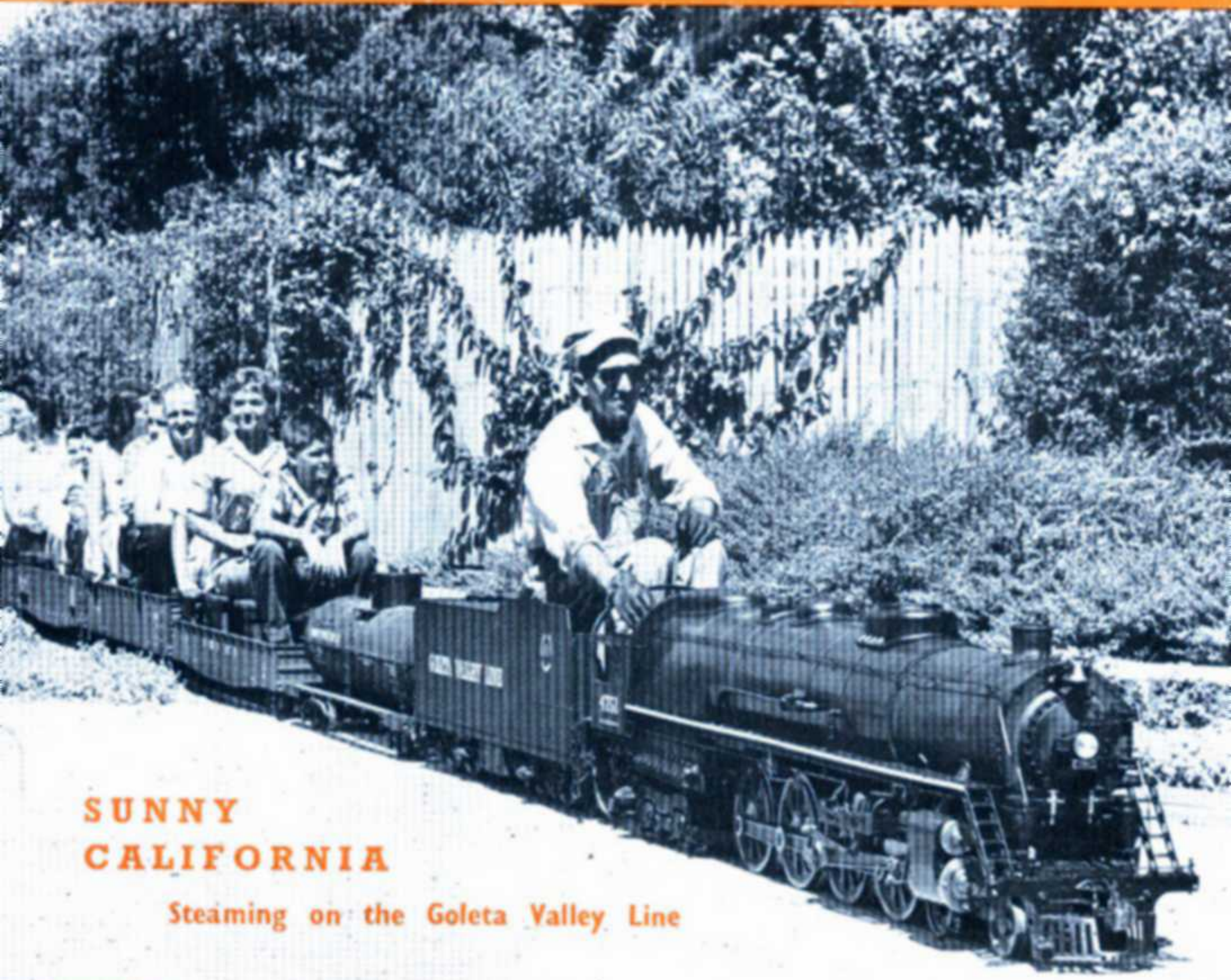
Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED



SUNNY
CALIFORNIA

Steaming on the Goleta Valley Line

IN THIS ISSUE: ME Newtonian telescope • Machine for spastics

1/3 11 OCTOBER 1962 VOL. 127 NO 3196

11 Oct. 1962 Vol. 127 No 3196

Model Engineer

Incorporating Mechanics (Home Mechanics and English Mechanics) and Ships and Ship Models

19-20 Noel Street, London, W1

Contents

Published every Thursday

Subscription** 78s. (**USA and Canada** $11.50), **post free.

Cover picture

A handsome 4-8-4 on the Goleta Valley ground-level line. Mr B. A. Butt, who left St Ives for Santa Barbara, specialises in railway photography. This is one of many fine pictures which he has sent to ME

Next week

Model tramcar builders can go another step forward with the second instalment of Geoffrey Swift's short serial on this subject. For model ship enthusiasts there will be a report of the recent exhibition organised by the Metropolitan Ship Modelling Societies at Charlton House

Smoke Rings A weekly commentary by VULCAN

CHILDREN at Tavistock can amuse themselves by pretending to drive an old Robey roller in their own part of the municipal pleasure grounds. The machine is firmly embedded in concrete.

Recommending this idea to other councils, Mr Geoffrey P. Clark of Tavistock points out that it serves a double purpose, "saving old steam engines from the scrap-heap and giving joy to the children.

This practice is being increasingly followed in the United States. Readers of *The World of Model Railways* will remember the description in that book of how locomotive No 1361, a K-4 of 1918, was dedicated to the children of Altoona at a ceremony on the famous Horseshoe Curve in the Appalachians. Since then, as readers know, other locomotives have been similarly preserved after their last run.

Adventurous play

I suggested a good while ago that model engineers could lighten some of our school playgrounds—barren wastes of concrete bordered, perhaps, with grass and flowers—by providing them with old vehicles or with special devices built as a club project.

Since then I have seen, in an architectural journal, some of the ideas which have been introduced in Scandinavia. Playgrounds there are equipped with ingenious constructions on which the children can climb about, instead of having little to do except chase each other.

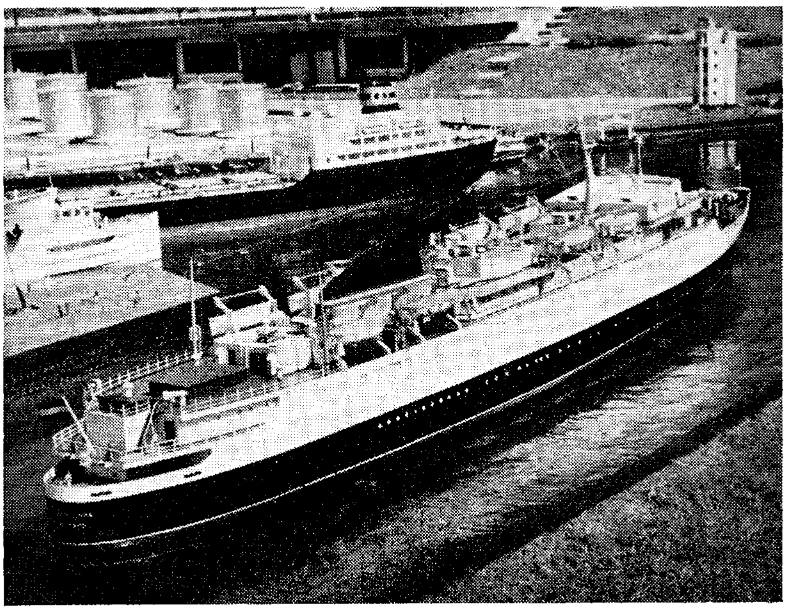
Some schools in Britain have constructions of this kind. They are generally welcomed by teachers and parents, and are highly regarded by child psychologists—so long, of course, as they are not sources of danger.

Model villages

MANY thousands of people visit the model villages which are now part of the seaside scene. But there are few model engineers among them, for they find the clash of scale, which is difficult to avoid in model village architecture, a bit trying.

There is another thing, too, which probably puts them off. There are few genuine scale versions of full-size objects. This is understandably so, for a detailed model is a delicate and expensive structure which could be easily damaged by heavy weather or the exploring finger of an inquisitive child.

But in Holland, at the miniature village of Madurodam, the modellers seem to have gone a long way towards overcoming this problem.



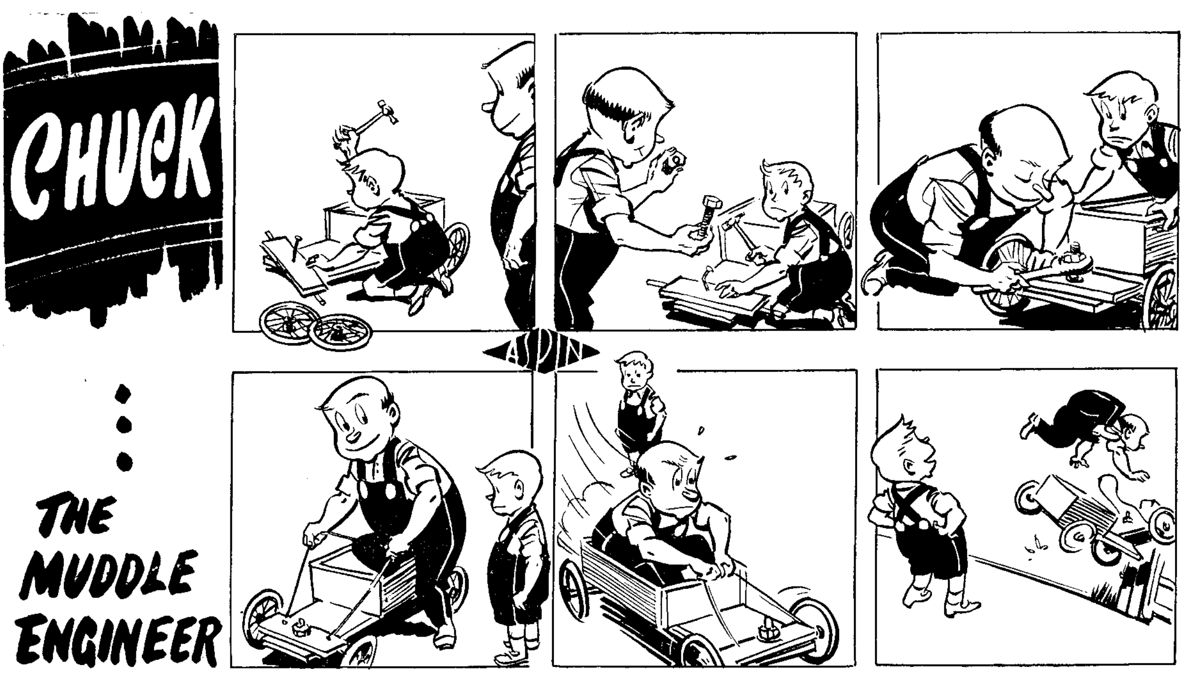
Growing city

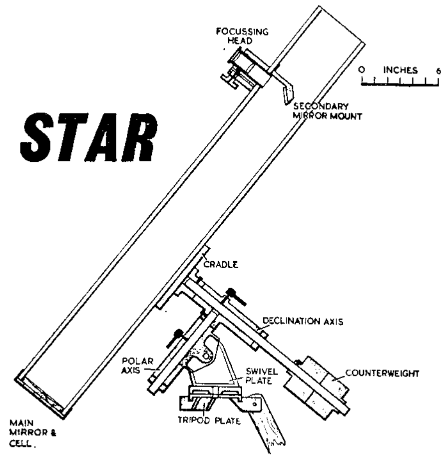
Madurodam, situated between Scheveningen and The Hague, is a miniature city erected as a war memorial to George Maduro, an army officer who distinguished himself in May 1940 but who met a tragic end in Dachau in 1945.

This tiny city is ten years old this year. From small beginnings it has grown enormously until it now has an airport and a remotely-controlled railway system.

But what is more likely to delight the eye of the model engineer are the scale models of the *Koningin Wilhelmina*, of the Zeeland Steamship Company, the *Willem Ruys*, flagship of the Royal Rotterdam Lloyd and the *Oranje*, flagship of the Mij. Netherland.

There are models, too, of a bucket dredger and a working model of a motor ferryboat. My photograph gives some idea of the detail which the constructors have put into this work.





POINT IT TO THE NORTH STAR

With the second instalment LEE TAYLOR arrives at the stage when the instrument can be taken into the garden for adjustment

THE mirror-cell presented several problems. Should I cast it or spin it? I finally chose spinning as the better method.

To spin aluminium (No 20 s.w.g.) I needed a form-tool and clamp-disc of $4\frac{1}{4}$ in. o.d. These were turned on top speed from two chunks of seasoned beechwood; I used the three-jaw and a $\frac{5}{16}$ in. bolt with a nut and two washers as a mandrel for the pair. As I turned them together, I found it necessary to put a centring hole in the bolt head and mount them between chuck and tailstock. The whole operation took about 15 minutes.

As the wood tended to scorch if too deep a cut were taken—I compromised by using medium speed—and takings cuts of only $\frac{3}{16}$ in. at a time, easing back at any sign that the tool was burning.

After separating the blocks, I remounted the tool block, and made a $\frac{1}{8}$ in. radius on one edge. I had already cut a 6 in. dia. disc out of the sheet aluminium, and drilled a $\frac{5}{16}$ in. clearance hole through the centre. Mounting the work between the two blocks, I began the spinning.

In technical papers, I have talked glibly of "spinning" sheet metal; now, for the first time, I was confronted with the horrifying prospect of having to do it myself. After many attempts to turn the extreme edge of the disc by hand, with a brass tool and brute force, I decided on cunning and mechanical leverage.

After clamping a piece of really tough oak 8 in. × $1\frac{1}{2}$ in. × $\frac{1}{2}$ in. in the slide-rest at an angle of 45 deg., I plastered it with Vaseline and fed it against the extreme edge of the aluminium disc, using rack feed. Much to my surprise, the edge belled over quite quickly, with some temperature rise.

After a few experimental tries, I soon found that the disc, if treated gently, gradually formed itself against the tool-block. Finally, I was able to give the fast stroke, which brought the wooden tool quite parallel to the disc-flange, flattening it to the wooden block. Throughout the whole process, I had to blob dollops of Vaseline on to the oak tool and allow the work to cool at frequent intervals. The operation took no more than half-an-hour.

The cell was hot by the time that it was finished, probably because the wooden tool did not permit rapid conduction of heat. When it was cold, I cut the mounting slots with drill and tin snips and removed the sharp edges with an emerycloth.

For a counterweight I decided upon a zinc casting, as zinc is quite cheap, is heavy for its size, and resembles aluminium in appearance. Many amateur telescope makers prefer to fudge a weight from concrete, or a tin-full of melted-down scrap lead. I suppose there are a thousand ways of doing the job, all quite satisfactory.

If you make the weight from lead, mount a piece of $\frac{5}{8}$ in. dia. rod through the tin can before pouring the metal. It is next to impossible to drill a $\frac{5}{8}$ in. hole through four inches of lead.

A counterweight of 2 lb. should be adequate for balancing a cylindrical Paxolin or cardboard tube, especially as the length of the declination axis shaft allows for accurate adjustment over a wide range. If you prefer a wooden "coffin box," extra weight will most certainly be needed.

The weight should not be greater than $3\frac{1}{2}$ in. in diameter, or in more southerly latitudes it may foul the tripod lugs at full east and west positions. A long and narrow weight is better than a short and fat one.

My drawing shows all the essentials for the tripod legs. Be sure that the hardwood is of good quality; I chose seasoned beech.

Although I used a 30 in. high tripod, others may prefer one 6 in. or so higher. The cross-brace helps to make the whole sturdy, and should not be left out. It also prevents the warping, which may occur with an unbraced tripod which has been in the night dew.

The barrel tube was simply a cardboard cylinder bought for a shilling from a local store supplying draughtsmen. It was intended for sending large blueprints and plans through the post. A standard size is 4 in. i.d. ($4\frac{1}{2}$ in. o.d.) × 36 in. long.

Coating the entire tube, inside and out, with Araldite gave it tremendous resistance to damage, and also made it impervious to moisture. When the Araldite was quite hard, I coated the inside only with matt black (anti-reflection) paint.

For the outer covering, I used a strip of Fablon. I lay the material upside down on a flat table, removed the protective backing, placed the treated tube plumb in the centre, and, with a rolling back-and-forth motion, gradually picked up on each side, until one side of the Fablon was firmly fixed, and the remainder needed only a final rolling to overlap. I have had no trouble with the Fablon since, and it seems to be quite sound in every way.

There is no good reason why metal tubing should not be used if you can afford it. Its only demerit is probably its thermal qualities. Condensation is apt to occur on metal if the telescope is moved from a warm room into a cold garden; this may mist the mirrors. Paxolin is an ideal material, but is not so easy to obtain.

My drawings show alternative tubes. A leading member of the Manchester Astronomical Society has just completed a very big reflector which has a galvanised iron tube in sections.

Having finished the tube, I marked out the positions of holes for the cell and focusing head, leaving the mounting location alone until I had found the proper balancing position for the tube.

I then fitted the necessary bolts into position. Cardboard can be drilled with an auger, and the holes can be opened out with a file-tang. It is as well to leave the clearance holes fairly tight, so that bolts and screws do not drop out easily.

Fitting the main mirror into its cell created some difficulty. There are many involved methods of doing this, all of them quite expensive. I chose a lazy but successful way. Roughing the inside of the cell with medium emerycloth, I marked out the position for three 1 in. dia. hardboard discs spaced at 120 deg. apart, and applied a coating of impact adhesive. Three discs were cut from a sheet of hardboard and roughed on both sides.

Adhesive was applied to one side, and the discs were positioned in the cell after the proper drying period. Then I put adhesive on the upper surface of the discs, and left them to dry out for several hours.

I coated the rear surface of my 4 in. dia. × 32 in. focus mirror with adhesive, lowered it carefully into the cell while it was quite "gooey," and centralised it. Small balsa wood wedges centralised the mirror in the cell; I inserted them around the inside edge of the cell-flange.

A disc of Bristol board was placed over the mirror, as a protection against dust, and the whole unit was put away until needed.

With this method of mounting the main reflecting surface, air may circulate freely around and under the mirror. No strain is put upon the glass, as it would be with locking screws, and the glass is insulated from the metal cell, allowing for unequal thermal qualities of the two materials.

Although the telescope has been bumped about in the back of a van over long distances, it is still in perfect alignment.

The secondary mirror may be rectangular or elliptical. Rectangular ones are cheaper and almost as efficient.

Whatever the shape, there need be little difference in the block upon which it is cemented. Mine was a simple 45 deg. wedge of aluminium, but wood or any other material may be used.

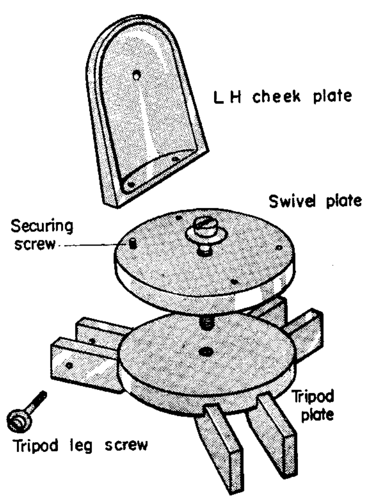
Out of the many types of eyepiece the Ramsden, Kellner, Orthoscopic, Monocentric and Erfle are best suited to reflecting telescopes. The Huyghens system tends to introduce many aberrations into a short-focus apparatus.

Perhaps the Ramsden is the best for general use. It is cheap to buy and can easily be made at home.

In simple form, it consists of two plano-convex lenses, mounted with their curved surfaces facing each other, and at a distance apart of slightly less than the focal length of either lens. (Both lenses must be of the same curvature.)

I made a Ramsden from two 1 in. focus plano-convex lenses, and mounted them ⅔ in. apart between curves. This gave a combination with an equivalent focal length (EFL) of about ¾ in.

We do not mount the lenses exactly at the focus of either one because any dust which happens to be on the front lens is right in focus and magnifies into a huge obstacle. By closing the distance, dust and marks are out of focus and not noticeable.



Tripod plate

The rest of my occulars were of 1 in., ½ in. and ¼ in. EFL. With my 32 in. mirror, they gave magnifications of ×32, ×64 and ×128. The ¾ in. ocular gave about ×42.

It will be seen that the magnification of any combination of lenses with a mirror can be calculated by dividing the focus of the mirror by the focus of the lens-system used as an eyepiece.

To calculate the EFL of any two lenses, the following formula may be used:

$$\text{EFL} = \frac{f1 \times f2}{f1 + f2 - d}$$

where *d* is the distance apart.

The other types of ocular mentioned are rather expensive when they are new, but secondhand ones may be picked up from surplus stores.

A small diaphragm or stop is normally mounted ahead of the front or field lens. It cuts out extraneous and useless light, and sharpens the field of vision. The stop should be at exactly the focus of the combination, and should appear as a sharp black edge.

The Royal Astronomical Society has standardised the dimensions of most telescope parts. You will find that most of the manufactured eyepieces are of either 1¼ in. dia. push-fit, or 1¼ in. × 16 t.p.i. screw-fit. My draw-tube was exactly 1.256 in. i.d., a cosy fit for standard push-fit eyepieces. It is easier to change powers, especially in winter, with a push-fit.

I have not said much about the cradle or tray in which the barrel tube is bolted. It can be of sheet metal or wood. If of wood, it is best fabricated from five shaped pieces of ¼ in. ply glued properly together.

At this stage, I gave all the parts except the barrel tube a white undercoating. Machined edges were left bright metal, contrasting well with the white enamel with which I finished the parts. I have often wondered why manufacturers of astronomical telescopes do not use white, as it is easy to walk into a black wrinkle-finished instrument on a dark night and knock the thing for six.

When all the parts were thoroughly dry, I reassembled the entire mounting, beginning with the tripod, and moving, as it were, upwards—to the swivel-plate cheek-plate assembly, to the polar axis, to the declination, and finally to the cradle.

Locking screws were fitted as I came to them. Two needed special attention: the polar and declination screws. They must have a friction device incorporated.

Both axes must be mounted in such a way that, when the telescope is trained upon a distant object, it will stay put without your having to tighten screws to keep it in view. This is especially so on high powers, as the tightening motion of even half a turn of screw thread is enough to cause loss of the viewing field.

I introduced a long, small-diameter leather plug, just big enough to be pressed into the threaded lock-screw hole. When it was tightened down on to the shaft by the lock-screw, it was springy enough to retain the shafts where they were put, and at the same time allowed of swinging the telescope on to the target.

Having assembled the mounting and the parts of the telescope as a separate unit, I decided upon the best position in which to fit the tube to the cradle. Ideally, of course, it should be at the point of balance, but this would cause the mirror cell to foul the tripod in some positions. A compromise had to be found between balance and rigidity, with sound function. The position shown in the drawing suited my instrument, and if your mirror is the same thickness as mine it should suit yours too. You can, of course, add a suitable weight, such as a metal disc, to the back of the cell for exact balance.

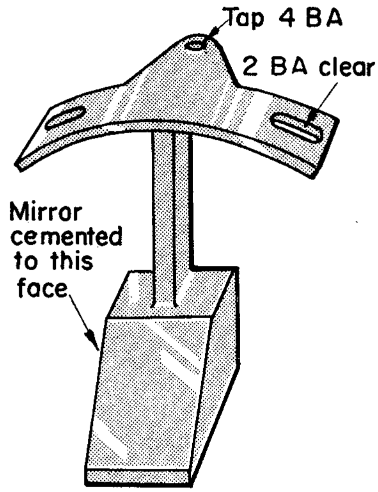
With the instrument assembled, it is necessary to collimate the optical components. This has to be done in stages.

Remove the eyepiece, and point the telescope toward the sky. Look down the draw-tube, and you should see the main mirror—or, more likely, part of it—reflected in the small secondary one.

Adjust the secondary until the main mirror is reflected centrally in the secondary, and appears concentric with the draw-tube.

Part of the inside black surface will be seen in the main mirror of the tube wall, and will probably be greater on one side.

Adjust the main mirror until



everything lines up as shown in the diagram, when the whole system will be fairly well collimated.

Take the instrument out into the garden, and point it toward a distant object—a church steeple or clock in the daytime, or a street lamp at least 50 or 60 yards away at night. The object should show as a crisp well-defined image when the eyepiece is properly focused.

The final adjustments can be made only on a point-image. The best of these is the Pole Star, which moves so little as to appear stationary, and gives plenty of time for fiddling with the optics. Any other star would move out of view within a few moments.

An artificial star may be obtained by placing a small steel ball-bearing in a sunlit position, in any place except Manchester, and examining the point-image so formed.

There is likely to be a flare, like the tail of a comet to one side. The main mirror then needs a very slight adjustment. Once this has been made, all optical parts should be tightened in position permanently and re-checked.

A badly adjusted optical system may seem quite good on a large object, such as the Moon, but would be useless for seeing the atmospheric belts on Jupiter, or the Cassini Division of Saturn's Rings.

★ *To be continued*

EASING A STICKING TAP

How often have you started to tap a hole in a tough material and had the tap seize in the workpiece? Then is time to go easy, lest you break a tap.

At recent technical meetings in Detroit, sponsored by the American Society for Metals and the Society of Automotive Engineers, among the trade exhibitors were vendors of special cutting fluid. This " juice " seems especially suited to conditions met in tapping strong, tough materials, such as alloy and stainless steels, aluminium-bronze, gear bronzes and the harder unchilled cast-irons. It is not recommended for use with aluminium or the general run of plastics. Essentially, it is methylchloroform.

In use, the tap is started, and as resistance to turning builds up, a few drops of fluid are squirted in and tapping continued.

The fluid is water white, quite volatile, and leaves no noticeable residue on the work as it evaporates. It acts as a penetrating extreme-pressure lubricant, as a deterrent to scuffing and galling between the surfaces of tool and work. The ease of turning is immediately apparent to the user.

The fluid is miscible with mineral oils, in fact, it has at times been used as an additive in the compounding of oils for automative rear axle gears.

Here are the trade names and vendors of two such products I have used from time to time for several months, and found useful in tough tapping and reaming operations. They are: Tap Magic, by The Steco Corporation, Little Rock, Arkansas, and Rapid Tap, by Relton Corporation, Pasadena, California.

This information may be useful to model engineers particularly in Canada and US.

Occasionally one hears of carbon tetrachloride (tetrachloromethane) being used for similar " unsticking " purposes. This compound, plus a corrosion inhibitor, is often used as a filler for small fire extinguishers, particularly for electrical fires, since this material is a non-conductor.

In emergency, I have used a little, taken from a fire-extinguisher, for sticky taps and it seemed to work, more or less. But, without confirming measurement, it did not seem to be quite as effective as methylchloroform.

Carbon tetrachloride is often sold as an incombustible spot remover for home dry-cleaning. Of recent years its open use industrially has been discouraged in the US because of ill-effects caused by its vapour, and of continuing skin contact.

Instructions for use of methylchloroform suggest it be used in well-ventilated places, not to breathe in the vapour, nor to have prolonged or repeated skin contact.

If precautions are taken when carbon tetrachloride is used, it would appear with the small quantities involved in the " unsticking " of taps by the model engineer, that there is no appreciable health hazard.

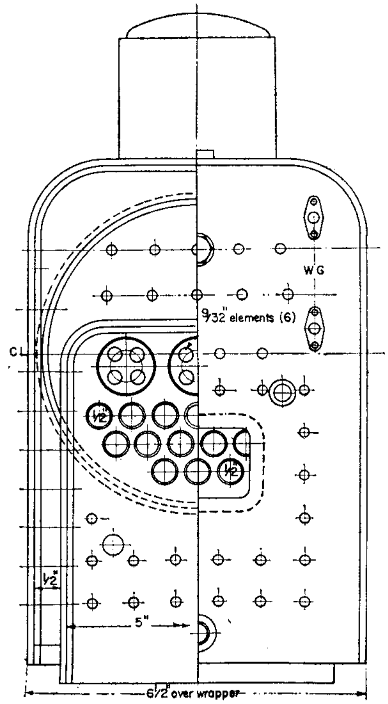
The foregoing information might be of help to others. I conclude with the usual disclaimer—namely—I have absolutely no financial interest in the vendors listed above.

ROLAND V. HUTCHINSON.

SCALING THE DETAILS

K. N. HARRIS concludes his two-part article with two tables. The appearance of many model locomotives, he says, is marred by bolt heads and nuts which are not in proportion to the whole

Continued from September 27, page 390



THE valve gear is the J.M.G., which is simple and robust and gives an excellent steam distribution throughout its range in either direction. A straight slide, with Greenly's correction to the vibrating link, whether applied to Joy, Greenly, Heywood or Sirsons valve-gear, will give a better and more accurate steam distribution than the unusual slide curved to the same radius as the length of the valve rod.

Far from being the perfect device that so many people believe it to be, the curved slide is only correct at its central position (where it is never used). The moment that it is tilted, it gives uneven port openings, a defect quite marked at the longer cut-offs.

With a boiler pressure of 125 p.s.i., and the usually accepted 85 per cent available in the steam chest and behind the piston, we have a tractive effort of

$$\frac{1\frac{1}{2} \times 1\frac{1}{2} \times 2\frac{1}{2} \times 106}{7} = 85 \text{ lb.}$$

A high proportion of this will be available at the highest speed at which the engine can safely run. At 7 m.p.h. the engine is turning over at only 336 r.p.m. (a 3 in. wheel at this speed gives 3 m.p.h. and a 75 in. wheel 75 m.p.h.). At 12 m.p.h. the rotational speed will be just under 580 r.p.m. and the piston speed 233 ft per minute.

The late cut-off in full gear makes for easy starting in all conditions, reduces the tendency to slip at starting, and in no way inhibits linking-up to short cut-off as conditions allow.

Cylinder drains are led to a Turpin steam-operated drain valve. The crosshead guides are of the three-bar overhead type and are carried by a motion bracket (which also provides a guide to the valve spindle, relieving the gland of any side pressure) quite independently of the cylinder covers. The arrangement prevents the transmission of heat from the cylinders and provides better access to the piston rod stuffing boxes; these, and those on the valve spindle, are of large capacity, with floating stuffing bushes, a type used by steam car makers such as White and Doble and by launch engine makers such as Savery's and Simpson Strickland.

The main frames (outside) are $\frac{5}{32}$ in. thick, strongly cross-braced by buffer beams, by stretchers carrying the pony truck pivots, and by a T frame, more or less amidships, carrying the feed pumps. Longitudinal cross-staying is rarely provided in model locomotives—in my opinion a serious omission in engines required for heavy continuous work, and particularly in outside-cylinder engines, where the racking strains are considerable. Austen Walton's *Twin Sisters* was about the earliest working model to have this feature. The top limb of the T stretcher takes care of it in the model which I am considering.

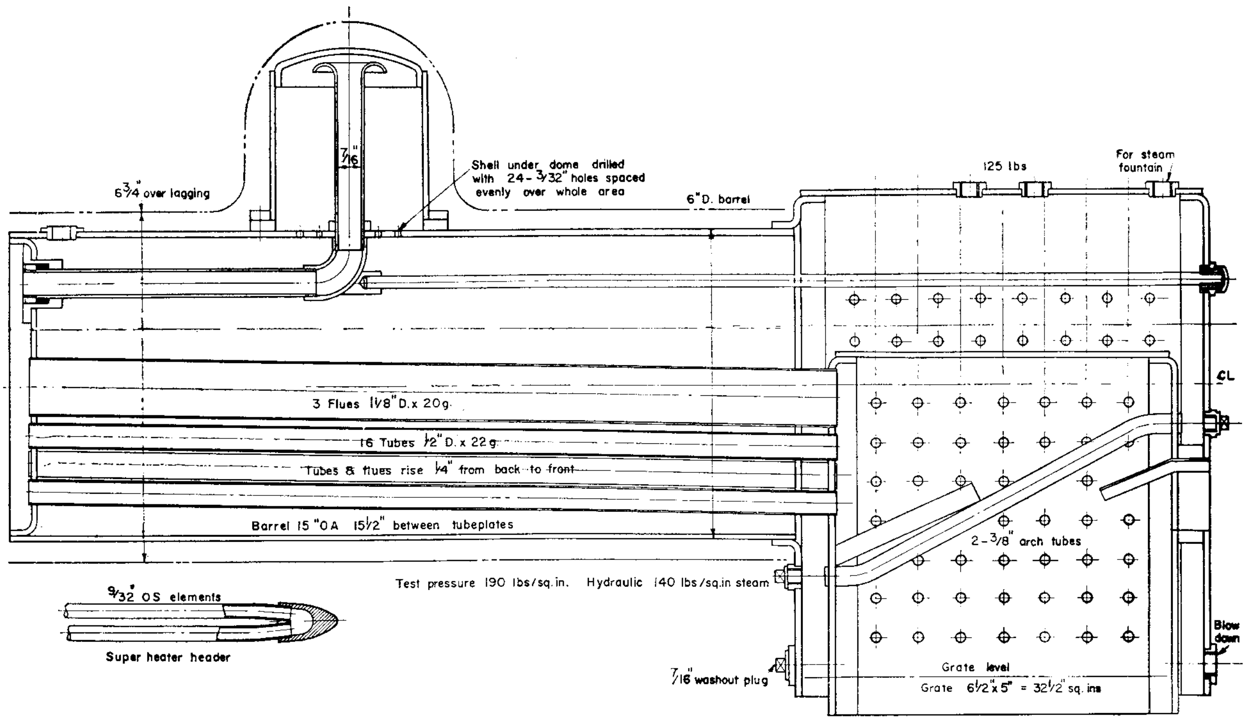
Pivoting of the pony trucks is worked out under Baldry's rule, which is generally accepted as sound. The wheel spacing is asymmetrical. A symmetrical arrangement leads to a certain amount of unsteadiness, and the increased distance from drivers to trailers allows of more room for firebox and footplate, while allowing the firebox to be entirely behind, and clear of the driving wheels—in turn permitting us to use a simple straight-sided firebox with a much increased grate area.

The two pony trucks are not identical, though they might be made alike with 7¾ radius. They have spring control. SKF double-row self-aligning ball bearings are used for all axles. Only one bearing on each axle should be positively located endways in its axlebox; the other must have a small amount of end-play—this is important. Helical springs are used throughout.

The roller chain transmission is efficient and simplifies construction; it is thoroughly sound mechanical engineering, and it appreciably reduces the spacing apart of the cylinders and the overhang from crankpin to axlebox, thus in turn reducing shouldering. Unusual, too, is the use of Hall's cranks. Mr Tucker, a dual winner of the Duke of Edinburgh Cup, used them on a beautiful model of an Irish narrow-gauge engine. They are adopted to help in reducing overhang.

As the fired wheelbase is only 10 in., the engine can obviously deal happily with any reasonable curve. The buffers (which have large heads, 1⅝ in. dia.) are purposely set low so as to match normal 5 in. gauge rolling stock. Running boards are not provided; they serve no useful purpose in a model such as this, and they reduce accessibility.

In conformity with the basic idea of the design, there is a complete absence of non-functional detail, but of course there is nothing to prevent anyone from adding details if he wishes. The lamp bracket in front of the chimney is no exception, as it



Boiler for 5 in. 2-4-2 tank engine

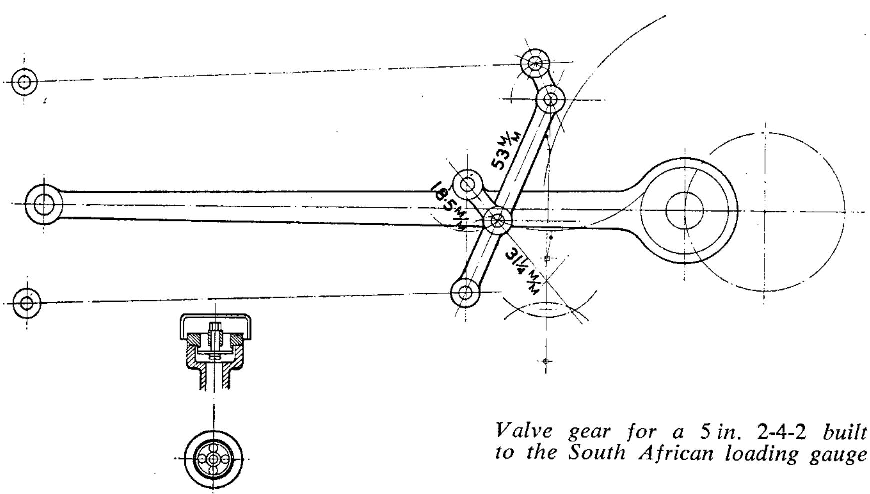
is intended for the mounting of a headlight. At Beech Hurst we do a great deal of running after dusk, and very good fun it is.

There is no cab or back bunker, merely a fascia board to carry the pressure gauges, one for boiler pressure, and, if a steam brake s fitted, one to register the pressure in the cylinder. The absence of cab and bunker provides accessibility to the controls and for firing, and makes observation of the fire much easier.

With a heavy load behind the engine, supplementary braking of the train is essential, but the engine brakes can do much. When driving wheels only are braked, the brakes can exercise at least as great a retarding effect as the engine can an accelerating one. Thus, if the engine can accelerate a train from rest to 5 m.p.h. in 30 ft, the brakes can bring it to rest from 5 m.p.h. in 30 ft. If the engine has braked carrying wheels or a tender (or both) the braking effect can be considerably greater than the greatest accelerative effect.

Somebody may trot out the old argument that 1.43 in. to 1 ft is an awkward scale. It is no more awkward than $\frac{17}{32}$ in. or $1\frac{1}{16}$ in. Level scales, such as $\frac{3}{4}$ in., 1 in., and $1\frac{1}{2}$ in. sound simpler, but in fact are not. A simple setting on the slide rule will enable you to read off directly the conversion of any dimension from zero to infinity. The only mental strain to which you will be put will be in deciding the position of the decimal point.

As all model locomotive enthusiasts do not possess slide rules, I have compiled two data tables. Table II gives equivalents for setscrews, studs, nuts and bolts, and recommend proportions for hexagon heads and nuts. The appearance of many model locomotives is marred by over-sized or badly proportioned bolt heads and nuts. While this has no effect on the working qualities of the model, it spoils the appearance and will certainly lose marks at an exhibition. It is no more trouble to use properly proportioned details than it is to use clumsy over-sized ones.



Valve gear for a 5 in. 2-4-2 built to the South African loading gauge

The equivalents given are for threads up to 2 in. (full size); all fall conveniently into the BA series. The BA thread over this range is stronger and more easily cut than the Whitworth. Most of the sizes are pretty well spot-on. The largest error is the 2 BA equivalent, which is 0.26 mm. (11 thou) over size; but as 11/64 in. is the nearest inch-size and there is no thread of this standard, the error must be tolerated!

Obviously the hexagon sizes given cannot all be met exactly from standard hexagon material. But a wide range of it is obtainable, and you will almost always find a stock size which closely approximates to the recommended standard. I do not suggest that modellers should go as far as the late Eng.-Cmdr Barker RN, who used to buy 16 BA hexagon screws and mill down the heads to the proportions he wanted! Any full-sized bolt or setscrew above 3/8 in. dia. can be re-produced to scale without its becoming too fiddling and fragile.

In considering and criticising the design, you must remember that the object is to produce a powerful, robust and reasonably simple locomotive for regular passenger hauling over a give-and-take continuous line —one which will be reasonably efficient, easy to handle and simple to maintain, with wearing qualities. How far this end is likely to be attained is for you to judge. ■

RUST IN WINTER

With the approach of winter, modellers will be thinking about the problem of rust in the workshop.

All air contains water-vapour. The warmer the air, the more water it holds, and if warm air is cooled water will be deposited. It follows that a cold piece of metal will become wet in warm air.

Now consider a workshop full of light air and heavy metal masses. The light air can change its temperature very quickly, perhaps within a few minutes. But a hundredweight of metal (a lathe, for example) would need an hour or more to change a few degrees up or down.

What happens during a frosty night? The workshop has perhaps been in use, so that everything is a trifle warm. During the night, the air cools rapidly and the metal masses slowly. Nothing untoward happens because the metal lags behind in the cooling process and is, therefore, always a degree or two above the air in temperature.

After a cold night, everything in the workshop is at the same low temperature, and so no water is deposited. But the coming of day causes the air to warm up by a few degrees. The warm air meets the cold metal and dew is deposited. This can even happen in high summer when a sharp frost occurs in the night.

How can dew be prevented? The remedy is easy to state, but not so easy to achieve. At all times, keep the temperature of the lathe a degree or two above the temperature of the surrounding air. To do this automatically requires a differential thermostat, which is a rather complex mechanism.

A simpler way is to put a low-wattage heater (say, a 15 w. bulb) under the lathe and cover it with a sheet of Polythene to trap the warmed air. Keep it on all night and every night; at the standard rate of 1½d. unit it would cost only 16s. 8d. for the whole year. By this means the temperature of the lathe will always be slightly above the temperature of the air. If it is kept only 1 deg. above the air, water cannot possibly form.

I should like to warn readers against the use of any heating device employing flame; it will produce large quantities of water vapour. A gallon of paraffin will produce about a gallon of water, and all this will fall as dew on cold metal. The only possible form of heating is by electricity, which gives off no products of combustion.—Haydn D. Smith.

TABLE I.—SCALE EQUIVALENTS AND CONVERSIONS
For Scale of 1.43 in. to 1 ft

To Full Size Linear $\frac{1}{8.4}$ or 0.119

Superficial (Areas) $\frac{1}{70.5}$ or 0.0142

Volumetric (and Weights) $\frac{1}{592}$ or 0.00169

1 sq. in. Model = ½ sq. ft Full Size (near enough)
1 sq. ft Full Size = 2 sq. in. Model „ „
1 lb. Model = 592 lb. Full Size
1 cwt Full Size = 0.188 lb. Model
1 ton „ „ = 3.77 „ „
50 „ „ „ = 188 „ „

Full Size	Scale	Full Size	Scale	Full Size	Scale
½″	0.060″	1′ 3″	1.8″	7′ 6″	10.75″
¾″	0.090″	1′ 6″	2.15″	8′ 0″	11.4″
1″	0.12″	1′ 9″	2.5″	8′ 6″	12.2″
2″	0.24″	2′ 0″	2.86″	9′ 0″	12.9″
3″	0.36″	2′ 6″	3.6″	9′ 6″	13.6″
4″	0.48″	3′ 0″	4.3″	10′ 0″	14.3″
5″	0.60″	3′ 6″	5.0″	11′ 0″	15.8″
6″	0.72″	4′ 0″	5.75″	12′ 0″	17.2″
7″	0.84″	4′ 6″	6.5″	13′ 0″	18.6″
8″	0.96″	5′ 0″	7.15″	14′ 0″	20.0″
9″	1.08″	5′ 6″	7.85″	15′ 0″	21.6″
10″	1.20″	6′ 0″	8.6″	20′ 0″	28.6″
11″	1.32″	6′ 6″	9.3″	25′ 0″	35.75″
12″	1.43	7′ 0″	10.0″	30′ 0″	43.2″

TABLE II.—SCREW EQUIVALENTS

Full Size dia. in.	Scale Dia. m/m	Nearest BA Equiv.	Actual Dia. m/m	Core Area sq. in.	Safe Load at 8,000lb. sq. in. (steel)
¼	0.74	16	0.79	0.00039	3.1 lb.
⅜	0.95	14	1.0	0.00064	5.1 „
½	1.51	11	1.5	0.00155	12.4 „
⅝	1.9	9	1.9	0.00250	20.0 „
¾	2.2	8	2.2	0.00345	27.6 „
⅞	2.6	6	2.8	0.00566	45.5 „
1	3.1	5	3.2	0.00757	60.5 „
1⅛	3.4	5	3.2	0.00757	60.5 „
1¼	3.8	4	3.6	0.00962	77.0 „
1⅜	4.2	3	4.1	0.0126	100 „
1½	4.4	2	4.7	0.0172	137 „
1¾	5.3	1	5.3	0.0218	174 „
2	6.1	0	6.0	0.0282	255 „

Recommended Bolt-Head and Nut Proportions:

Hexagons, Width across Flats = Dia x 1.75 to nearest STD

Height of Bolt Heads = Dia. x 0.875

„ „ STD Nuts = Dia.

„ „ Nuts for Heavy Loading Dia. x 1.25 to 1.5

„ „ Lock Nuts = Dia. x 0.6

For Threads from 0 BA to ⅜″ or 7/16″ use ME 40 TPI. Above 7/16″, use STD Brass Pipe Thread 26 TPI. For Boiler Stays 5/32″-3/16″-7/32″ and ¼″ use "ME" 40 TPI

LEVER-TYPE INDICATORS

By GEOMETER

IT is true, as Mr Westbury wrote recently in Postbag, that modern precision instruments are not essential for accurate work, and that many model engineers and craftsmen manage without their aid. Ingenuity and skill, patiently perfected, serve them instead.

It is fortunate that this is possible. Pause a moment in your lapping. Reflect that the most precise machines cannot generate surfaces to optical precision, but that the work can be done by craftsmen with crude equipment, and you have traced one of the sources from which has sprung our well-organised and thriving society.

Without lenses and prisms there would have been no telescopes, microscopes or spectroscopes. Man would have known little of stars and atoms. His knowledge of physiology and medicine would have extended over but a tiny fraction of the present area.

If you do not possess a dial test indicator, and feel the need for an accurate test instrument, you can make a craftsman's substitute of the lever or pointer type, two examples of which are shown in diagrams *A* and *B*. With either, you can true diameters and faces, set angle plates and slides on the lathe, and perform many tests on the surface plate.

The first indicator has a simple lever pivoted on the frame or back-plate, its pointed end moving over a scale. A rise or fall at the working end *X* is multiplied in the ratio of the distances from the pivot, so that small errors can be easily seen. In setting-up, you bring the pointer to zero, like the needle of a dial test indicator. Outside diameters and buttons can be adjusted to spin truly, and you can do the same with bores that are large enough to accept the working end of the instrument.

The second indicator, shown at *B*, is the same in principle as the first, but extra movement is obtained at the pointer by making it like a bell crank with a link between it and the lever. This gives two-stage multiplication of the rise and fall at *X*. You can read errors easier on the scale.

For use on the lathe, either indicator can be mounted on a holder of square steel bar. The ends of this can be faced in the independent chuck. Near one of them, a hole should be drilled to the same size as the holes marked *W*, say $\frac{1}{4}$ in. Then the indicator can be held by a bolt. The bar gives vertical and horizontal mountings for the indicator through the way that it is clamped to the top-slide. The bolt permits angular settings—up-and-down and sideways.

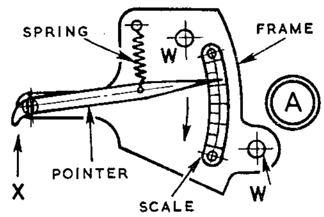
An alternative holder of standard type can be easily made as shown at *C*. The square bar is drilled and tapped for a round pillar which is shouldered and threaded at the end. You may be able to make it to the size of the one on your surface gauge, so that the indicator can be used on this too.

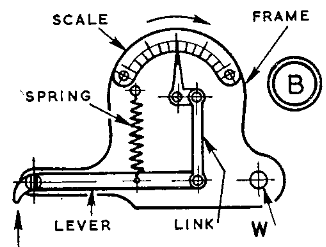
For holding the indicator now, you need a knuckle joint as on a surface gauge, the type of fitting which consists of a cross-drilled bolt and sleeve. With this, the indicator can be set vertically on the holder at *C*. For a horizontal mounting, an angle bracket is used as well, as at *D*1. This bracket is drilled and fitted with a countersunk screw, after being bent.

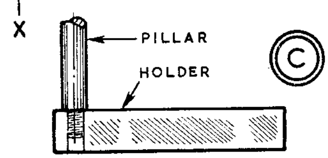
Flat material between $\frac{1}{16}$ in. and $\frac{1}{8}$ in. thick can be used for the frame of either indicator: steel, duralumin, brass. The scale can be scribed on it; or if your prefer, the scale can be separate and screwed or riveted to the frame. Use celluloid sheet if you like. Scribe the arcs and graduations carefully and fill them with indian ink or black paint. Surplus blobs can be scraped off when they are dry. Markings show very clearly when they are placed next to a strip of white plastic or painted foil under the celluloid.

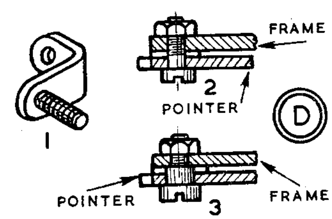
There is a choice of pivots for the pointer or lever. A thick frame can have a pivot locknutted in a tapped hole, *D*2. For a thin frame, the pivot should be shouldered, *D*3. Both should have a washer.

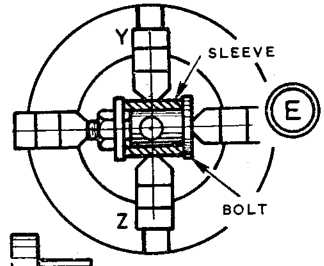
In making the knuckle joint, leave a head on the bolt, to set up as at *E*, for boring with the sleeve, centrally between jaws *YZ*. Then face the sleeve and mount it with the bolt in a plate for final facing, as at *F*. ▣

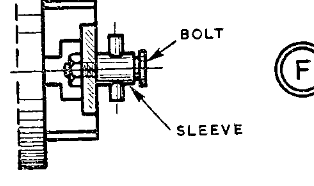








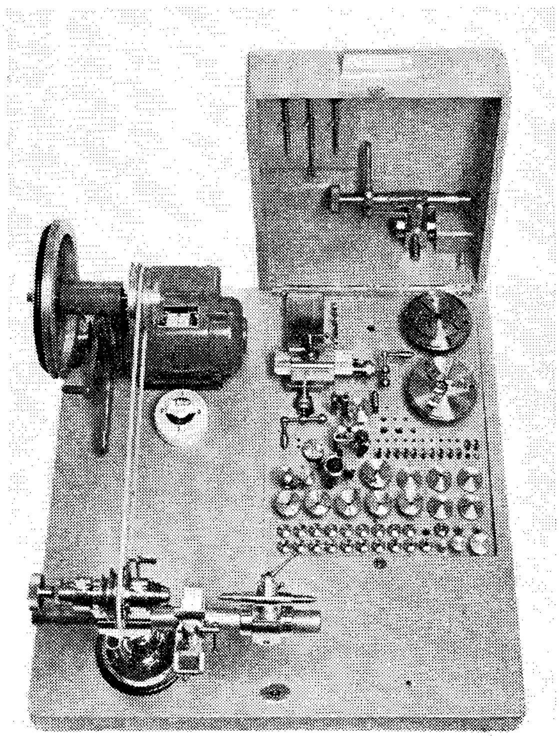




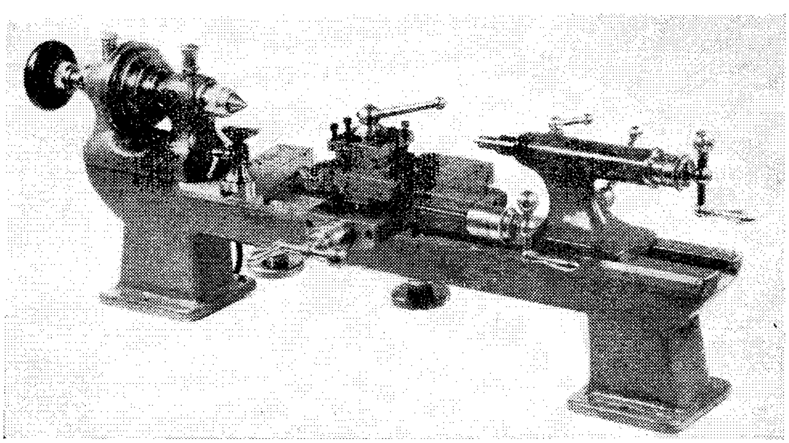
SMALLEST OF ALL

Capacity, convenience and cost: EDGAR T. WESTBURY considers these factors in the choice of a machine. This is his second article

Continued from September 27, page 411



Swiss horological lathe, with full equipment by Henri Picard et Frere



One of the new instrument lathes by the Allanson Engineering Company

One of the first essentials in selecting a lathe is that its salient dimensions should be large enough to accommodate the work with which it is intended to deal. This factor is often not definitely known, and whatever your size of lathe there may be occasional jobs which tax its capacity to the limit, or even exceed it. But most model engineers have a general idea of the size of work which will normally need to be machined for the models in which they are interested.

The capacity of lathes is usually given in terms of the height of the mandrel axis above the centres, and the maximum length between the centres. For the first, which really represents the *radial* clearance, the word "swing" is sometimes used, defining the maximum *diameter* of work which can be held without fouling the bed. But these dimensions do not necessarily represent the actual size of workpiece which can be machined. If the lathe has a slide rest, its height will reduce radial clearance, and thereby limit the size of work of any substantial length which must pass over it. Length may be further limited by the projection of chucks and fixtures from either the live headstock or the tailstock.

Many British lathes have a gap in the bed, in front of the live headstock, which allows discs or other short work pieces, larger in radius than the normal centre height, to be machined. This feature is not favoured in Continental and American lathes, and is often criticised as being liable to weaken the bed, affecting rigidity and alignment. But its success depends primarily on good structural design, and the proper distribution of the metal in the region of the gap. In my opinion, the gap is a great asset in increasing the useful capacity of a small lathe, and is better than increasing the actual centre height when economy of material (and therefore cost) must be considered. It should be remembered that wheels, flanges and other flat parts often have to be held by clamps or fixtures over their outer edges, and clearance for them is necessary. The classic small British lathes, such as the Britannia, Milnes and Drummond M, have all employed the gap bed very successfully.

Of the smallest sizes the most important for the professional worker are in the class designed specifically for horological and fine instrument work. They can be recommended for many operations on miniature models, such as electrically-driven railway equipment in sizes from O gauge downwards. But they are not ideal lathes for modelling, and are by no means cheap to buy new, as they are usually built to exacting standards. The term "precision" applied to lathes in this class is generally merited, but is somewhat vague, and does not necessarily represent a definite standard of quality. The best of these lathes may cost, with the equipment, anything up to about £200.

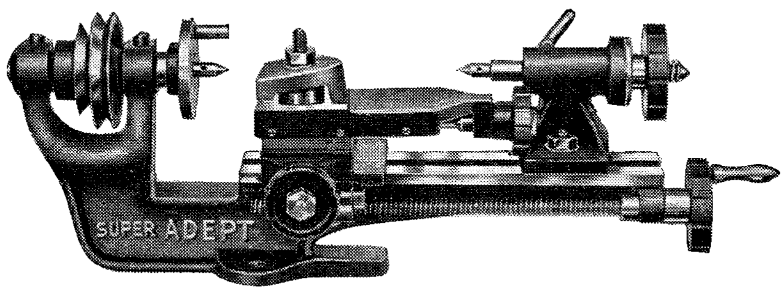
Many of them are not equipped with a slide rest, except as an extra piece of equipment. The technique of operating them is different to that of the general engineers' lathes, and most horologists learn to use hand tools for all but very special jobs. The wide range of fittings, including collet chucks, pivoting and polishing tools, enhance the adaptability of the machines in their particular field. Several of them, from about 30 to 40 mm. centre height, and of foreign manufacture in the main, are now obtainable in Britain; those interested will find numerous examples illustrated and described in *The Watchmakers' Lathe,* by Donald de Carle.

Machines of somewhat similar design, but increased in centre height up to 50 or 60 mm., are often found in model workshops. A special favourite is the $2\frac{1}{2}$ in. lathe made by the late George Adams, and unfortunately no longer marketed. I have recently examined a newly-introduced lathe by Allanson Engineering Company of Ealing, London W, which incorporates the usual features with many original ones, and is very moderately priced in relation to its quality.

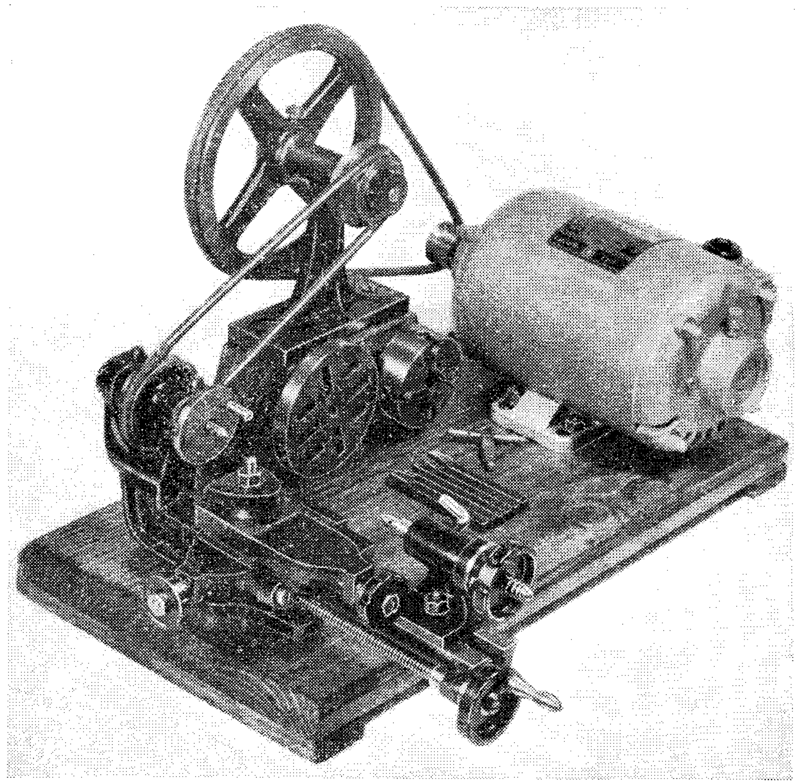
Two or three versions of this lathe, varying in detail design, are in production. The example illustrated is $2\frac{3}{8}$ in. centre height by 11 in. between centres. It has a hollow mandrel tapered for 8 mm. collets, with drawbar, and four-speed cone pulley. The bearings are of the double-opposed-cone type, with hardened cones and bronze bushes. A fully compound slide, with four-tool turret toolpost, is fitted.

Comparable in size and nominal capacity to a watchmaker's lathe, but entirely different in design, is the Selecta Unimat, which is really in a class of its own, and is more versatile than most other small machines. It has a double-bar bed with a sliding saddle, and a cross-slide which also moves on round bars. The headstock unit, complete with motor and countershaft, is detachable, and can

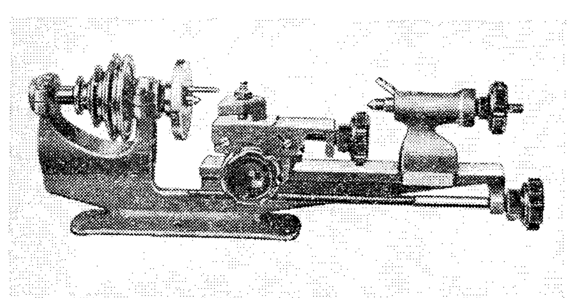
● *Continued on page* 479



Familiar to many: Super Adept $1\frac{5}{8}$ in. lathe by F. W. Portass Limited



Here is a Super Adept with motor, countershaft and equipment



Flexispeed $1\frac{5}{8}$ in.

Firing without fuss

R. A. FARDON and GEORGE OCKLESHAW have devised an inverted-bottle method of using liquefied petroleum to power a model locomotive

By using liquefied petroleum gas as a fuel, we are able to have a locomotive ready at short notice and to run it with very little need of cleaning.

The engine is a fairly large 1 in. scale $3\frac{1}{2}$ in. gauge Pacific. A boiler about 20 in. long has a 5 in. dia. barrel and a grate 5 in. wide $\times$ 7 in. long. The burner is fitted in the fire hole because the frame design made it difficult to fire from below.

Fuel is carried in the tender in two $1\frac{3}{4}$ lb. cylinders inverted so as to discharge liquid. Each has its own stop valve as a permanent fixture in the tender, so that it may be changed during a run. A third valve, in the form of a dummy tender brake, is used to control the fire.

This method of using the fuel is essential, for with the required draw-off of gas the small cylinders and their contents chill excessively and there is a serious drop in gas pressure.

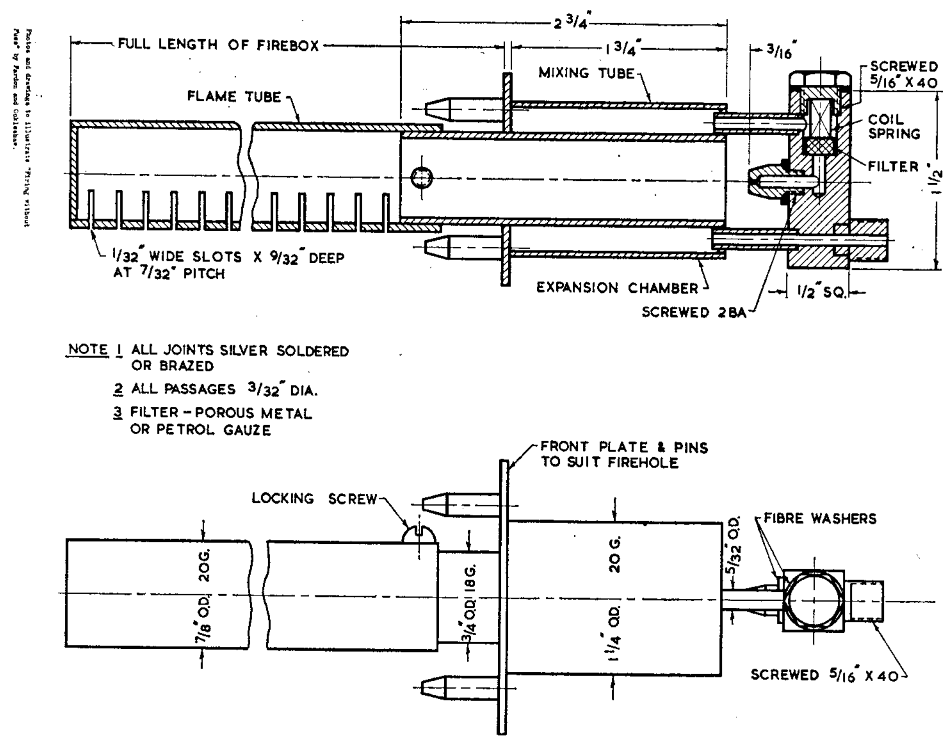
The liquid passes from the control valve through a short, small-bore reinforced Neoprene hose to the expansion chamber fitted around the burner. The chamber is heated by conduction from the firebox. As long as the temperature is maintained at about 120-140 deg. F, a constant flow of high pressure gas is supplied to the burner. It is important to have a good filter right behind the jet, and on no account to have a valve between the jet and the expansion chamber.

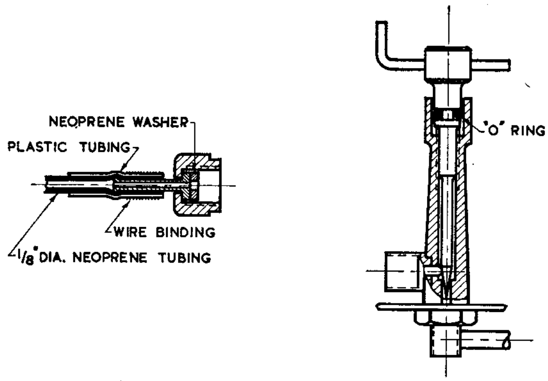
For the burner, neither material nor dimensions seem to be critical. The filter is placed so as to protect the jet against all dirt; it is easily removed for cleaning.

In place of the normal gland packing and nut, all valves have been fitted with "O" rings, which form a perfect seal, give no trouble if they are kept lightly oiled, and are easily replaced. The plate forming the front of the expansion chamber was made to overlap the rectangular firehole by $\frac{1}{4}$ in. on all sides. It is provided with four pegs $\frac{5}{8}$ in. long and $\frac{3}{16}$ in. dia. arranged to spring lightly into the corners of the firehole and so secure the burner. At present I am using a jet 0.025 in. dia., but it would be wise for you to begin with one of about 0.018 in. and adjust it to suit the engine.

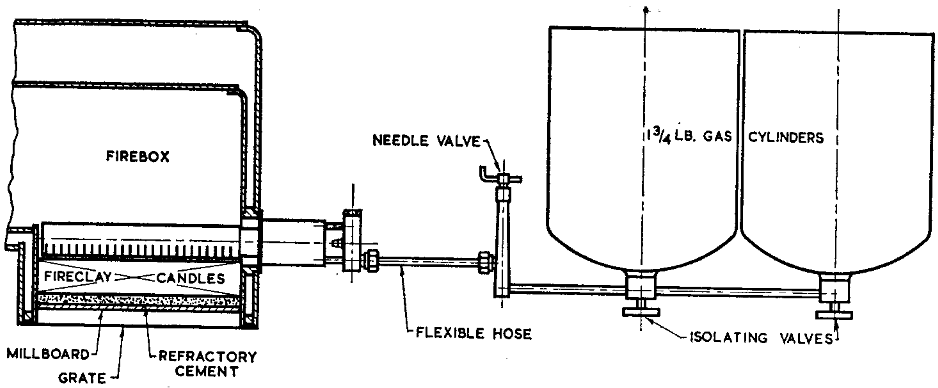
To keep the firebox airtight we covered the grate with asbestos millboard on which was spread a $\frac{1}{4}$ in. layer of refractory cement made by mixing equal parts of Ciment Fondu and crushed asbestos millboard with water. When thoroughly dried, the whole bottom of the firebox was covered with fireclay "candles," as used in gas-room heaters. They act as flame stabilisers on which the gas burns, and they rapidly become incandescent. The radiant heat makes up a large part of the useful energy available within the boiler.

As will be seen from the drawings, the flame tube is slotted. It operates with the slots facing downward and in fairly close contact with the

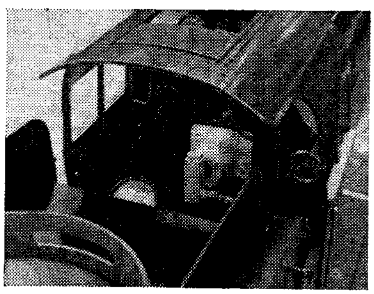




Nut and tail for flexible hose and (right) a gland arrangement with the use of an O ring



Gas-fired installation


Burner in position. On the left are the bottom of the cylinder and the pressure gauge used during the tests

candles. This arrangement is important as the burner will not function with the slots uppermost.

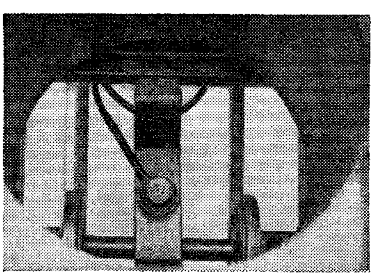
Lighting-up is very simple. The burner is withdrawn about one inch, a lighted match is applied, and the control valve is opened a small amount. With the flame low, the burner is replaced in the firebox. After a short time, the valve may be gradually opened as the candles begin to glow. About a minute later it may be turned to full fire; at this rate a boiler containing almost a gallon of cold water produces steam in about four minutes and is ready for work in twice that time. At no time is a blower used. The exhaust blast seems to have no effect at all upon the performance of the burner.

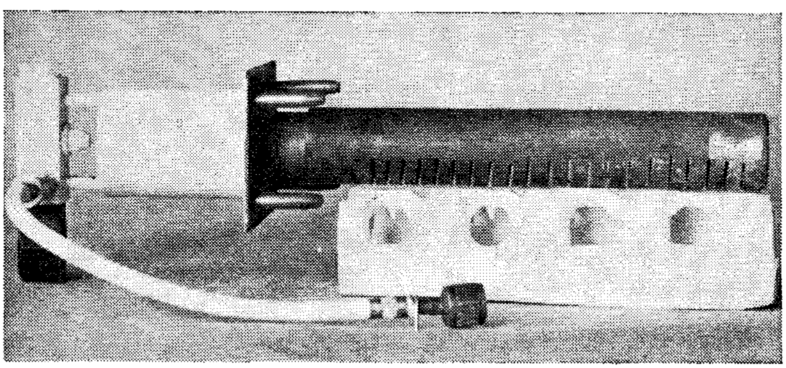
We have spent about two years on developing this method of firing. It is unaffected by outside conditions and is easy to light up, quiet in operation, and easily controllable from low to full. The fuel consumption for hauling a load of 5 cwt on a continuous undulating track is about 1 lb. of gas an hour. ■

LOCOMOTIVE PICTURES

So many readers have shown an interest in the photographs which accompany Robin Orchard's series "Library of Locomotives," that a booklet of 60 railway engine pictures has now been published by Percival Marshall Ltd.

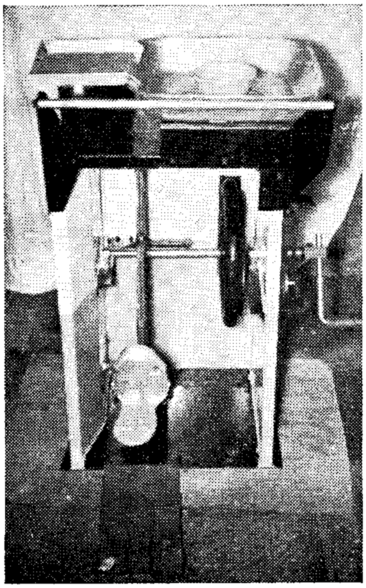
Some of these have already appeared in the series; others are still to be dealt with. The book, price 2s. 6d., may be had from any newsagent, or from our offices at 19-20 Noel Street, London W1. Postage is 4d.


One of the recesses in the tender, with connection for the gas cylinder


Burner and refractory "candle" positioned as in the firebox

FOR SPASTIC CHILDREN

BURTON JESSUP designs and builds a potter's wheel especially suited to their needs



THOSE who are concerned with spastic children may be interested in the potter's wheel I have designed and made for teaching them this old and valuable craft.

One boy works the pedals, another turns the main shaft by the handle on the side, and a third boy models the clay. As the boys are limited in muscular power, all the main bearings are provided with ball races. The driving shaft is fitted with a balance wheel from a mangle and is driven by a cycle sprocket and chain. The foot pedal is returned by a tension spring housed in a spring box at rear of cabinet.

The cabinet is made of light iron-plate, flanged for bolting together and reinforced on the drive side. Timber could be used instead of iron.

Increasing speeds are obtained by the use of step-up pulleys driven by ¼ in. dia. leather belts.

Before attempting to make a drawing, I carefully studied a number of spastic boys to discover their capabilities. The machine had to be absolutely safe, with guards for all the moving parts. So that it should run easily, I fitted races to the main driving and vertical turntable shafts. I tried step-up pulleys of various sizes to get the correct revolutions of the turntable for modelling.

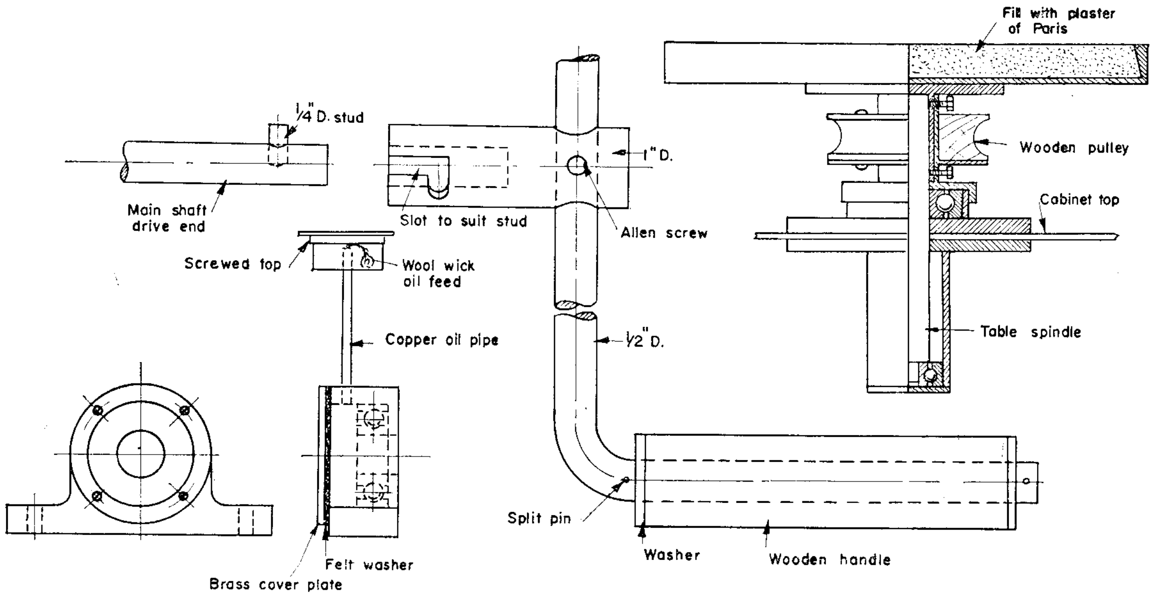
The pulleys were made from wooden toy wheels fixed to a brass backing plate and bushed. For the pulley stalks I used bright round-bar mild steel, screwed at one end and fitted to a backing plate which was drilled and tapped central to suit them.

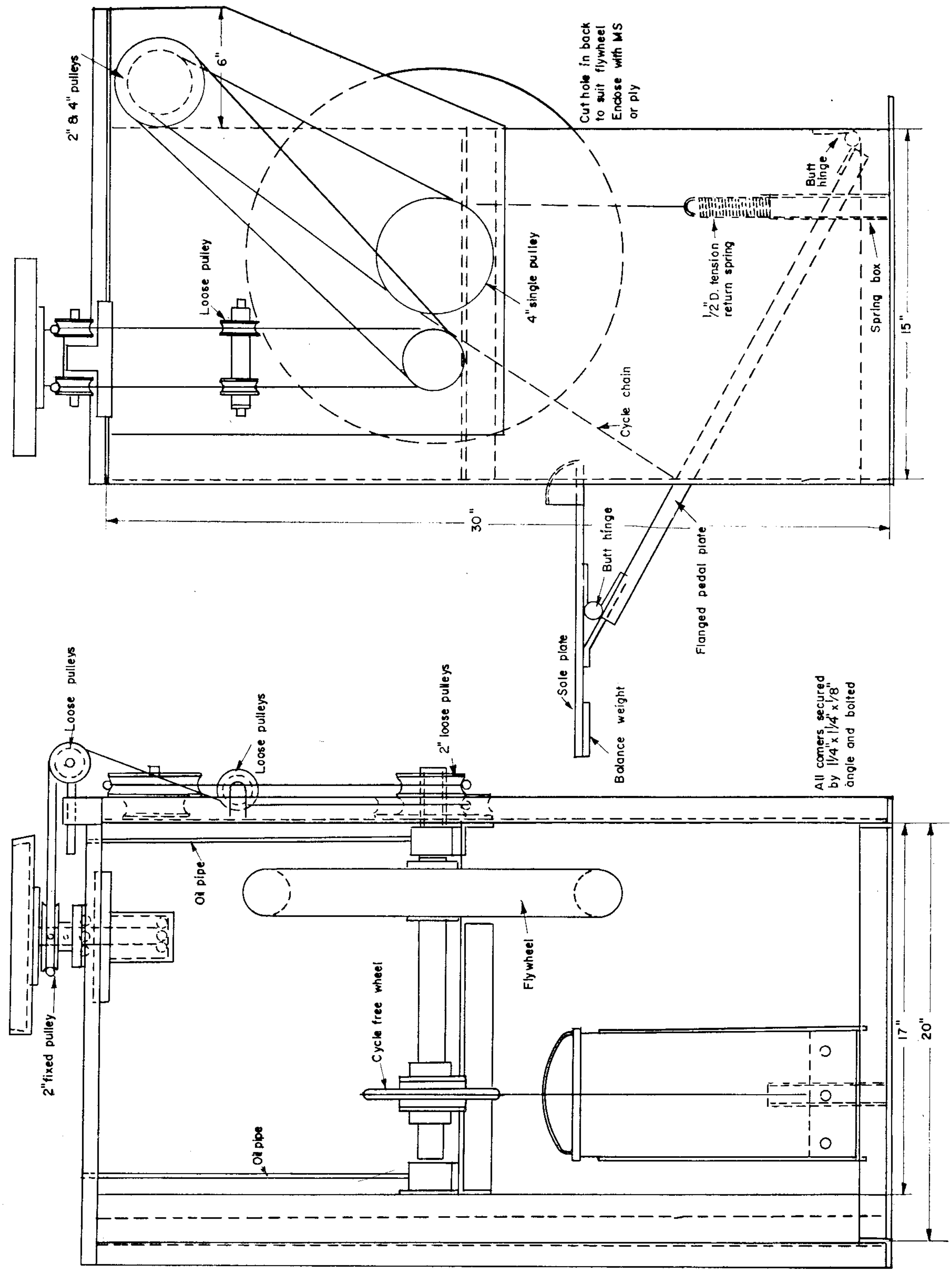
The protruding stalk end was burred flush, and the drill end was made from a 1/16 in. split pin.

I preferred this method of drive-pulleys to a direct drive from shaft to turntable as the wheel would be easier to rotate. The pedal was counter-balanced so that it would always remain in the horizontal position. I provided the far end with the clip for a leather toe cap. The catapult elastic fitted to the pedal allows it to return snappily and prevent any lag in speed on the turntable. A handrail at the top front of the cabinet helps the pedal operator in conjunction with the back rest.

In the photograph the pedal is shown shaped like the sole of a boot. The guard for the flywheel and other parts is shown; it is a nearly flat plate, or three-ply wood panel, bolted on the four holes which can be seen in the sketch. The side-guard for the pulleys was a wooden and plywood box. A small finger-bowl of water is stood on the small tray.

The left-hand side of the cabinet is flared out slightly to give the pedal operator ample room. ▣




2" & 4" pulleys
6"
Cut hole in back to suit flywheel Enclose with MS or ply
Loose pulley
4" single pulley
Butt hinge
1/2" D. tension return spring
Spring box
15"
Cycle chain
30"
Butt hinge
Flanged pedal plate
Sole plate
Balance weight
All corners secured by 1 1/4" x 1 1/4" x 1/8" angle and bolted
Loose pulleys
Loose pulleys
2" loose pulleys
Oil pipe
Flywheel
2" fixed pulley
Cycle free wheel
Oil pipe
17"
20"

MODELLING THE CRANBORNE

Now plate the hull

OLIVER SMITH offers cheerful encouragement to the beginner in this instalment of his serial on the quarter-inch Cranborne

Continued from 27 September, page 412

Now that we have reached the interesting stage where we begin to plate the framework of our hull, it is possible that we may be doing the same as the builders and designers of the *Cranborne*. When a new ship is to be built, the method of determining the number, shape and arrangement of the plates is often worked out on a wooden scale model. The builders can then make sure that the joins will be clear of obstruction. They also know exactly how much material they will require.

Some readers have expressed to me their fears of plating a hull successfully. They worry about what they think might happen through distortion of the sheet material while they are soldering. apparently they visualise the final result as the product of a home-perm kit, rather than as the proud effort of the home shipyard! There is no possible cause for alarm, and if they adhere to the advice given in this serial the result should be a success. After all, these instructions are all based on practical experience and not on unsupported theory.

There is one other point that I would like to answer: a query concerning the frames at the fore and aft ends. When it comes to fitting the plates to these sections of the hull, you will find that they do not fit closely to the frames in the same way as they do amidships. Instead, the plates will come into contact with the frame only at one corner of the T or angle section, whichever type of material is used. A few of the readers who built the *Moorcock* thought that they could not effect a sound joint in these conditions. But as far as our needs are concerned, a very sound joint can be made by running in some extra solder between the frame and the plate. The space is in the form of a trough, and the solder runs in like nobody's business.

Modellers who are not prepared to accept this method and would rather set their frames in the recognised fashion, so that the plates will sit flat against them, can do so by careful manipulation with a pair of pliers. I would warn the beginner that this is a task which must be tackled very carefully. For all the benefit that is to be gained, he will do better to leave the frames as they are; it will not weaken his hull in any way, and he will have the satisfaction that the frames are shaped, if not set, like those of a full-size ship.

The most suitable material for plating the hull is 23 s.w.g. brass sheet. If tinplate is preferred, or is more easily obtainable, it can be used instead. A certain amount of variation can be allowed in the s.w.g. size, but there should not be any difficulty in obtaining the size recommended. If the material has to be ordered from a metal stockist, bear in mind that it can be supplied in strips of a width to suit.

As I mentioned in my last instalment, 2 ft × 1 in. × 23 s.w.g. is a very convenient size. The strips have the added advantage of good straight edges, important in providing a good butt joint.

If you are limited to the use of the kitchen table, you will find you can handle the task comfortably. As each strip is marked off into the size of the plates required, the only cutting tool needed is a small pair of tinman's snips similar to those in the illustration of work on the stem.

Owing to the number of illustrations appearing with this instalment —they are invaluable to the beginner—it has not been possible to include the plating drawing showing the shape and position of each plate. It will, however, be published with the next instalment.

This does not mean that the more experienced builder must wait while I help others over the stiles. He can begin with the plating, including the moulded stem.

A line of plating is known as a strake. At this stage we can complete three strakes, one along the keel and one on either side—the garboard strakes.

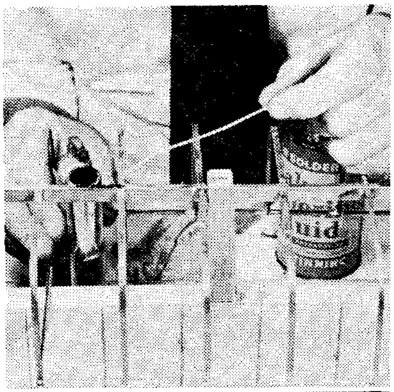
From the brass sheet, cut 21 plates 4½ in. × 1 in. (an easy task if the material was bought in 1 in. strip form) and three plates 3 in. × 1 in. Readers who do not want to waste any of their material can make their 4½ in. long plates slightly longer or shorter, as they wish. The final measurement must come to 31½ in. when one set of plates is put end-to-end, excluding the 3 in. plate.

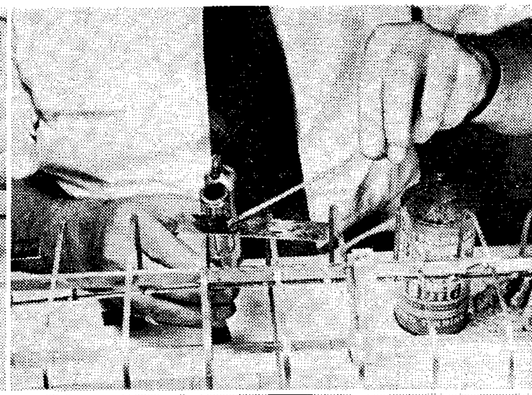
The first plate to be fitted is at the forward end at the foot of the stem. Of the plates in this strake along the keel, the first needs a little additional shaping. The others are fitted as cut.

So that we do not mix our plates and strakes, I will number each plate, beginning with No 1 at the stem, and identify each strake with a name or number. The plates which we are about to lay we will call the keel strake; and the No 1 plate is one of those which was cut 3 in. long. The additional shaping to this plate is required by the contour of the forward end where the lines of the strakes cease to be parallel to the water-line and gradually curve upwards. The curve decreases until the sheer strake (the topmost strake) is level with the sheer of the deck.

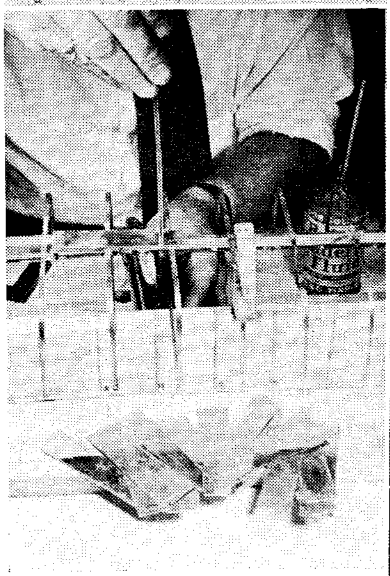
Mark a line down the centre of the 3 in. plate, and at one end only scribe another mark ⅛ in. each side of the line. Now measure 2 in. along the centre line and scribe a line across to each edge of the plate, taking this dimension from the end where the ⅛ in. dimension was marked off.

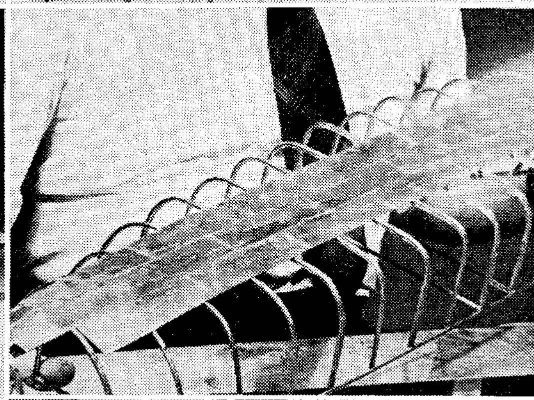
Join up the marks by scribing a line in the shape of an outward curve from each side to the end of the plates, and then cut along the line



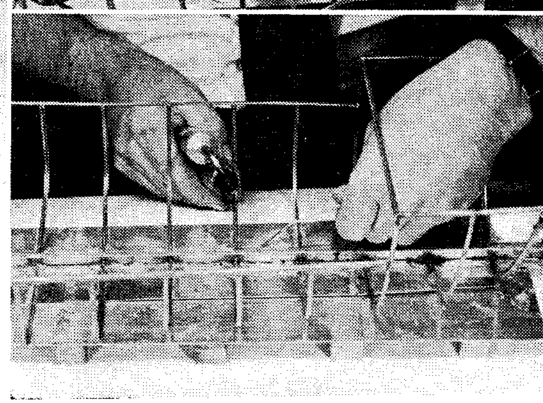


These two pictures are of tinning operations. In the first photograph the frames and keel are being dealt with; in the one on the far right, the plates are being prepared before they are attached





First right: Fixing a plate on the framework
Second right: Three of the strakes in place



Right: Soldering the butt joint on inside of the hull

with a pair of tin snips. The tapered end of the plate is positioned at the foot of the stem beneath frame 19.

Before shaping the plate to conform with the bow, tin the inside of it and also the keel and frames, so that when it has been shaped you can fix it without any bother. After it has been fitted, the remaining plates in this strake are no problem; the illustrations show the procedure. As the keel is of thicker material than the frames and plates, it requires a little extra heat, but afterwards the remaining strakes are soldered more easily.

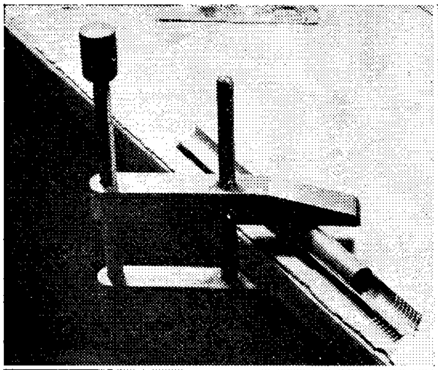
Leave No 8 plate in the keel strake for the time being; we will deal with the after end later.

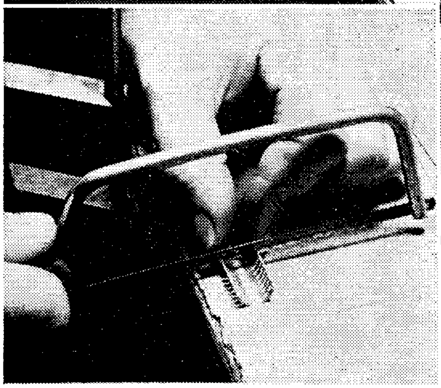
Our next task after fitting the keel strake is to give our model a moulded stem. I think that a moulded stem is far easier to make and fit than a square-cut and greatly adds to the vessel's appearance. There is no need to make a wooden former to shape a piece of material; I have an easier way.

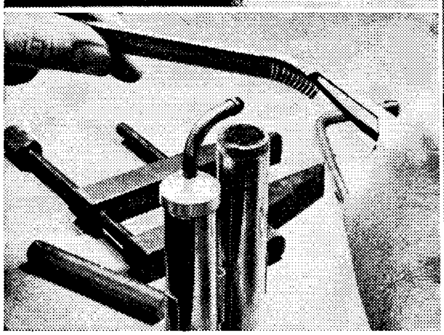
Obtain a piece of thin-wall brass or copper tube, 9 in. long of the same s.w.g. as the material being used for the plating and with an outside diameter of $\frac{9}{16}$ in. Cut the tube down the centre of its length with a Junior hacksaw, and remove the rough edges with a smooth file. Using the same hacksaw, cut ten slots $\frac{3}{32}$ in. apart at one end to help you in bending to the shape of the stem.

You can hold the work quite firmly for the cutting of the slots by placing a piece of round bar inside the half-section of tube, clamped as shown in the illustration. In this way no harm can come to the workpiece through clamping. When the slots have been cut a very neat curve can be obtained with very little effort. Should the brass material tend to be a trifle springy, you can cure the trouble by applying a little heat to the area.

The base of our moulded stem must be $\frac{1}{4}$ in. wide to match up with the No 1 plate of the keel strake. With a pair of snips remove the metal not required in a gradual taper from the bottom. Solder the section of tube by first running some



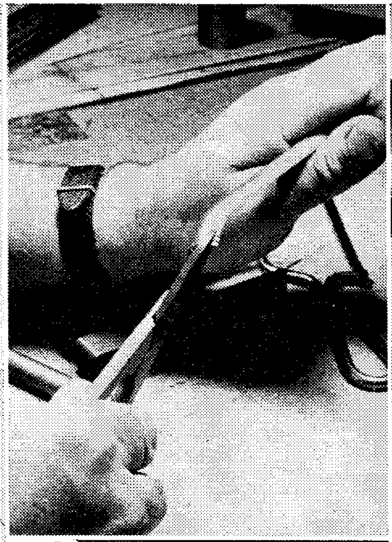


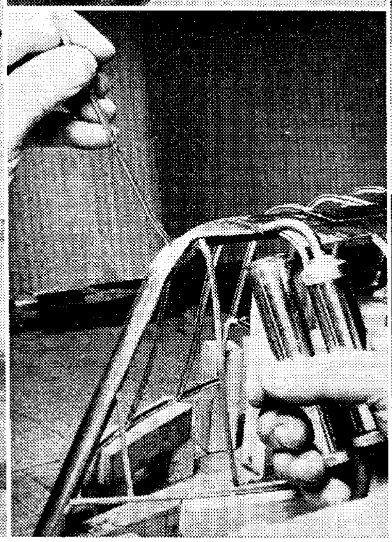


Top: Clamping half-tube for slotting

Centre: Slotting with Junior hacksaw

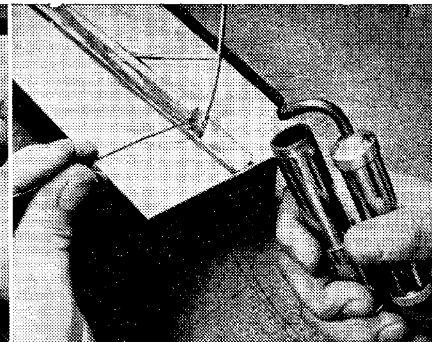
Above: Bending with the blowlamp

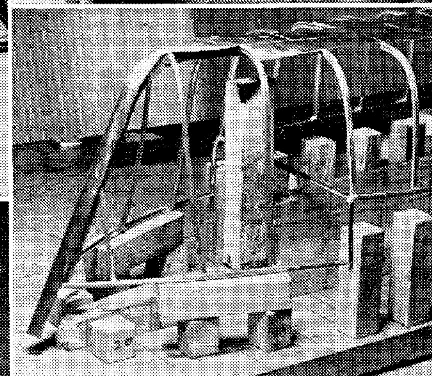




Top: Now the unwanted metal is trimmed from the moulded stem

Above: First soldering task in the moulded stem fixing





Top: This is the second operation: the framework is stood on its end

Centre: Moulded stem in position

Above: No 1 plate is fitted to garboard strake on starboard side

solder where it joins the No 1 plate, and then remove the framework from the jig and stand the work on end so that solder can be run into the trough formed by the shape of the moulded stem to the stem post itself. The material for the moulded stem can be left long enough for you to continue to the bulwarks of the fo'c'sle; or it can be sawn off at deck level if you prefer. If it is left on the long side, some extra packing will be needed on top of the supports when the work is returned to the jig.

Our next task is to add the two garboard strakes to the hull. The other two 3 in. plates are the No 1 plates of the port and starboard sides. They will need shaping, as shown in the illustration and I suggest that the beginner should make a dummy one out of thick paper or cardboard before beginning on his material. When this one has been added, the remaining plates are quite straightforward.

As all the joints of these plates have been butted before any more are added, we must make sure that our hull is going to be water-tight. Once again remove the hull from the jig and solder all the joins on the inside. Do not be afraid to apply the solder generously; if the joints have been made neatly the soldering will not affect the appearance on the outside.

★ *To be continued on October* 25

DAY AT TEMPLE NEWSAM

MARTIN EVANS travels two hundred miles north to run his Jubilee locomotive in the grounds of the famous Leeds mansion where Darnley, who married Mary Queen of Scots, was born in 1546

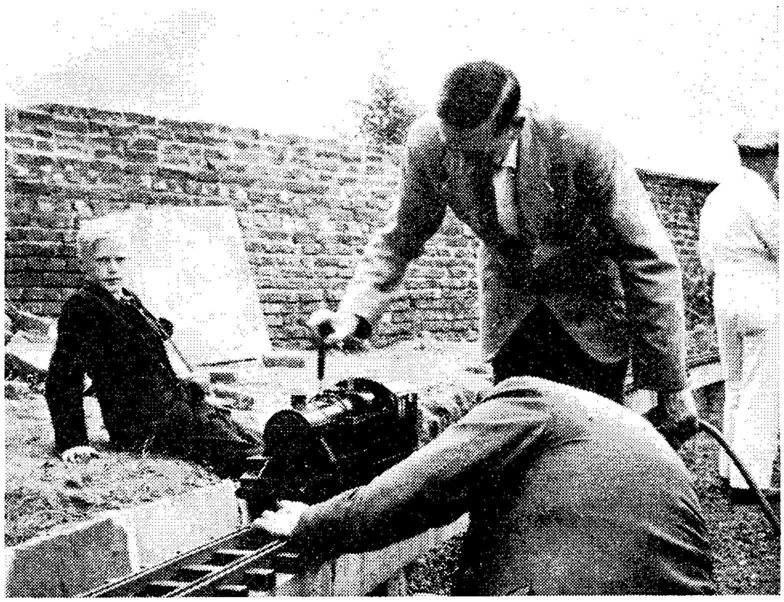
WHEN I arrived in Leeds with the original *Jubilee,* the subject of my constructional serial in ME from 1 April 1958 to December 1959, I was received with the hospitality traditional to Yorkshire.

My host, Mr Stanley Cooper, showed me his superb 5 in. gauge GWR *1500* class engine, built to the *Speedy* drawings with certain modifications which he had found necessary. The engine is unfinished, but it will not be very long before she will be having her steam trials.

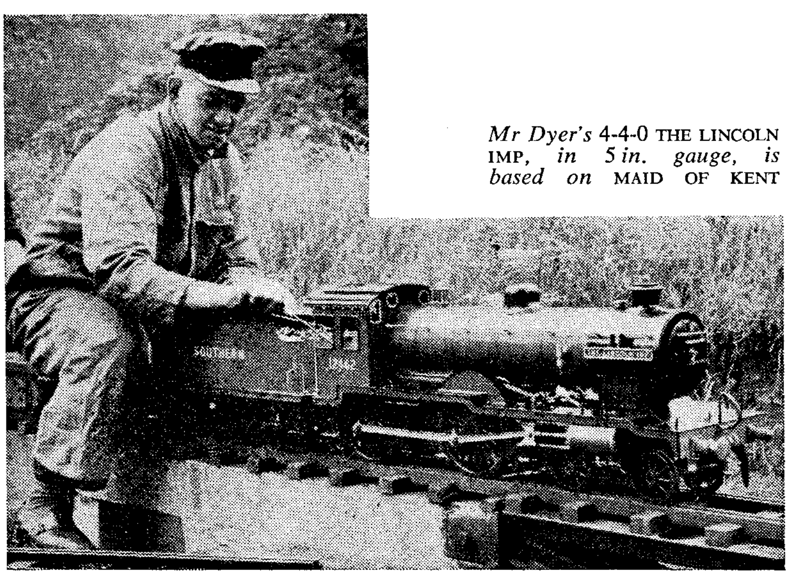
The increase in valve travel which builders of *Speedy* have discovered to be necessary, is obtained on this engine by an increase in the movement of the reversing arm forwards of the centre line, so that in full forward gear the amplitude of the die block is increased. Piston valves are fitted; they are of the solid bobbin type, with deep oil grooves.

On arrival at Temple Newsam, I had a good look at the track, which is built with steel rails put into slotted wooden sleepers laid on 6 ft concrete spans supported by concrete buttresses. The track is an oval one, a fifth of a mile long with gradients of 1 in 90 and 1 in 100.

By the station, one section is arranged on a vertical pivot, so that the length of track can be swung out to give access to the steaming bays. On the opposite side to the station is a short tunnel with end-doors which can be locked. In it are kept passenger cars, signals, and so forth.



Getting ready: the author with JUBILEE



Mr Dyer's 4-4-0 THE LINCOLN IMP, *in 5 in. gauge, is based on* MAID OF KENT

An unusual feature of the Temple Newsam track is that all the land inside the oval is thickly wooded, with long grass coming down to the side of the line. This prevents a driver from seeing anything at all of the other half of the oval. His visibility is severely restricted except when he is on the straight sections. No signalling system has yet been installed, and when more than one train is on the track at a time the driver has to keep a sharp lookout or he will be into the rear buffers of the train ahead!

Mr Ronald Jeffrey, the secretary, told me that a colour-light signalling system was to be built very shortly. It should be a great asset.

Besides providing useful dry storage space, the tunnel adds to the interest of running. The roar of the trains as they pass through has to be experienced to be believed.

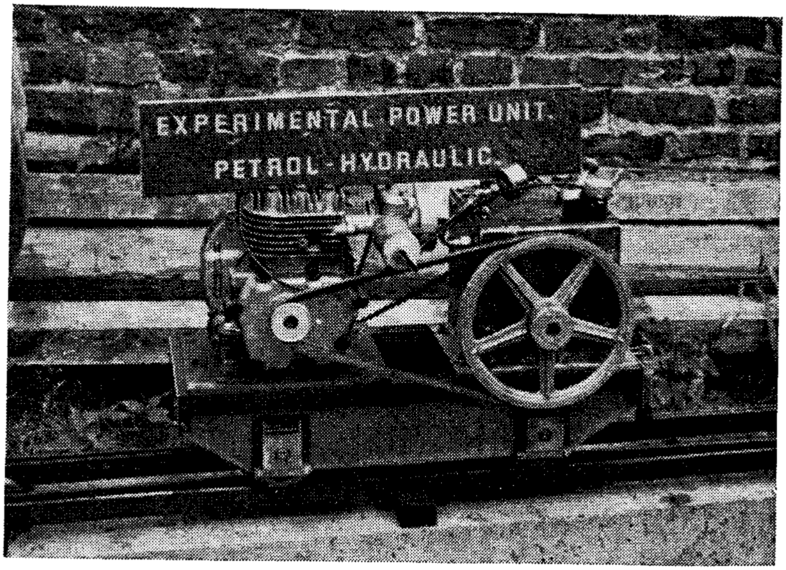
One of the first engines to raise steam was the 5 in. gauge 4-4-0 *Lincoln Imp,* built by Mr Dyer, that indefatigable member of the Lincoln MES. The engine is based on LBSC's *Maid of Kent* and is fitted with outside cylinders and inside Stephenson valve gear. She runs extremely well.

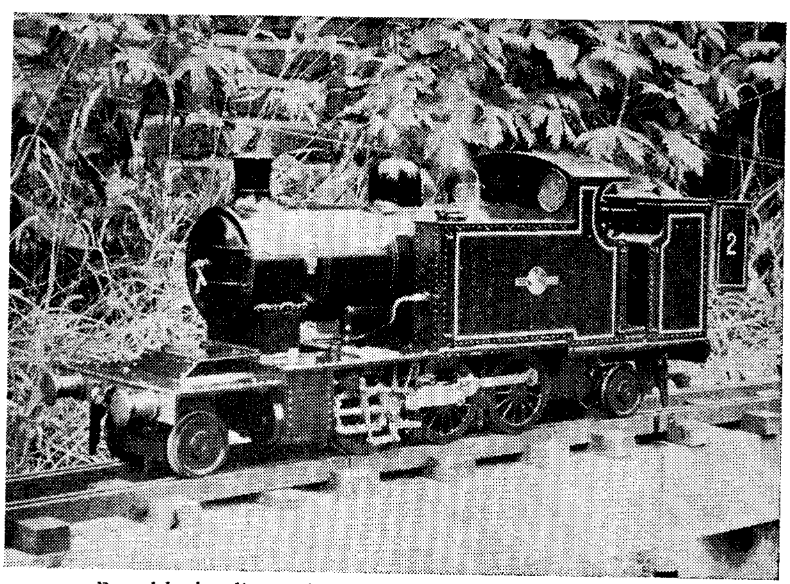
The *Imp* was soon followed by the 5 in. gauge LMS 2-6-4 Stanier tank by Mr J. W. Heslop of Thirsk. This engine was awarded a Bronze Medal at the 1960 ME Exhibition. She looks fine and goes very well indeed.

The Leeds club locomotive is a 3½ in. gauge two-cylinder LNER Pacific—a rebuild by Mr J. Hainsworth, the president. It was put in steam, followed by my own *Jubilee*.

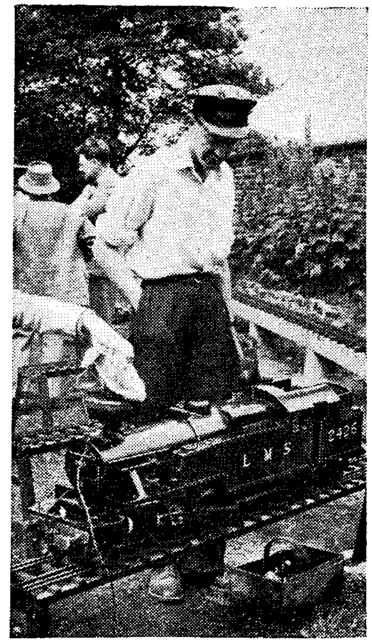
As the leading pony truck of *Jubilee* insisted on leaving the rails, she had to be withdrawn to the sheds for adjustment to the springing at the front end.

Meanwhile other engines had arrived. Among them was a *Maid of Kent*, rebuilt as a 4-4-2 tank by Mr Thompson; the original builder had been Mr Flaxington. The 0-6-0 tank *Butch*, constructed by Mr Jeffrey, has now been rebuilt as a





Petrol-hydraulic engine for 5 in. gauge by Mr Faulkes, and a 5 in. BUTCH *with extended frames. The* BUTCH *was built by Mr R. Jeffrey and rebuilt by Mr Hainsworth*



Getting up steam on Mr Heslop's handsome 4-6-4T *LMS in 5 in. gauge*

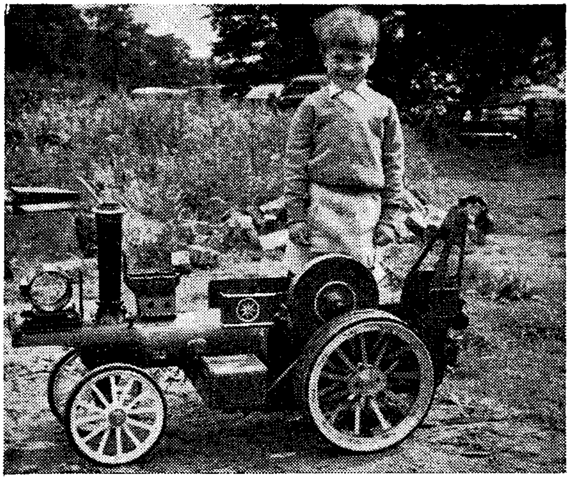
2-6-2 tank by Mr Hainsworth. In this form she should be steadier on the track.

Steam did not have things entirely its own way, as Mr Faulkes of Leeds had his unfinished petrol-hydraulic 0-4-0 running. This machine is for 5 in. gauge and the motive power is provided by a 60 cc. Jap engine; she is a great hauler.

Other engines included an 0-4-0 tank to the *Juliet* design, fitted with slip eccentric valve gear, and built by Mr Stevenson of the Lincoln MES. Mr Hainsworth's very fine three-cylinder *Green Arrow* has a special type of cylinder lubricator. Three pumps are arranged side-by-side on the left-hand running board, each of them drawing its oil from a separate reservoir. The idea is excellent, as it is possible to see whether each cylinder is receiving its proper share of oil.

Mr Hainsworth told me that for the laminated springs he used two thin leaves of spring steel at the top and the correct scale number of leaves, made from duralumin, below. Apparently this arrangement gives all the flexibility desired and saves the need to cut slots out of the leaves, as is often done to increase flexibility.

After one and a half hours of running, a heavy shower drove all except the hardiest to seek shelter. Before the rain moved off, lunch-time had arrived.



Unfinished Burrell showman's engine by Mr Bennett, built at 2 in. scale

Later in the afternoon, *Jubilee* was again put in steam and covered several laps. Mr Cooper took out *Butch*, and Mr Hainsworth did some very fast running with his *Green Arrow*.

An unexpected visitor to the track was Mr R. Booker, on leave from Kuwait. Mr Booker is building the 5 in. gauge 4-6-0 engine *Springbok* as a first attempt. From the photographs which he showed me, he is making a very good job of her.

After an excellent tea provided by the society, grates and ashpans were dumped and boilers blown down, in readiness for packing. Altogether I enjoyed the day, in spite of somewhat unfriendly weather. It is good to see so much enthusiasm for the steam locomotive in the West Riding. ■

MATTHEW MURRAY ENGINE

IT must seem odd to many readers that an article can be published with the wrong pictures, as happened with Robert Cocks' story about his model of the Matthew Murray engine (September 6).

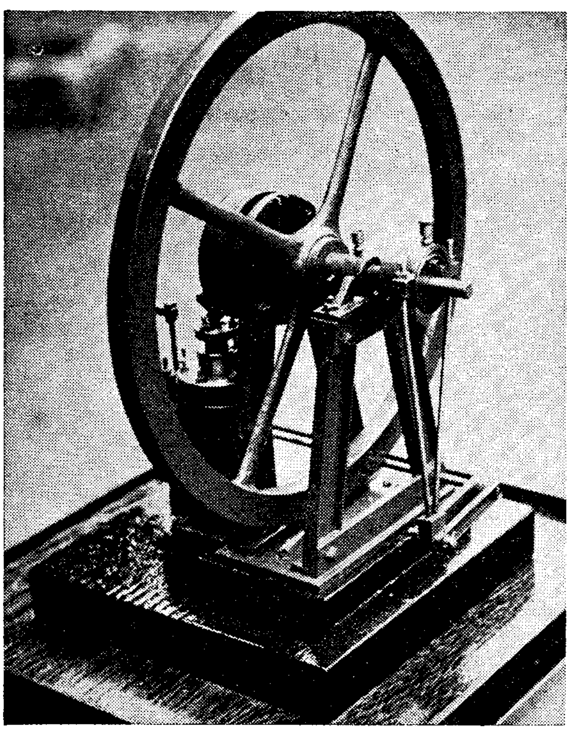
But this kind of disaster can overtake the best of us, as viewers of a recent BBC TV news will realise.

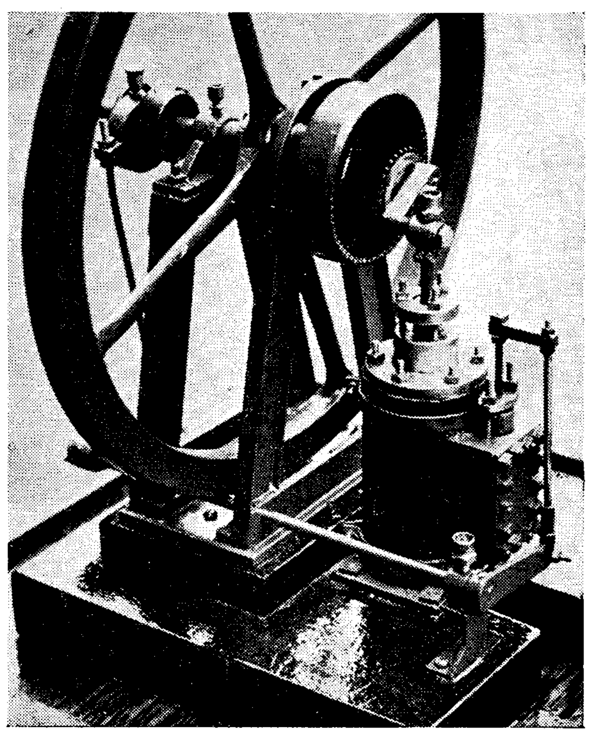
What happened was that Mr Cocks sent us two articles, both without pictures, the photographs to be obtained at a later date. We were short-handed at the time, as several of the staff were on holiday. To get things through quickly, the text was dealt with before the pictures were ready—a highly unusual procedure in normal circumstances.

Unfortunately, the wrong set of pictures was married to the copy. Even so, this error could have been quickly discovered but for one reason. The block pulls were not on the page proofs.

We apologise to Mr Cocks for this unfortunate slip, and hasten to set the record right.

The two photographs below should have been with the article.





 Continued from September 27, page 410

Everyone liked them

ROBIN ORCHARD looks at some of the tank engines which have been removed from the railways of Britain in recent years

IT is the tank engine which has suffered the most in the past two and a half years. The small shunting tank has been cut unmercifully as the number of diesel shunters has steadily increased throughout Britain.

Suburban and branch tank engines, some of them big and very handsome, have passed to the scrap heap quickly because of the rapid introduction of diesel railcars, the pruning of unremunerative services, and the wholesale electrification of various parts of the country. Over 30 classes of tank engine have gone, and over 20 of them were smaller than 0-6-2Ts.

First we will look at the big engines. We must go to the North of England, to Gateshead, where in 1909 Wilson Worsdell, the brilliant North Eastern Railway designer, introduced a series of massive 4-8-0Ts. The wheel arrangement was by no means common in Britain and was generally used for pushing heavy freight trains over the humps of marshalling yards. The NER engines were built expressly for this purpose.

We might think that the wheel arrangement would not lend itself to elegance in design, but the NER men were masters in the art, and these engines were, in my opinion, some of the handsomest tanks ever seen in Britain. Everything about the design was beautifully balanced, and no-one could fail to admire the saftey valve covers.

Mechanically, too, the engines were very fine. They had three cylinders, two outside and one inside the frames, with a common steam chest. The cylinders were 18 in. bore and 26 in. stroke. Piston valves were also used. Setting the cranks at 120 deg. was said to give "a more uniform crank effort than was possible by a two- or four-cylinder layout." Hand and steam brakes were provided.

Overall the boiler was 11 ft long; 4 ft 9 in. in diameter. The firebox was 8 ft long and had a grate area of 23 sq. ft. Heating surface of the boiler was 1,310 sq. ft, and the pressure was 175 p.s.i.

The coupled wheels were 4 ft 7¼ in. dia. In working order, with 2,000 gallons of water and 4¼ tons of coal on board, the engine weighed 85 tons 8 cwt. It had a tractive effort of 34,080 lb.

Over the years 13 of the engines were built. All lasted well into nationalisation. In 1951 they were still at work though they could be found at only three places: Newport, where eight were stationed, Hull Dairycoats, where there were four, and Tyne Dock, which had one.

An engine rebuilt with a superheater was among the earliest to go. The last survivor, which lasted long after the others had gone, was 69921.

Staying in the North, we take a look at the two classes of 4-6-2T which have disappeared. Let us move across country to the Gorton district of Manchester where the GCR had its works and where in 1911 J. G. Robinson sent out the first batch of his very successful 4-6-2Ts. They were intended to work on the suburban service through Aylesbury and High Wycombe and also for the Nottingham and Leicester runs should the need arise. While they were not particularly fine-looking, having far too much of a hunched-up appearance, mechanically they were excellent. The designer used a two-cylinder layout with cylinders of 20 in. dia. and 26 in. stroke, and coupled wheels 5 ft 7 in. dia. The bogie had 3 ft 6 in. wheels. Those on the pony truck were three inches larger.

The boiler, which was originally superheated with the Scmidt apparatus, had a tube heating surface of 1,294 sq. ft and a firebox heating surface of 141 sq. ft. With the 214 sq. ft provided by the supereheater, the combined heating surface amounted to 1,649. Grate area was 21 sq. ft and boiler pressure 180 p.s.i. In working order the engine weighed 86 tons.

By the outbreak of the First World War, 21 of the locomotives were hard at work. In 1923 another ten arrived. They were identical to the earlier engines except that they were never initialled GCR but were lettered LNER from the beginning.

Gresley added another 13 engines to the class, which by then was designated A5, for use on the North Eastern Section. Slight modifications of the original design, to suit the North Eastern loading gauge, pushed the weight up to 90 tons 11 cwt.

All the class passed into the hands of British Railways with the exception of 5447, scrapped in 1942. It was not until 1957 that scrapping began in earnest. In the mid-fifties the engines were very widely scattered. Lincoln, Immingham, Langwith Junction, Boston, Darlington, Saltburn, Colwick and Neasden all had old GCR engines, and Saltburn, Neasden, Stratford and Norwich engines designed in 1925. The 1925 engines had gone by the close of 1960.

It was the North East which first saw the other class of 4-6-2Ts to have become extinct—the old LNER A8 engines which appeared in 1913 as Sir Vincent Raven's D class 4-4-4Ts. This wheel arrangement was rather rare in Britain. The Wirral Railway had used it some years earlier, but few other lines had tried it—surprisingly, for it produced a well-balanced engine reported to be equally at home running in forward or reverse gear.

Like most NER engines, the Ds were massive and extremely elegant. They used three cylinders—cast in one piece, according to the *Railway Magazine*. The bore of the cylinders was 16½ in. with a stroke of 26 in. Piston valves of 7 in. dia. were provided. Among the notable fittings on the original engines were a steam reversing gear, an exhaust steam injector and a compressed air sanding apparatus.

The boiler, which was pressed to 175 p.s.i., had a heating surface of 1,252.974 sq. ft. With a water capacity of 2,000 gallons and a coal capacity of four tons, the engine scaled 84 tons 15 cwt. The coupled wheels of the engine were 5 ft 9 in., and those of the front and rear bogies 3 ft 1½ in.

While the Ds were built ostensibly for local traffic, it was not unknown for them to haul faster trains—work which they loved, and in which they showed the excellence of their design.

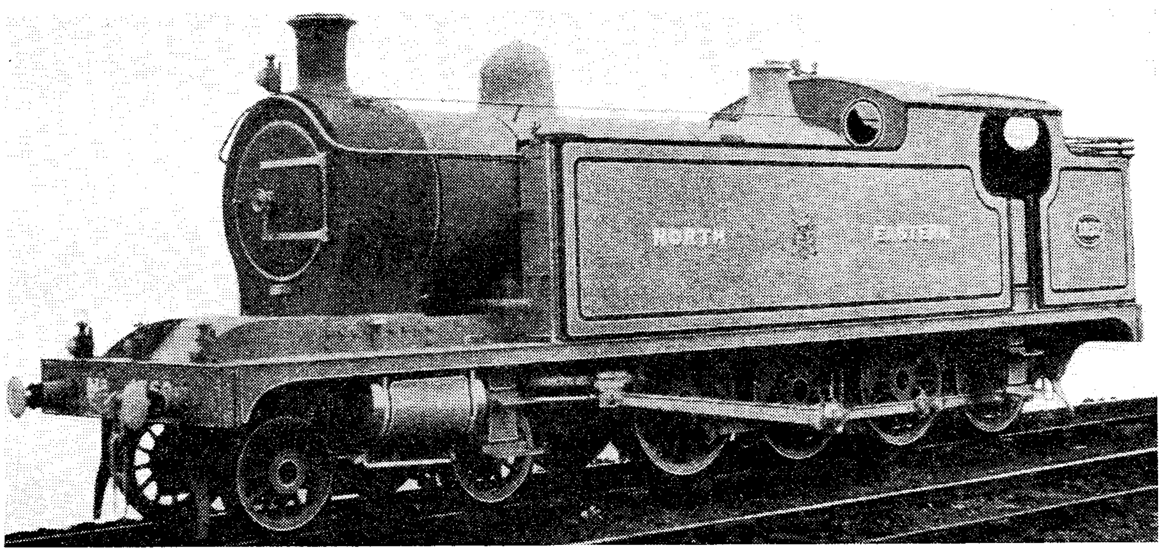
Eager that every locomotive should pull its weight, Gresley decided to improve the adhesion by rebuilding the engines as 4-6-2Ts. Rebuilding began in 1931. The rear bogie was removed and the frames were altered to take an extra pair of coupled wheels and a pair of 3 ft 9 in. trailing wheels. This had the effect of increasing the adhesion weight from 32 tons 19 cwt to 52 tons 6 cwt, while raising the actual weight of the engine by only 9 cwt. The rebuild also brought a slight increase in the tube heating surface.

In this form the engines had a new lease of life and were very popular with drivers and operating staff. They all passed into BR ownership and were hard at work in the 1950s over a wide area of the North East. At that time Whitby and Middlesbrough had the largest allocation, seven each, with six for West Auckland and five each for Sunderland, West Hartlepool and Saltburn. The remainder were scattered between Hull (Botanic Gardens), Selby, Scarborough, Leeds (Neville Hill) and Stockton.

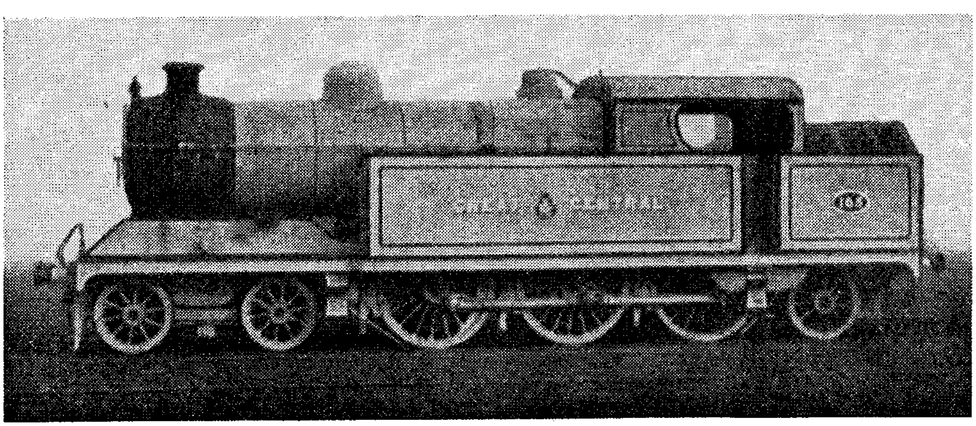
It is interesting to reflect on the changes which have come to some of the locomotive sheds listed here. Five of them, Whitby, Middlesbrough, Saltburn, Selby and Stockton no longer exist. Sunderland, the mother over three other sheds and two sub-sheds, is now only a class G shed under Gateshead. Hull (Botanic Gardens) shed 53B and its old mother-shed at Hull (Dairycoates) find themselves under York; and Leeds (Neville Hill), once a B class shed under York, has become an H class shed under Leeds (Holbeck). Only West Auckland and West Hartlepool have not changed. They remain as F and C class sheds under Darlington.

The withdrawal of these three classes, the T1 4-8-0T and the A5 and A8 4-6-2Ts, brings the two-wheel arrangements to the verge of extinction. Only two 4-8-0Ts are left on British lines, the surviving G16s on the Southern, and five 4-6-2Ts, the H16s, in the same area.

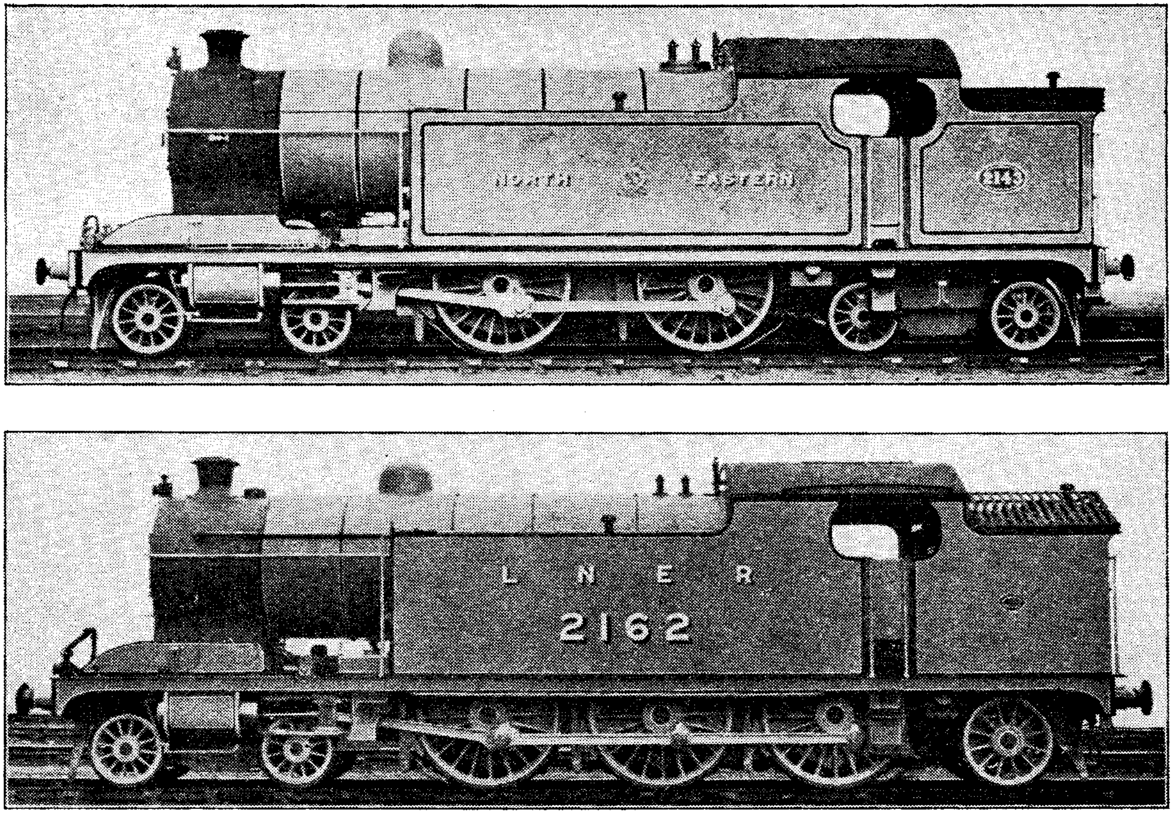
Like these two types, the 4-4-2Ts are also on the brink. When this series began, there were four types;



North Eastern 4-8-0*T in all its glory. From* The Railway Magazine *of* 1909



GCR 4-6-2*T, later LNER class A*5. *From* The Railway Magazine *of* 1911



NER D class engine, as originally built (top) and as altered by Gresley from a 4-4-4T *to a* 4-6-2

now only one remains, the C16 of the Scottish. The three which have gone are the C15s of the Scottish, the 0415s of the Southern, and the last of the old Tilbury tanks on the Midland.

The C15s were the excellent series of tanks introduced by W. P. Reid to the North British Railway in 1911. These chunky, powerful engines, built by the Yorkshire Engine Co. Ltd, earned for themselves the nickname of "Yorkies." They were popular engines with an aptitude for quick running and fast acceleration. They had two outside cylinders, 18 in. bore × 26 in. stroke, coupled wheels 5 ft 9 in. dia., a boiler heating surface of 1,309 sq. ft, a grate area of 16.6 sq. ft, and a boiler pressure of 175 p.s.i. In working order they weighed 68 tons 15 cwt.

These lovely engines were used in all sorts of places. They became famous on Glasgow and Edinburgh suburban systems. Three years after their introduction, Reid brought out a superheated version, later to become LNER class C16. A couple of these locomotives still lie mouldering in Scotland and are therefore technically extant, though the only time their wheels will turn again is likely to be when they go to the heap.

The 0415s were, of course, the Adams radial tanks used on the Lyme Regis branch. They were fully described earlier in Library of Locomotives (in 1961 on October 26, November 9, November 23, and December 21; and in 1962 on January 4).

When I began this series on old locomotives there were three of the old London, Tilbury and Southend Railway 4-4-2Ts left. The 4-4-2T with two outside cylinders had been adopted as the standard for working the line in 1880s, and had been constantly altered and brought up to date until the 1930s. Its family tree began with the series of 48 engines introduced by Thomas Whitelegg from 1880. These engines were usually known as small Tilburys. They had 6 ft 1 in. coupled wheels and 17 in. × 26 in. cylinders. In LMS days they were classified 1P. They were fine little engines with quite amazing acceleration when they were given their head.

But by 1900 there was an obvious need for larger, more powerful engines, and Thomas Whitelegg had a series of 13 built with larger wheels, 6 ft 6 in. dia., and larger cylinders, 19 in. × 26 in. These were beautiful machines. I have always liked locomotives with outside cylinders.

From 1905 to 1911, 12 of the original Tilburys were rebuilt with a much larger boiler and 6 ft 6 in. driving wheels. The rebuild was followed by the introduction of four new engines on this formula. Thereafter no further engines were added until after 1923, when the LMS built a series based on the 1909 batch.

In LTSR days most of the engines were painted in a lovely green with the names of places on the line in gold on the side tanks. Under Midland and then under LMS rule from 1912, the maroon crept over them, and finally black. This was a pity: green suited them, as the preserved member of the class No 80 *Thundersley* bears witness.

Scrapping was brisk when it began, for most of the engines had been long in store.

★ *To be continued on October* 25

Around the TRADE

Safe for children

A NEW British Standards Code of Safety Requirements (B.S. 3443: 1961), covering toys and other articles used by children, refers to the need for restricting lead contents in paints used on these articles.

The Humber Oil Co. Ltd are able to confirm that all their Humbrol one-hour enamels in both the decor and model ranges comply with B.S. 3443:1961, and have done so for the past 20 months. They are, therefore, completely safe for use on children's toys, models, furniture, pets cages, kennels, kitchen utensils and aviaries, and, of course, for redecorating rooms in which children play.

Cordless drill

THE $\frac{1}{4}$ in. cordless drill introduced last year by Black and Decker is now generally released through their usual dealers. Prices for the unit are: C.601 cordless drill complete, with re-charger, £28; C.6000 re-charger £4; and 50435 replacement power pack £8.

With the drill you can make $\frac{1}{2}$ in. dia. holes in wood, $\frac{3}{8}$ in. dia. holes in masonry, and $\frac{1}{4}$ in. dia. holes in metal.

The tool should be of particular interest where mains electricity cannot be used. It is designed primarily for drilling in wood. Over 200 $\frac{1}{4}$ in. holes can be drilled in 1 in. thick wood before the battery needs re-charging; as the battery can be re-charged at least 400 times, this gives a total of 80,000 holes before it needs to be replaced.

A speed of about 800 r.p.m. gives adequate torque for drilling in masonry or metal, although its performance in $\frac{1}{4}$ in. mild steel drops from 60 $\frac{1}{16}$ in. holes to about 12 $\frac{1}{4}$ in. holes a charge.

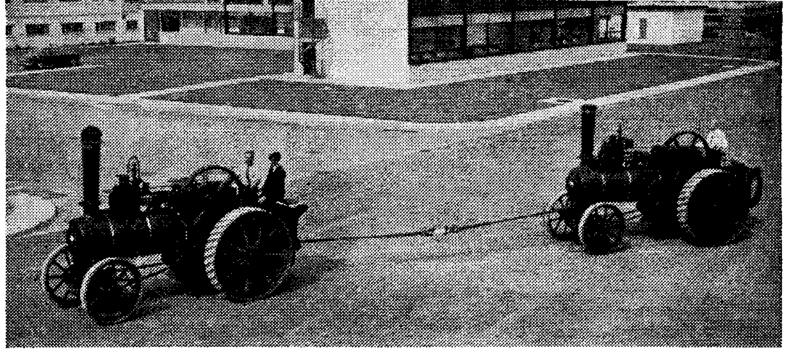
Model engineer inventor

R. S. GILL of Weston-super-Mare, whose Gapjuster badge-tool won a silver medal and diploma at the Brussels International Exhibition of Inventions last year, is a reader of ME.

He writes: "I have for many years been a keen model engineer and have followed your most interesting magazine with great enthusiasm. It has been of immense instruction and help to me."

The Gapjuster, which will be shown at the *Yorkshire Evening News* Exhibition in Leeds, is a combined spark-plug badge and tool for the adjustment of spark-plug electrodes and contact-breaker points on cars, motor-cycles, scooters and mopeds. It is sold, with a greetings card, for 2s. 6d.

Another R. G. Gill invention is the Gap-Fob, an ignition adjustment tool and chrome spark-plug badge which gained a medal at Brussels.

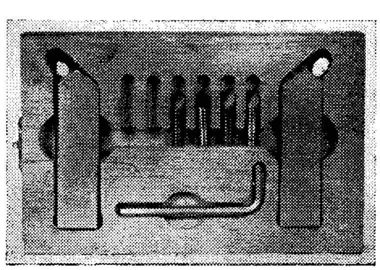


These two traction engines at Duxford, near Cambridge, are pulling a joint bonded with Araldite adhesive for joining metal to metal. The test was filmed, and the picture here is taken from the film sequence

Lathe tool holder

SO many devices have been produced for holding tool bits, and so much ingenuity has been devoted to methods of setting and clamping them, that we may doubt whether there is any scope left for originality in their design. But in the tool-bit holder-set recently introduced by Myford Engineering Co. Ltd, of Beeston, Notts., several new features are incorporated, not the least of which is the method of setting the cutting edge of the tool bit exactly on centre height, without the need for packing or guesswork.

The tool bits, six of which are supplied with each set, are of a specially durable grade of high-speed steel, of round section. Two holders, of square section, for right- and left-hand working, are supplied. The bits are clamped by a sunk socket-head screw and plunger rod from the rear end. They project at an angle, and can be ground in position to produce either rounded or angular cutting edges, with normal front and side clearance, as required for the particular operation. For turning wood or plastics, grinding on the top face only is sufficient.



To set the cutting edge exactly to centre height, the holder is laid upside down on a true flat surface, such as the lathe bed or a surface plate, and the tool bit is pushed through its seating from the underside, until the cutting edge also makes contact with the above surface. It is then locked in position by the socket screw.

If there should be any discrepancy, through variation in the height of and lathe toolpost, it can be corrected by a suitable shim or packing piece under the holder or the tool point.

Though intended primarily for use with Myford ML7 or Super-7 lathes, the holder set is adaptable in this way to other types of lathe. It is supplied in a wooden case with swing lid and clasp. Full instructions for use are engraved on the holders.

Christmas packs

HOW many shopping days to Christmas? J. Stead and Co. Ltd, of Sheffield, are not going to be left behind. They have issued a folder (with Santa Claus on the front) illustrating a selection of their tools and tool bits in attractive coloured packs.

There is a ratchet screwdriver at 10s. 6d.; a sheet saw at 16s.; an electrician set at 24s., and a pad saw at 6s. Tool bits for motorists are also supplied in these Christmas packs.

Perhaps some wives will accidentally read this?

THIS WAS THE REAL THING

Everything was thrillingly familiar to K. R. NORTHGREAVES when he left his little Juliet and went to explore the locomotive works at Eastleigh in Hampshire. But it surprised him that the boilers were tested to only 25 p.s.i. above working pressure !

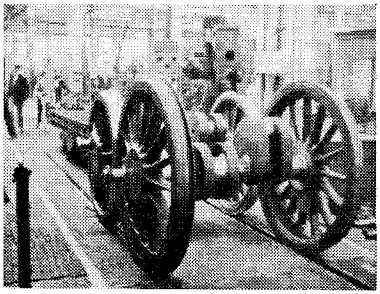
ABOUT two years ago I decided to build a $3\frac{1}{2}$ in. gauge *Juliet* locomotive as a first exercise in live-steam construction. For several reasons, including the lack of a suitable workshop, my progress was slow, and by this Spring I had only reached the frames, wheels and cylinders.

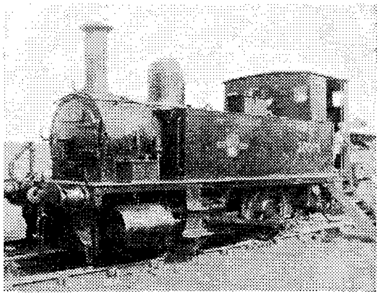
Having become fairly well acquainted with a model locomotive, I thought it would be a good idea to see the real thing. With a cheap day-excursion ticket in my pocket, I left Waterloo one day in August bound for Eastleigh Locomotive Workshops on their annual " open " day. The experience was wonderfully rewarding. For the first time I could crawl in, over and under steam locomotives of all sorts, and ask questions of the locomotive builders in attendance.

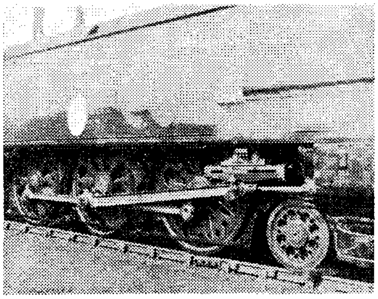
The model locomotive so closely parallels its full-size counterpart that I could not help smiling with delight at quite simple things as the " riveted-on " horn-blocks on the main frames, and the sets of connecting rods bushed ready for erection.

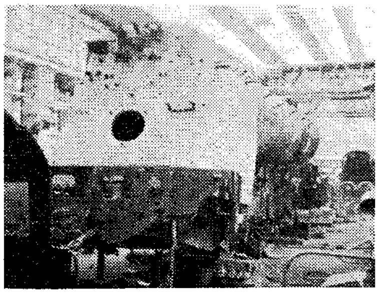
Then, of course, there were the wheels. What a joy to see that when a pair of drivers were having their tyres turned to size, the tool was chattering and biting $\frac{1}{2}$ in. chunks out during the roughing process! It made me feel much better about the chatter marks on *Juliet's* drivers.

I was surprised to learn in the boiler shop that boilers were given hydraulic and steam tests to only about 25 p.s.i. above working pressure. Boiler tubes were being expanded into end-plates that were







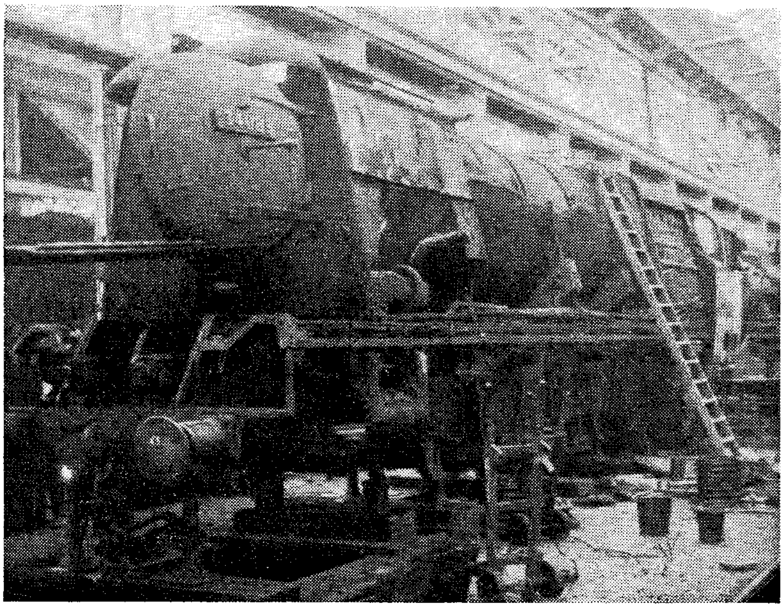


Top to bottom: Double-throw cranks and wheels await further attention

Southern Region has its own JULIET, *an A class B4 dock shunter* 30096 *of a type designed by Adams in* 1891

Battle of Britain class 264 SQUADRON *is back on the road after an overhaul*

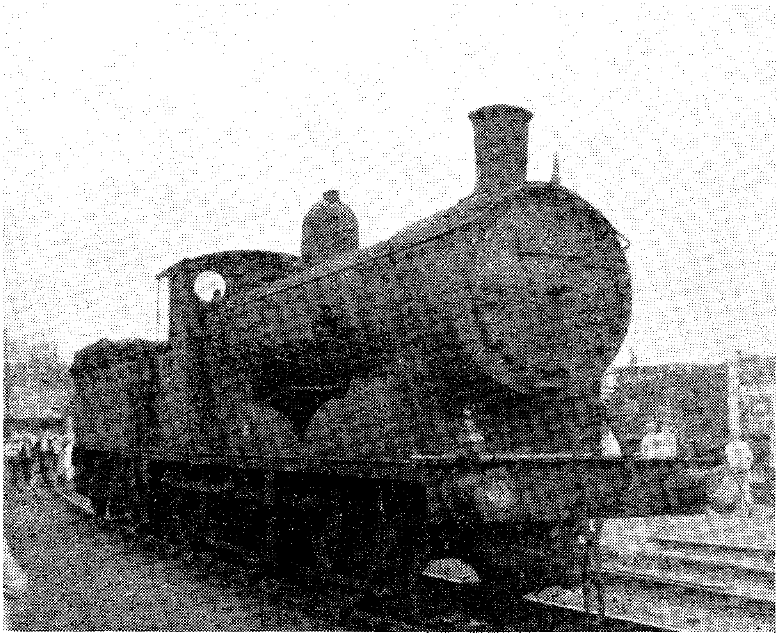
New pin: Boiler mounted on frames

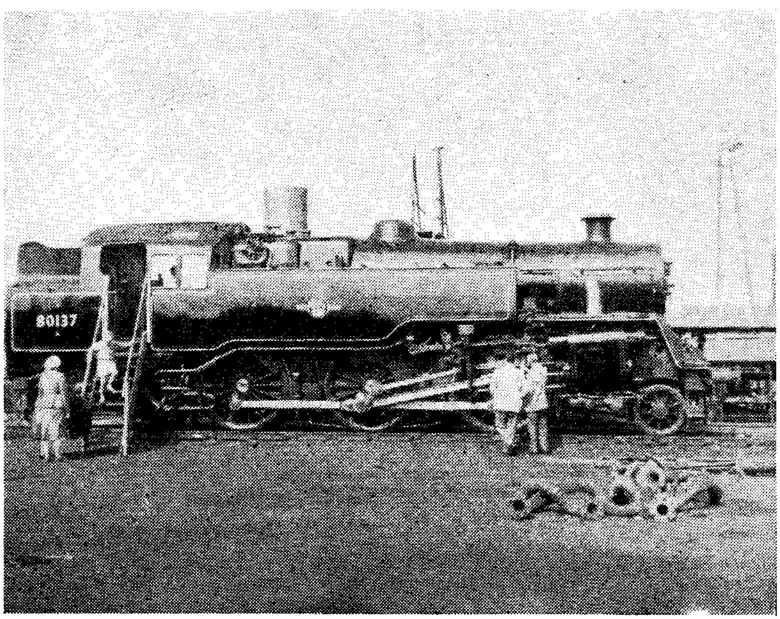


Here is Battle of Britain 606 SQUADRON *partly dismantled, with the superheater tubes withdrawn* extremely familiar. One thought-provoking sight was of copper boiler plates about an inch thick being cut up for scrap. I believe that *Juliet's* small boiler will cost about £5 for materials, and so what the real thing costs I shudder to think.

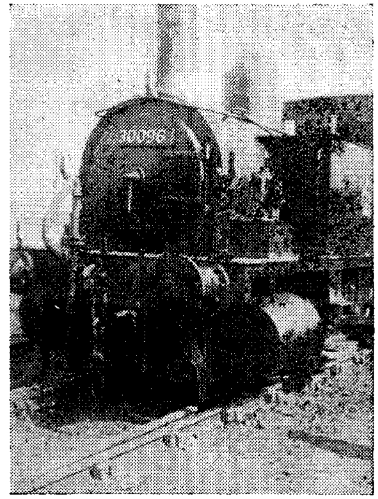
All too soon the visit ended. But on the way out I was delighted to find a small dock shunter which is surely the nearest that the Southern Region has ever come to owning a life-size *Juliet*.

I returned to Waterloo full of enthusiasm and determined to repeat the visit next year, by which time I hope that I shall be choosing an original for my next model. ▣

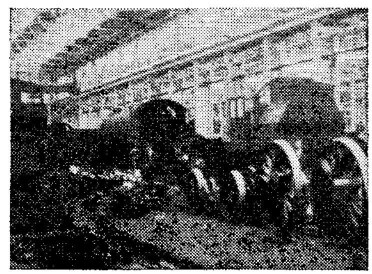




Top: It is Open Day, but this Drummond 700 is away on the side-line. Above: Bright and shining—a refurbished BR 2-6-4 tank just unshopped



Front of Adams Class B4



Under repair

Class 515

Readers' QUERIES

- Queries must be within the scope of this journal and only one subject should be included in each letter.
- Valuation of models, or advice on selling cannot be undertaken.
- **Readers must send a stamped addressed envelope with each query and enclose a current query coupon from the last page of the issue.**
- Replies published are extracts from fuller answers sent through the post.
- Mark envelope "Query," Model Engineer, 19-20 Noel Street, London W1.

Name plate

Please can you tell me if there is any way of engraving a small brass nameplate, for my model grasshopper steam engine? I would like to do it at home. I know it can be done with steel stamping letters, like those used in engineers' workshops, but there is not much chance of borrowing a set of these now that I have retired. I have tried one or two jewellers, but their prices are bit too high for an old-age pensioner.

My engine is ¾ in. bore × 2½ in. stroke. It took many years to build it. Except for the cylinder no part ever saw a lathe. For instance, the 8½ in. dia. flywheel was cut by hand from ⅜ in. steel plate! I spent about five months of my spare time sawing and filing and *sweating* on this job alone.

I have cut a brass nameplate 3 in. × 1¾ in. × ⅛ in. thick. I only want to put my name, and the bore and stroke and scale size, on this plate.—C.B., West Kensington, London.

▲ *There are several methods of engraving name plates suitable for model engines, but a great deal depends on the size of letters and whether they have to be produced in relief.*

Stamped letters are not very satisfactory in small sizes, as it is very difficult to get them in proper alignment and even in depth. Nearly all small nameplates with incised letters are produced by machine engraving, and some readers have gone to the trouble of making engraving machines for this purpose. Letters in relief are often produced in the same way. In the larger sizes, pattern letters which can be cemented to a back plate are available, but this method would be difficult to apply in very small sizes.

Another method applicable to any size would be to make a reversed drawing of the nameplate, and get it reproduced by a photographic engraving process. If you care to give us exact particulars of the nameplate we may be able to get this work done for you.

Nominal horsepower

Could you please tell me what n.h.p. is? I have searched through the local library and all other possible sources of information with no success whatever.—W.J.H., Liverpool.

▲ *The term "nominal horsepower" is employed as a rating figure for certain types of engine. It is based generally on cylinder dimensions, and it has been used for the assessment of taxation.*

It does not necessarily denote the actual power of which the engine is capable. This is determined by brake tests of the engine, and is termed "brake horsepower" (b.h.p.).

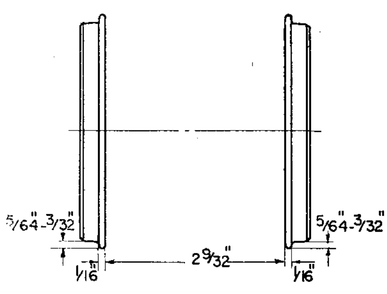
Between the rails

Will you please tell me whether rail gauge is measured between the inside of the rails, or between their centres?

On completing the wheels and axles on a 4-6-2 engine of 2½ in. gauge, I find that the measurement between the outside of the flanges is 2⅝ in., leaving 1/16 in. space between flange and rail each side. Is this correct. — M.H., Shoreham-by-Sea, Sussex.

▲ *Rail gauge is always measured between the rails.*

The usual wheel measurement for 2½ in. gauge are shown in the sketch.



Clipper in KeriKeri

In my retirement I am building a one-twelfth to the foot model of a clipper ship, but I am doubtful if I can find the necessary deck fittings, blocks, deadeyes, and so forth, in New Zealand. Living in a country district, I feel rather isolated, Auckland is 165 miles distant.

Having lived in England, and having built such models in the past, I know that you will be able to advise me on the possibility of getting the necessary parts from the UK. Any information would be most welcome. —G.M.T., Bay of Islands, New Zealand.

▲ *The best source of supply for model ship fittings is The Web Model Fittings Company, 204(E) High Road, London N22. Their latest catalogue is priced 4s. 6d. It includes fittings in various scales for sailing ships and for almost every other kind of vessel.*

[*Scots readers in New Zealand may be interested to know that G.M.T. is a doctor with a degree from Edinburgh. We wish him success with the clipper.*—EDITOR.]

Lathe centres

Is it practicable to mount the headstock and tailstock of an ML7 lathe on blocks to give a temporary centre height of 5-6 in.?

If so, is it difficult to obtain accurate re-alignment of the headstock when normal centre height is resumed?—E.J.C., Glasgow.

▲ *It is quite practicable to mount the headstock and tailstock of a lathe on parallel packing blocks, to give a temporary increase in the height of centres.*

The alignment of the headstocks could only be positively assured if you machine them accurately with tongues and grooves as in the original fittings. Otherwise it would be necessary for you to test the alignments after fitting them to the packing blocks and providing some means of maintaining them truly in position.

Maid of Kent

I have just bought an old *Maid of Kent* 5 in. gauge incorporating Joy valve gear. I intend stripping it down and completely rebuilding it.

Has any reader using LBSC drawings discovered any faults? Are there any weaknesses in the motion, and is there a lack of steam in the boiler?—C.J.G., Newport, Mon.

▲ *There has been some criticism of the Stephenson valve gear on the 4-4-0 locomotive* MAID OF KENT. *The Joy gear is quite satisfactory.*

The boiler is a very good steamer, and no alteration is recommended.

POSTBAG

The Editor welcomes letters for these columns. A PM Book Voucher for 10s. 6d. will be paid for each picture printed. Letters may be condensed or edited

NO HOLDING HIM

Sir,—A letter with the heading Dial Test Indicators in Postbag of August 30 very rightly points out that expensive precision instruments are by no means essential; careful work and simple inexpensive devices can still produce wonderful results. The importance of making this known to and appreciated by newcomers to modelling seems to be a thing which the MODEL ENGINEER has always emphasised.

Even on a project like a locomotive, an enthusiast with only a vice, hacksaw and files, and an electric hand drill, can have a great deal of fun and can produce the frames, trim up rough castings, and get immersed in the work by studying the drawings.

This may easily provide many weeks of recreation. During this period the model engineer will also gain some insight into what the next steps will be. Perhaps he will weigh the possibility of how much can be saved to buy a lathe. He will probably buy more drills, or will learn the first steps in well-known methods of scrounging odd bits of material. Perhaps wooden patterns will come next.

It is also likely that the modeller will join a model engineering club. With this fellowship, a new world will open up and the voice of experience will be heard. From then onwards there is no telling what may happen.

As in learning to swim, the first thing is to get used to the water. Model engineering, once begun, becomes a recreation lasting a lifetime, and no-one with the will to use his brains and his hands to the best of his ability need ever fear that lack of expensive equipment will hold him back. He will almost inevitably overcome all obstacles. And—most important—those who succeed in overcoming the greatest difficulties, financial or otherwise, get the most out of model engineering.

Rothesay, New Brunswick. FRED MASSEY.

TORONTO SOURCE

Sir,—Francis G. Wilks of Ontario wants a source of supply for metal rod, bar, tubing, and so forth.

I obtain mine from Peckovers Limited, 115 McCormack Street, Toronto 9. Their steel list, and their brass and copper list, including other alloys, would no doubt be mailed on request, or could be picked up at the office. They have a minimum charge of $5.00.

I know of no vendors of threaded fittings for modellers' work. Some, of limited scope, are stocked in automobile accessory shops, but not with threads conforming to model standards

Willowdale, Ontario. A. H. BRADEN.

MARKLIN

Sir,—I thank you again for the cheerful welcome at Noel Street. We have made a very interesting tour of England and have seen many fine steam locomotives. I hope to come back next year for holidays with my family.

I read in ME of September 6 the query of Mr G. Howarth of Rochdale about his hot-air engine. The nameplate " G and M & Co." means Gebrüder Märklin & Co., Nurtemburg. The engine is German and was advertised the last time in the 1930 catalogue of Märklin & Pöppingen, Wurttemberg.

It was made in three sizes; Mr Howarth's was the biggest one. The missing part was the vaporising pipe (methylated spirit) going to the top of the engine.

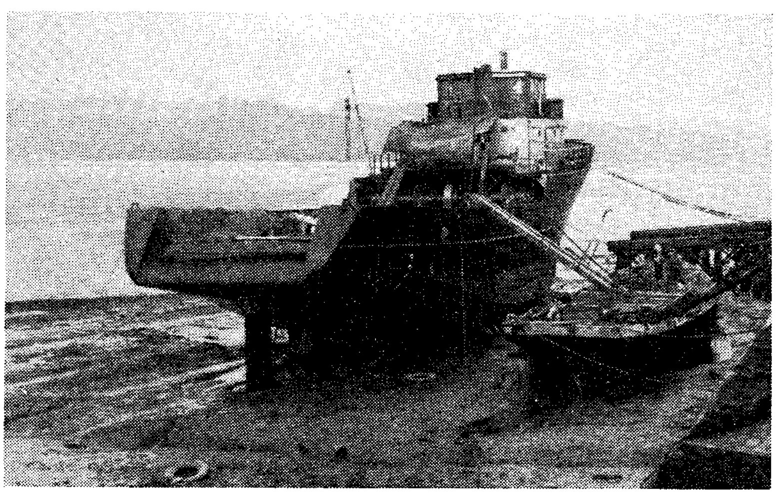
My best wishes to all on ME.

RENE BINDSCHEDLER.
Pully-Lausanne, Switzerland.

APPLEDORE TRAWLER

Sir,—While on holiday at Appledore in Devon this year, I saw a new type of trawler under construction, with provision for stern fishing. I believe that some of these vessels are already in service.

K. R. NORTHGREAVES.
West Weybridge, Surrey.



Out of Appledore. *To all who have read the PM book of that title, this picture will be encouraging as proof that the old days are not yet over in the haunts of Richard Grenville and Amyas Leigh*

REMEMBERED

SIR,—I was interested in the picture of the small gas engine in Smoke Rings on September 13. I can remember as a boy trying to save up my very small pocket money for one of these engines.

An elderly gentleman next to us had one of exactly the kind illustrated. I could not save enough for it in a short time, and then we left the town and I lost track of it. If I were lucky enough to get one now, I should be very glad.

Walshaw, Lancashire. H. MARSDEN.

WELCOME

SIR,—As you have a letter from someone who dislikes the traction engine photographs, here is a reader who likes them. They are welcome because no other publication gives traction engine pictures as a rule.

The rallies are usually at some remote and inaccessible place in the distant provinces, and so opportunities for observing the engines in action are rare; photographs are the next best thing.

Richmond, Surrey. EDWARD ASHWORTH.

BELL HAMMER

SIR,—I have read Mr J. H. Wilding's "Bell from a Fire Engine" (September 20) with interest, and will try to answer his cry for help.

To get the best tone out of any bell, use a heavy hammer with a short drop. When at rest, with the head just clear of the bell, the hammer shaft should lie at about 55 deg. to the horizontal.

Mr Wilding's hammer drop of $4\frac{1}{2}$ in. on an 18 lb. bell is just half Big Ben's, and Ben weighs $13\frac{1}{2}$ tons!

I would suggest a cast-iron hammer head, 2 in. dia. and $2\frac{1}{2}$ in. in length, with the striking face domed as shown in his figure 9, and with a lift of $1\frac{1}{2}$ in.

He can do this with a small geared motor driving a cam or snail, which lifts the hammer and is arranged to complete one revolution of the cam at a time. A micro-switch operated by a lug on the camshaft engages immediately that the hammer drops, and cuts the motor supply.

The count wheel should operate a second switch wired in parallel to the first. Thus the cam will revolve once every time that the count wheel switch closes.

Caterham, Surrey. DOUGLAS HUGHES.

FAIR ORGAN

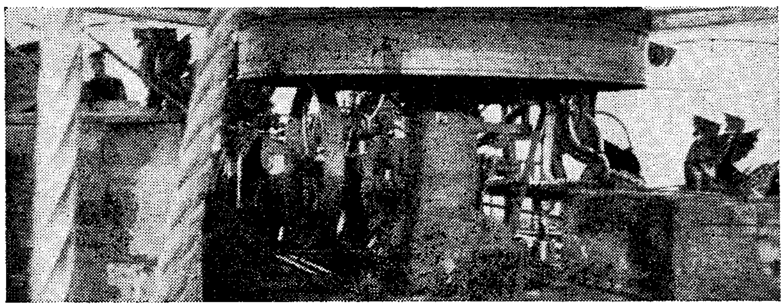
SIR,—I was interested to learn from D. R. Moore in the September 6 Postbag that Percy Cole's organ is still travelling in the West Country. This organ, which was originally used with Aspland's Bioscope Show, was built by M. Gavioli of Paris in the early nineteen-hundreds, and was later rebuilt in this country by the Dutch organ-maker J. Verbeeck.

The switchback ride with which it travels is an ornate set of Venetian gondolas. I recall seeing it at Hounslow Heath Fair about ten years ago, in company with George Irvin's three-abreast electric galloping horses and a chairoplane.

These three prominent and elderly-adult rides gave a distinctly old-style appearance to the fair. The gondolas were then steam-worked, including a powerful whistle, and in contrast to most electric rides the organ did not suffer the ignominy of a slowing in tempo every time the ride was started.

My photograph shows the Savage centre engine at the Hounslow Heath Fair.

Caterham, Surrey. JOHN H. MEREDITH.



Fair-day on Hounslow Heath

HMS VICTORY

SIR,—I am a bit nonplussed at the problem of E.A.R. of Havant in Hampshire. To obtain the information he requires, all he need do is telephone the Main Gate at Portsmouth Dockyard, to be sure exactly when he may visit HMS *Victory;* and take a half-crown return ticket to the Dockyard at the appropriate time; some 30 minutes' journey.

There he will find the ship herself, surrounded by her original guns On my last visit four of her maindeck guns were fully rigged on board. There is, 50 yards to the westward, the *Victory* Museum. All this he can inspect and sketch at his leisure. He will have to obtain permission to take a camera into the Dockyard.

If E.A.R. should doubt the simplicity of this, he may rest assured, as I lived in Havant for 20 years as a youngster, and have visited the Dockyard countless times.

As a matter of passing interest, the last time I saw HMS *Victory* was on 3 December 1951, with her mainyard raised in salute and her Ensign at half mast. I was proceeding to sea in HMS *Starling* to bury my father at Spithead.

It was he, Rear Admiral J. H. Batchelor, who supervised the building and the rigging and took command of the then-famous quarter scale model of *Victory* in the middle thirties. I was much privileged to sail as a member of the crew in 1936.

(Lieut-Col) H. T. N. BATCHELOR.
Whitchurch, Cardiff.

MARKING FLUID

SIR,—In writing of the *Cranborne,* Oliver Smith mentions a marking-out fluid called the Gem-Marker.

It may be helpful to readers to know that this is obtainable in several colours at most stationers.

Guildford, Surrey. R. M. HUGO.

BARGAIN!

SIR,—I recently wrote to you about the name of 3265. Of course, this engine is *Tre, Pol and Pen,* and the engine I was thinking of was 3285, which was named *Katerfelto.*

ME seems to get better every week. When you think of the vast amount of useful information given every week for 1s. 3d., I think it's a bargain. More power to your elbow at Noel Street.

Codsall Wood, Wolverhampton. R. S. HOWARD.

WE ARE SEVEN

SIR,—We are the Machynlleth and District Model Engineering Society in a little village in Central Wales. When we began several years ago we were 14 members, and now we are only seven. Several have gone to live elsewhere.

Our ages are: G. Jones, 75; E.

Jones 75; H. Kendall, 74; G. Elridge, 65; J. Jones, 64; H. Owen, 54; and R. Lewis, nearly 80.

We have a very fine collection of models and tools made from articles in MODEL ENGINEER. Mr Carter and Miss Ann Carter of Norbury, London, paid us a visit on Friday last, and stopped for nearly four hours.

We have helped Brig. E. W. Richards on several occasions with the North Wales Area Exhibitions at Llandudno, and we have been at the Shrewsbury and District Model Engineering Exhibitions for several years.

I have been taking MODEL ENGINEER since 1902.

Secretary. R. LEWIS.

RED ONCE

SIR,—The Duke class locomotive, *Katerfelto was No* 3285; *Tre Pol and Pen* was 3265.

Everything between the frames was painted red, except the quadrant link, the fork ends of all levers, the inside faces of the axleboxes, and the brake gear.

Today, of course, it all looks black. I know, because as a Western Region driver I oil an "inside motion" almost every day.

Severn Tunnel Junction. R. W. GALE.

ROOFING FELT

SIR,—After reading Mr Haydn D. Smith's letter in Postbag of September 6, I should like to give a word of warning to the uninitiated.

The surface of roofing felt is readily dissolved by oil and paraffin. Therefore take care that black and tarry footprints are not transferred in Chuck style to the domestic accommodation!

Wingham, Kent. F. A. MERRY.

BIG WHEEL

SIR,—Perhaps the final answer to Mr Neal's problem about the 1894 Big Wheel at Earls Court is that, as Mr Blazdell says [Postbag, September 6] it was dismantled in 1906 by George Cohen Sons and Co. Ltd.

The demolition contract provided, subject to heavy penalties, for the removal of the whole structure in five months. The tonnage involved was not large—about 1,000—but it was a troublesome job. The *Evening News* reported: "The whole structure will be considered as an arc resting upon an inverted arc which supports it. The arc to be cut is on the top, and as it stands uncut it supports itself. But when once cut in the centre, it loses its self-support and would, if not externally held up, collapse. To prevent this, two monster struts will be erected to take the weight. . . ."

So far, so good. Then to our disgust, it was discovered that some 20,000 bolts were in a perished condition and had to be removed and replaced by new ones to prevent serious accident!

Further, the weather was very bad, with high winds which often made it impossible for men to work aloft.

We are glad to report that in spite of all difficulties the work was done on time; and so ended the Great Wheel.

The George Cohen 600 Group Limited, Wood Lane, London. J. S. BOWEN.

FOR THE SCHOOLS

Continued from page 459

be mounted on a vertical column for drilling, milling and grinding. Its capacity is somewhat restricted for model work, but it will handle many operations outside the normal range, and extra attachments may be had for sawing, screw chasing, and so forth.

Most of the small lathes which have been produced in Britain, specifically for model work, have been based on the traditional "engine lathe" and followed its main features of design. These include a sturdy cast-iron bed, with flat angular-sided shears, and a sliding saddle which can be traversed over the maximum effective distance by a lead screw. The earlier machines, in addition to the saddle slide, usually had only a single swivelling slide, but all except the very simplest now have a fixed cross-slide as well; in other words, a "fully compound" slide. A common practice is to make the live headstock integral with the bed. This has some constructional advantages, and is perfectly satisfactory if properly carried out; but should there be any initial error in alignment, correction is very difficult, or even impossible.

These lathes nearly always have plain parallel headstock bearings, split on one side only for taking up radial play, and with equally simple end-play adjustment. As precision bearings, they are inferior to the opposed cone bearings usually fitted to instrument lathes, and this has an adverse effect in turning fine, accurate work; but on the other hand, the plain and rugged nature of this feature and others makes them less liable to be deranged than the more delicate working parts of instrument lathes. They are generally better suited for dealing with castings and other comparatively rough jobs, and their only limitations in this respect are those imposed by their physical dimensions. Though they are often looked upon as the "poor relations" of the more specialised lathes, and are much less elegant and highly finished, their practical utility, in relation to their low cost, is beyond dispute.

The smallest lathe in this class is the one which was originally produced before the war by F. W. Portass, of Sheffield, under the name of the Adept. It is still popular, and the modern version the Super Adept, now incorporates a fully compound slide-rest, with lead screw traversing motion, and several other improvements. The centre height is $1\frac{5}{8}$ in., and as the machine has a gap bed it will accommodate faceplate work up to 5 in. dia.

Another lathe of similar size and specification is made by Flexispeed Limited, of Sheffield. In both these machines, the "big lathe" features include a mandrel with a screwed nose to take chucks, a faceplate and driven plate, and sockets in both mandrel and tailstock barrel to take tapered centres and other fittings. The technique of operating them therefore follows standard machine shop practice.

Critics of these small, inexpensive lathes say that they are too small to be considered seriously as practical machine tools, but there is a good deal of evidence to the contrary. Many excellent models, some of them prizewinners, have been constructed with their aid. One of their important assets, which is often forgotten, is their convenience. Dwellers in flats or small houses find it quite impossible to set up a permanent workshop, and must, therefore, rely on small or portable pieces of equipment if they are to carry on model work at all.

As will be seen from the photograph, an Adept lathe, together with its motor, countershaft and tool equipment, can be accommodated on a basebord about 12 in. × 18 in., its bulk and weight being low enough for it to be tucked away unobtrusively when it is not in use.

Another attractive feature of these lathes is that they offer unlimited scope for improvement and elaboration. I have seen them fitted with such refinements as collet chucks, internal back gearing, vertical slides, and dividing and wheel-cutting attachments. With a little skill and enterprise, they can be made to turn out work as accurate as that of much more expensive lathes, and they are certainly no less versatile.

★ *To be continued on October 25*