in various combinations of two or three to give different focusing ranges. Using a 6mm extension tube on a 50mm lens will give a focusing range from approximately 19" to 12" (48cm to 30cm), an 18mm tube will give 12" to 10" (30cm to 25cm), and a 25mm tube will give 9" to 8" (24cm to 22cm). The best way for the novice to use extension tubes is to put a short one on first and see if it will focus close enough. If not, try the middle size and so on.

Exposure can sometimes become a problem when working close to a subject with these accessories. Close-up lenses are usually taken care of by the through the lens meter of modern SLR cameras but some extension tubes may not provide the meter coupling between the lens and camera body. If this is the case you will have to allow extra exposure to compensate for the extension. The easiest way in this case is to take one frame at what the meter says and then "open up" by one stop for the next frame and, again open up one stop for the third frame. This is known as "bracketing your exposures" and is a useful dodge if you are not quite sure how things will turn out. If you are using flash to light the subject it is better to "bracket" your exposures in this way because the flash itself won't be able to do it for you.

In Summary

Unfortunately, the limited space in an annual magazine of this type means that we can only gloss over the subject of scale model photography but I hope the foregoing will have given you some ideas and, perhaps, a better understanding of how to improve the photographs you take of your models. When you think about it, having spent so much time and effort on building your model, it would be a pity not to be able to take some nice photos of it so that you can preserve its "new" condition and also be able to show friends etc. what it looks like.

Many of the techniques which I have described will also make it easier for you to take photos of the full size prototype which will help you when building and detailing your models. There are so many preserved engines etc. around these days that is relatively easy to locate the one you are modelling and study it for information. It also makes a nice a day out away from the workshop for a while. A change of scene and a bit of fresh air works wonders - especially if you are running into problems in the workshop!

So, give it a try - and see if you, too, can produce better photographs of your models. ■

FURTHER information

by Mike Wade

Some more ideas on what to model and where to get help

It is impossible in a magazine of this size to cover every aspect of the model engineering hobby and it will therefore be necessary for the modeller to look elsewhere for more information. The following notes may help to point you in the right direction.

Traction Engines

Model traction engines have the advantage of not needing a track to run on. All you need is a large enough area of ground and you may drive them anywhere to your heart's content. There are obviously some legal restrictions governing this but these do not normally pose many problems.

There are many variations in the design of traction engine and, in fact, the term "traction engine" is often used incorrectly to describe all types of steam road vehicle in general. The smallest of these vehicles is actually called the Steam Tractor. Built to a weight limit of 5 tons, they were used mainly to haul lighter loads on the roads and were normally fitted with some form of springing to both axles. The larger general purpose Traction Engines were built to cover a variety of different duties, mainly in the agricultural area, including the driving of threshing machines

and saw benches as well as providing power to haul trailers and equipment around on farms etc. Most of these engines had a single cylinder and very often had no suspension arrangements as they were not designed to run on the roads.

Another type of engine, and probably one of the most popular with steam enthusiasts, is the Road Locomotive. These were much larger engines, often with compound cylinders, and they were used for heavy haulage on the roads. Some of the really large loads such as industrial boilers or sections of bridges would require two of these engines to haul them and the sight of them in action would be enough to stir the hearts of anyone. A specialised type of road locomotive was the Showman's Engine which would be owned and used by fairground operators. These magnificent engines would have a generator mounted on an extension in front of the smokebox which was used to provide electrical power to drive the fairground rides and lighting. With their long overall canopies bedecked with coloured lights, and all the polished brass work they would look really splendid.

The largest engines were the Ploughing Engines with their massive boilers and cable drums hung beneath. They would need all their enormous power to haul seven- bladed ploughs from one side of a field to the other. These engines were usually fitted with compound cylinders and would be taken all over the country by their owners as they went from job to job as needed.

Road Rollers were, as the name suggests, used for rolling road surfaces and had a long cylindrical roller in place of the front wheels. Generally owned by local authorities or road building contractors, they did stirling service in building and maintaining the highways and byways of their period.

Steam Wagons were a relatively late arrival on the scene and were developed to carry goods on the public roads quicker and with less damage to the road surfaces. The steam cylinders were usually hung underneath the chassis and they often employed a vertical boiler in the cab of the wagon or tractor unit. Painted in various company liveries, they were a familiar sight on the roads until the internal combustion engine took over.

Popular modelling scales for "traction engines" range from 1" to the foot up to 1/4, or occasionally 1/2, full size. For rally use and passenger hauling, engines of 3" scale and upwards should be considered but the smaller scales may be used to produce "showpieces" which are easy to handle.

In Conclusion

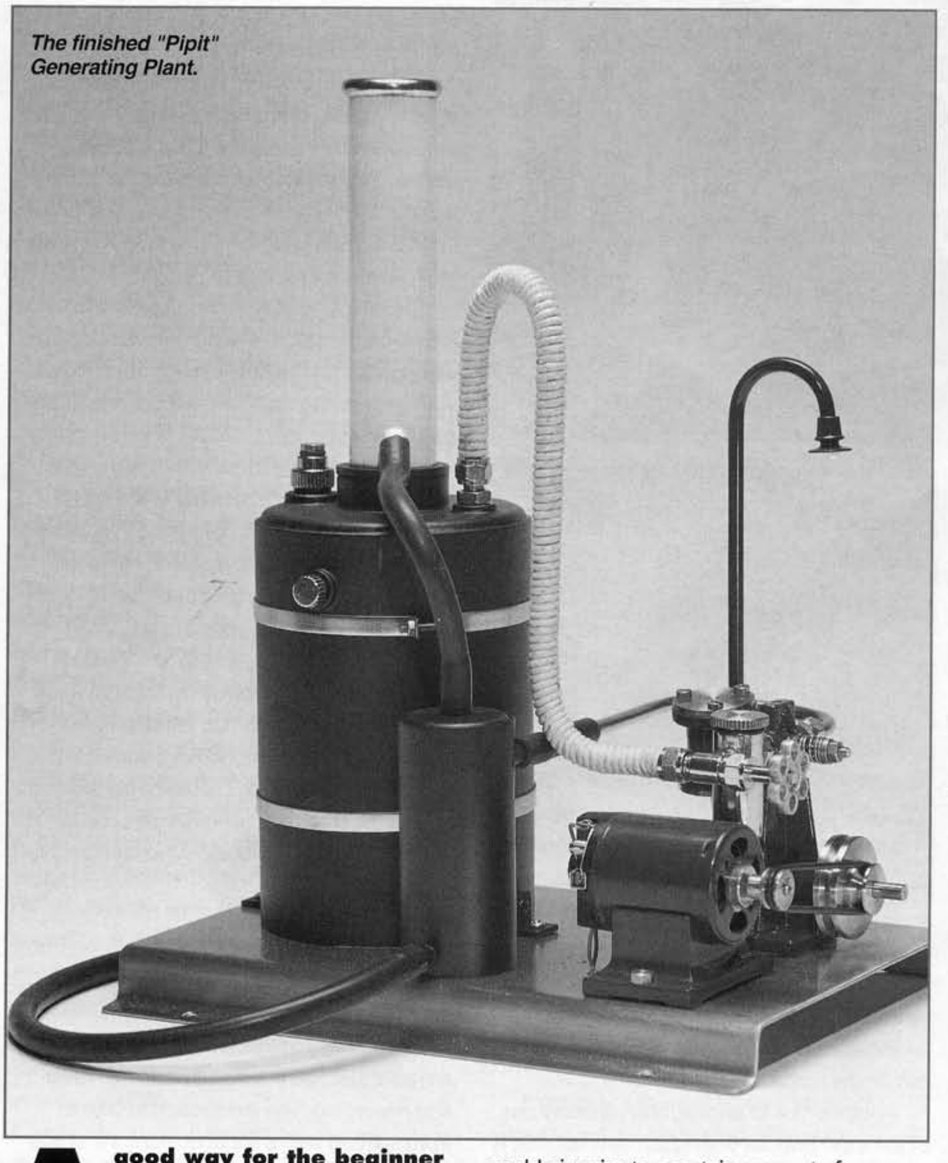
Whatever you may decide to take up in the model engineering hobby, and however small or large you involvement becomes, I am sure that you will find it both enjoyable and rewarding. The satisfaction to be had from starting with a set of drawings and raw materials and finishing up with a model which is actually "all your own work" has to be tried to be believed.

The best piece of advice for anyone contemplating this hobby is :-

"Don't be afraid - Give it a try - You will probably enjoy it!"

I wish you good luck and happy modelling in whatever you may choose to do. ■

Building the "PIPIT" electricity Generating Plant



The finished "Pipit" Generating Plant.

A good way for the beginner to start model engineering might be to assemble a simple steam engine from a kit of machined parts ...

The absolute beginner with no previous experience of engineering may find the thought of making an engine from scratch a bit daunting. Not knowing what the various parts are called, or how they go together, could give rise to a certain amount of confusion and uncertainty. Add to that the problems of learning how to read technical drawings and use unfamiliar tools and machines might even put them off starting at all! If you feel that this might be the case, an easy way to make a start would be to purchase a set of machined parts for a simple engine in kit form and assemble them. All the turning, thread cutting, milling etc. that may be required will already have been done and all you will have to do is to assemble the kit using a few simple hand tools and following the assembly instructions supplied.

As you put the kit together you will soon learn what the various parts are called and see how they relate to one another. You will be able to easily work out how the engine functions as you go along and, because it will only take a few hours to assemble the model, you will be able to produce a working engine quite quickly. Once you get the pleasure from seeing your first model in steam you will have the incentive to want to build another engine from scratch and, with the experience already gained, this process will become much easier.

This photo shows the contents of the box containing the kit. Everything needed to complete the model is included, with the exception of the paint, and comprehensive instructions are provided.

Several of the commercial suppliers to the model engineering hobby offer kits of parts for different types of model and a browse through some of their catalogues should find something which is of interest. The subject of this particular article was chosen as being particularly suitable for the beginner as it uses a simple oscillating engine, the operation of which is quite easy to understand and will thus be a good introduction to steam engines in general.

The "Pipit" Steam Plant

Cheddar Models Ltd. offer a series of steam plants and engines which are suitable for use as stationary engines or for driving steam boat models. The smallest engine in their range is the "Pipit" engine and this may be obtained as the Pipit Stationary Plant, the Pipit Marine Plant or the Pipit Electricity Generating Set. I have chosen to describe the Electricity Generating Set because this comes complete with a dynamo and lamp standard and will make a nice model for the mantelpiece and also demonstrates the conversion of steam energy into electricity.

(This set is often used in schools etc. for educational purposes).

The basic kit comprises a fully machined set of parts for the single cylinder oscillating engine, a ready to use boiler (fully silver soldered and tested), a displacement type lubricator with stop valve, an engine exhaust oil trap, a dynamo and a lamp standard with lamp. The main steam pipe and the engine exhaust pipe are supplied with nuts and nipples fitted and just require bending. All necessary nuts, bolts and boiler fittings are supplied as well as a 3ml tube of Loctite Lock 'n Seal. The instruction sheet supplied is very comprehensive and, with reference to the numbered exploded diagrams, it is a simple case of following the instructions in order to build the model.

All that will be needed in order to assemble the kit are three spanners - 2,6 and 8 BA; two small screwdrivers - one flat, one cross point; a few needle files; a small hammer; a cocktail stick for applying the Loctite; and a few drops of steam oil. I also found that a small pair of tweezers, a knife blade and a small bulldog clip came in handy as well.

Preliminary Work

Before starting to build the steam plant, the instructions advise that you study the instructions carefully all the way through and try the parts together in a dry run in order to check for any burrs etc. The kit which I assembled was very clean and only one or two burrs were found, these were soon removed with a few careful strokes of the needle file. The fit of the various parts was extremely good and shows how well these kits are made.

It is always a good idea to paint components before assembly so I used an air brush to apply six or seven thin coats of enamel paint to the engine standard, cylinder block and dynamo casing, allowing each coat to dry for a couple of hours before adding the next one. Don't forget to put some masking tape over the machined port faces and the ends of bores before painting. What I did forget was to paint the cylinder top and bottom covers prior to assembly. This is really a matter of personal preference but they would have been painted on the full size engine. If you are really keen you could also paint over the heads of the screws after assembly.

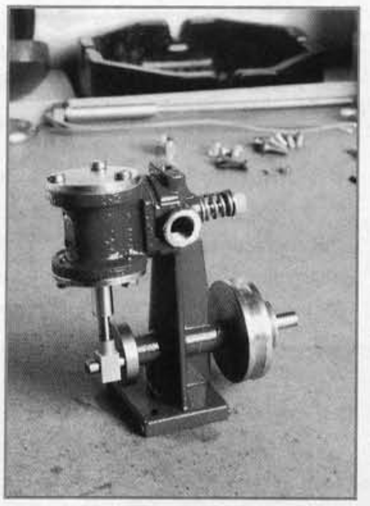
Engine Assembly

Following the instruction sheet, the first item to start with is the cylinder unit. Using the end of a cocktail stick, a small drop of Loctite Lock 'n Seal was applied to the tapped hole in the cylinder port face. Don't apply the sealant directly from the tube as this will result in too much of it flooding into the hole and it may overflow into the port holes - if any sealant gets into the ports or cylinder it may well glue moving parts together and stop the engine from running! Only a small amount of sealant is needed, in this case just enough to go around a couple of threads. The short threaded end of the trunnion pin was then screwed in place and any excess sealant was carefully wiped off. In order to ensure that the assembly remains square as the sealant cures, the instructions recommend that the assembly is fitted into the engine standard and secured with the spring and nut to put it under tension while it sets. While the above item was setting, the bottom cylinder cover was slid onto the piston rod, making sure to get it the right way up, and a ▶

Top: This view shows the working set-up on a board on the desk. Above: The fully machined engine parts as supplied - cylinder & covers, column, piston and rod, flywheel and crankshaft.

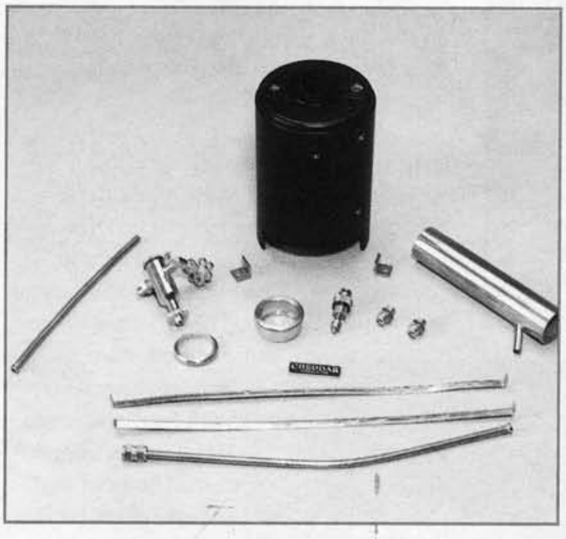
Above: First stage - cylinder & trunnion pin assembled and held in column while sealant cures; big end fitted to piston rod with bottom cylinder cover in place. Below: Securing the cylinder cover in place with the screws provided.

Having completed the cylinder assembly - with piston in place and end covers fitted - it is now ready to attach to the column.

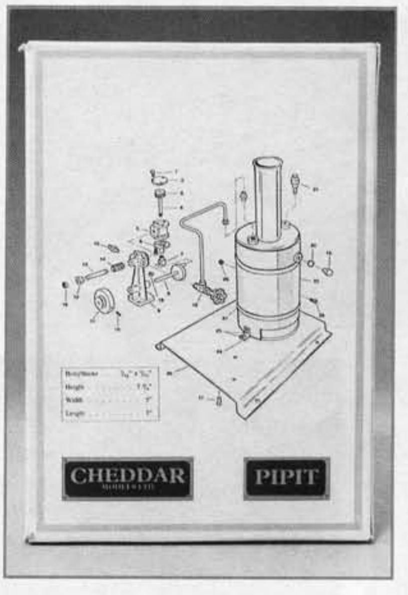


This photo shows the finished engine assembly ready for mounting on the baseplate when needed.

First job on the boiler is to fit the boiler bands. I found the use of a small Bulldog clip helped to hold the ends together when fitting the bolt an nut.



This photograph shows some more of the parts as supplied - L to R, copper pipe for the engine exhaust; lubricator with stop valve; chimney cap; chimney coupler; pre-set safety valve; pipe union fittings; chimney with exhaust connection; two boiler bands and main steam pipe. The boiler (top) is supplied tested and ready for use.



Very clear exploded diagrams show how the various parts fit to gether. The written instructions are also very helpful.

The boiler is shown here with all the fittings in place. Blanking plugs are used in bushes where optional accessories may be fitted.

small drop of Loctite was applied to the thread in the big end before screwing it in position on the piston rod. After wiping off any excess sealant, this unit was put aside to cure making sure that the cylinder cover was well away from the big end in case there was any sealant left on the rod at that end.

The next thing to do was to put a very thin smear of steam oil around the cylinder bore using a clean cocktail stick. After applying a thin smear of sealant to the flange of the bottom cylinder cover, and making sure there was no oil on the bottom cylinder face, the piston was carefully inserted into the bore and pushed about halfway in. The end cover was then slid into place and the screw holes were lined up before fitting the three 8BA cheese head screws and tightening them up. The screws only need tightening until they hold firmly - there is no need to exert so much pressure on the screwdriver that the slots get chewed up! After applying a small drop of oil into the cylinder bore from the other end, the top cover was fitted into place with a smear of sealant on the flange and three 8BA cheesehead screws as before. Any excess sealant which had been squeezed out of the flange joints was carefully wiped off.

This completed the cylinder assembly which was then put aside while the "bottom end" was attended to. The shaft of the crankshaft assembly was given a thin smear of oil before inserting it into the hole at the bottom of the engine standard. The flywheel was positioned on the other end of the crankshaft, with the small pulley outwards, and was secured in place with the grub screw which was already fitted in the flywheel (the Allen key for this is supplied in the kit). The instruction sheet recommends a lengthwise end "float" of 0.2 mm between the back of the flywheel and the front of the engine standard. 0.2 mm is equivalent to 8 thou (or 0.008 in.) and is about the thickness of the cardboard packet used for cigarette papers. It is useful to keep a packet of cigarette papers handy - even if you don't smoke - as they can be used for all sorts of things in the workshop. The papers themselves are 1 thou (0.001" - or 0.025 mm) thick.

After applying some steam oil to the port face, the cylinder assembly was now fitted into the engine standard - being careful to line up the crankshaft so that the big end fitted over the crankpin - and was secured in place by fitting the spring, spring retainer and the nut. A small drop of Loctite was used to secure the nut. Enough tension needs to be applied to the spring so that the cylinder is held in firm contact with the port face but too much tension will result in the cylinder becoming too stiff to move easily.

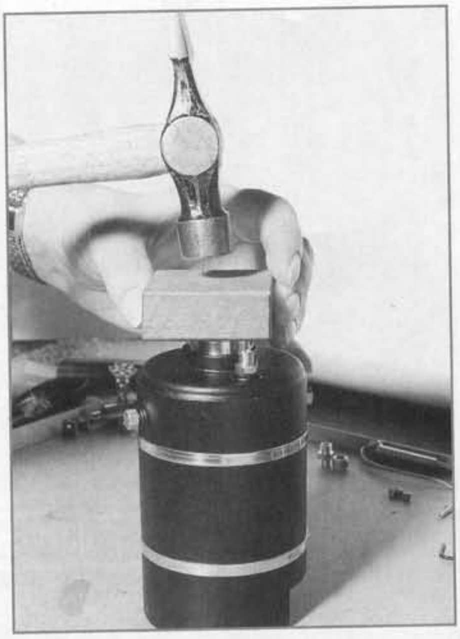
Having completed the engine assembly, attention was now turned to the boiler and its fittings.

Boiler Assembly

Ready made from copper and fully silver soldered and tested, the boiler is supplied as a ready to use item and thus avoids the need for any soldering etc. All that is needed is to fit the various unions and safety valve as required. Several optional accessories are available for the boiler including a pressure gauge, water gauge and wood lagging. The boiler in the kit is not supplied with any of these and it is perfectly safe to use it in this form - the water level being checked via a level plug when cold. For the purpose of this article I have built the boiler in this way but I would recommend the fitting of a water level gauge if you intend to use the optional gas burner at a later stage.

I followed the instruction sheet sequence for assembling the boiler but found that the safety valve and union on top of the boiler gave a slight problem when fitting the chimney coupler later on as they fouled the wooden block which I used to protect the coupler from the hammer. In retrospect, it might be better to fit the chimney coupler first and this is achieved by positioning the coupler in the spigot on the top of the boiler and tapping it down with a small hammer and a block of hardwood. (Put a piece of masking tape over the holes in the boiler top to prevent splinters falling in). The block of wood is used to prevent the hammer from putting dents in the brass coupler - as well as spoiling the look of the job this could prevent the chimney from fitting inside the coupler. I would also recommend that the boiler base is supported on a block of wood as well (to prevent damage to the boiler). Don't be tempted to use heavy blows from the hammer - several lighter taps, and constant checking all round for squareness, will make sure the job is done properly.

Returning now to the instruction sheet sequence, the first job is to attach the boiler bands. These are supplied as flat strips with the ends turned up at 90 degrees and pre-drilled. As they are quite soft it was easy to bend each of them round the boiler barrel by hand, starting at the halfway point and bending each half in turn with finger pressure. The problem came when trying to fit the securing bolt and nut. As the bands are "springy" they needed to be held together



Left: Carefully pree the chimney coupler in place in the boiler spigot by hand and then tap it down using a hammer and wood block. Keep checking that it goes in square. Right: You may need to turn the block on edge to clear the safety value and union, if already fitted, (see note in text about this operation) in order to seat the coupler right down on the spigot.

while the bolt and nut were fitted. I found that the use of a small bulldog clip at the extreme ends of the upturned pieces allowed me to use both hands to get the bolt and nut in place. Once the nut was holding by a couple of threads, the bulldog clip was removed and the nut finally tightened up. Make sure to get the boiler bands level all the way round.

Next to be fitted were the level plug and the safety valve. The 'O' ring needs to put in place on the level plug - this was a tight fit but was soon achieved by finger pressure alone (don't be tempted to use any tools for this as you may easily damage the 'O' ring). The safety valve is pre-set at the factory and only needs screwing into place. Do not use any sealant on these items as they will have to be removed frequently for filling the boiler. The 'O' rings will make a pressure-tight seal.

Having fitted the steam pipe union in the remaining bush on the top of the boiler - using a drop of sealant applied to the thread in the bush - and also fitting the necessary blanking bushes in the sides of the boiler - the boiler assembly was completed.

(Within the boiler assembly section, the instruction sheet gives details of how to fit some of the optional items and it is a case of skipping on until you find the next item relevant to the way you wish to finish your particular boiler).

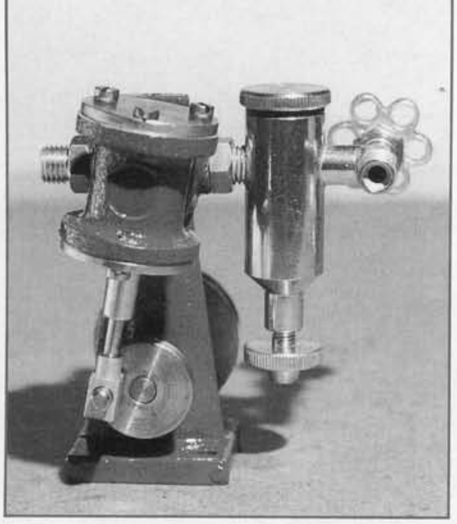
Final Assembly

Having completed the engine and boiler assemblies it only remained to attach these to the baseplate and connect up the pipework etc. The baseplate supplied with the kit is made from brass sheet and has been folded and drilled at the factory ready to accept all the various parts of the steam plant. It would be a good idea to make a wooden base for this and stain it with a wood dye to make for a neat appearance for the finished model. Perhaps a sheet of chequer plate on top of the wooden base might look nice. This is where you can personalise your model and put in some of your own handiwork if you feel like it.

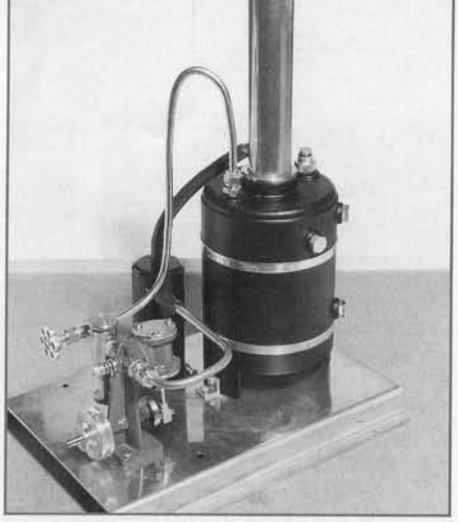
For the purpose of this article I mounted the boiler onto the brass baseplate with the self-tapping screws provided and then fitted the lubricator stop valve into the engine standard with a drop of Loctite sealant and secured it in a vertical position with the locknut. After also fitting the exhaust union to the other side of the engine standard, I mounted the engine on the baseplate and secured it with the 8BA cheesehead screws and nuts.

Next came the pipework. The steam and exhaust pipes are supplied in straight lengths with the nuts and nipples already fitted. All that was needed was to offer the pipes up to the relevant connections on the engine and boiler and bend them to shape. The copper pipes are in a soft condition and it was quite easy to bend them using finger pressure only. The engine exhaust pipe as supplied is cut long enough to extend to allow for the builder to arrange his own position for it. As the oil trap was being fitted in my case it was necessary to cut the pipe to length with a junior hacksaw and clean the end up with a needle file.

It is worth remembering that copper will "work harden" as it is bent, so try to make sure that you bend them correctly first time. I



The complete engine assembly is shown here with the lubricator and stop value and the engine exhaust union in place. The engine could be used in this condition to power many different sorts of model e.g. small railway locomotives or steam trams etc.



This photograph shows the finished "Pipit" electricity generating plant which was constructed for the purpose of this article. The steam pipes have not yet been lagged because the Author intends to modify the plant by adding some of the operational accesssories.

made a bit of a mistake because I bent the steam pipe very neatly in the first place but found that, when I later tried to fit the exhaust oil trap in place, the entry pipe for the exhaust fouled with the steam pipe. This meant that I had to re-bend the steam pipe to make it miss the oil trap pipe and, because of the work hardening, the finished steam pipe isn't as neat as I would have liked. What I should have done in this case would be to anneal the steam pipe by heating it to a Cherry red colour and let it cool down slowly but I tried it without annealing to see if a beginner would be able to manage it. The answer to that is ... yes it can be done!

All that remained to be done now was to fit the exhaust oil trap in place and connect it up with pieces of the silicon tube which is supplied with the kit. The oil trap will remove any oil particles from the exhaust before it is allowed to escape up the chimney - this prevents oil spots being ejected all over the place! The dynamo was soon fitted in place and the drive "belt" was cut to length from the rather neat spring type material supplied. Make sure to cut the right end of this, though, or you will remove the smaller end which is used to connect the belt up by pushing it into the other end! Belt tension is a matter of trial and error - cut it a bit long first and gradually shorten it until it will drive the dynamo when the engine is running. The lamp standard was secured in place with the nut below the baseplate and the wires were soldered to the terminals on the dynamo. Now we are ready for the first steam test!

Running the Steam Plant

The first thing to do whenever a boiler is to be steamed is to make sure there is enough water in the boiler. So, by removing the knurled level plug from the boiler side and also removing the safety valve I filled the boiler with water until it just started to come out of the level plug hole. The level plug was then refitted, followed by the safety valve. (I would recommend the use of distilled water or rain water rather than ordinary tap water. This will help to prevent the inside of the boiler from scaling up after a lot of use). I then checked that all the boiler fittings were properly tightened up and that the main steam stop valve was closed.

After making sure the drain tap was closed, the lubricator top cap was removed and the lubricator was filled with steam oil up to the level of the cross tube which can be seen inside. The rest of the engine bearings were given a spot of oil as well. Steam oil is quite suitable for this as it will thin down as the engine warms up.

For the purpose of this article I decided to try the meths tablet method of firing the boiler, so I purchased a packet of meths tablets form a local model shop and, following the "Pipit" instruction sheet, I put a couple of tablets on the fuel tray and lit them around the edges. With the tray in position under the boiler, steam was raised in a few minutes and the stop valve was just cracked open to warm the cylinder up. After turning the engine flywheel by hand a few times, the steam valve was opened a little bit more and the engine then started to run under its own steam. It was really enjoyable to see the engine running and the lamp being lit up by the electricity generated from the dynamo.

At the end of the run, the tablet tray was removed and the remains of the tablets were extinguished. The engine was wiped down with a rag with a drop of steam oil on it to preserve the paintwork and the boiler was allowed to cool down slowly. The drain tap on the lubricator was opened to allow the condensed water inside to drain out and I refilled the lubricator with steam oil ready for the next steaming session. It is easier to do this while the engine is still warm as the oil will run easier. And that, as they say, was the end of a very enjoyable exercise in building the "Pipit" Electricity Generating Set.

What to do next

Some of the accessories for this engine would be well worth investigating. A 2" dia. Ceramic Gas Burner is available for the Pipit and this would make the engine easier and more economical to run as it can be used with disposable gas cartridges. Cheddar Models can also supply a very neat Refillable Gas Tank with gas control valve which can be used to make the steam plant completely self contained. I would recommend the fitting of the Water Gauge Kit if you are using the gas burner so that you can keep an eye on the water level - and perhaps add the Hand Force Pump to enable the boiler to be topped up with water while it is in steam. The Pressure Gauge Kit would also make a nice addition to the boiler and the Wood Lagging Kit would make the boiler look quite smart, as well as keeping some extra heat in.

Maybe you could now look at building something else for the engine to drive. Its own engine-driven water pump or a small saw bench, perhaps. Maybe even convert the set up into a narrow gauge locomotive - the choice is yours and the ideas are endless!

I hope this description will encourage you to have a go at building an engine in kit form and that it may be the start of your model engineering hobby. If so, good luck and good steaming! ■

Specifications

Steam Plant:	
Length	6.7/8" 175mm
Width	5.1/8" 130mm
Height	7" 180mm
Weight	2.2 lb. 1kg
Engine:	
Bore	7/16" 11mm
Stroke	7/16" 11mm
Length	2.1/4" 57mm
Width	1.1/4" 28mm
Height	2.1/2" 63mm
Working pressure	Up to 30psi (2 bar)

Prices of Pipit machined kits:
(price includes VAT)
Stationary Plant - £111.33
Marine Plant - £111.33
Electricity Generating Set £168.22