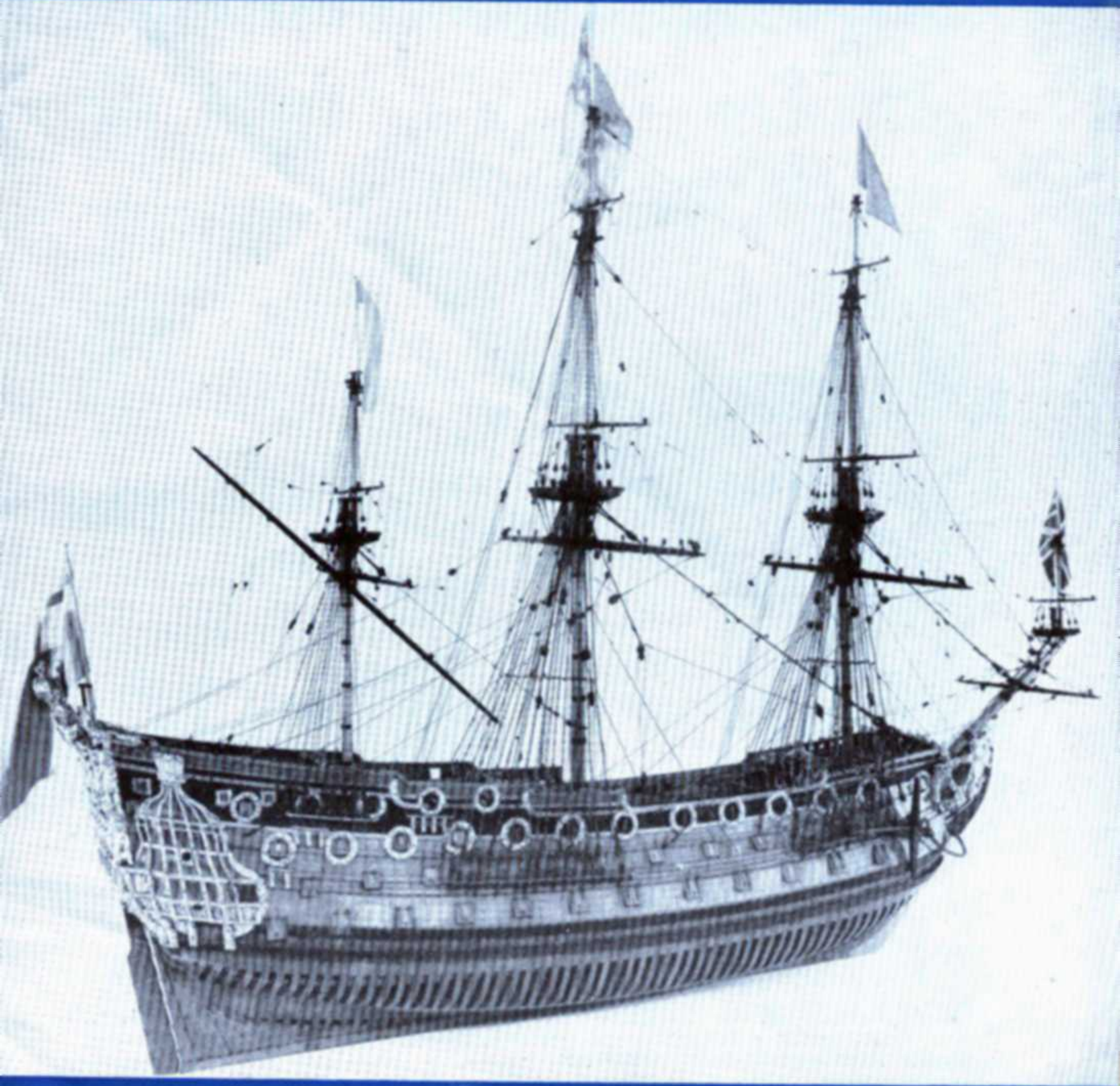
Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED



ONE SHILLING 26 JUNE 1958 VOL 118 NO 2979

Model Engineer

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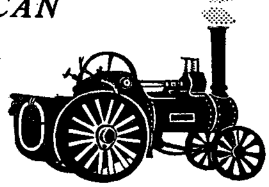
Smoke Rings

By VULCAN



COMMENTS about the Diamond Jubilee issue of May 1 continue to reach me from many parts of the world. Last week, they were arriving from the United States and I was very pleased to receive them, especially as they all said pleasant things about the issue.

Now, from Sweden and Poland, are two more comments. A reader from Malmö says: "May I congratulate you on the celebration of the Jubilee. I have always liked the magazine very much and it has given me endless enjoyment."

Another reader from Warsaw writes: "I think the magazine is very interesting and has a beautiful form. My friends to whom I showed the issue were of the same opinion."

I am grateful not only to these two readers but the many others who have written from other parts of the world.

Sail to steam

ONE of the most striking exhibits on view at the "From Sail to Steam" special exhibition at the National Maritime Museum is a magnificent model of the four-masted full-rigged ship *Wendur*. This is about 6 ft long and is beautifully detailed and rigged.

An intriguing exhibit is the letter from Lord Nelson advising the Admiralty to take notice of the new application of the steam engine to ship propulsion. His acute mind quickly saw the possibilities. No doubt he had in mind the difficulty his frigates, "the eyes of the fleet," had at times in keeping on the move under sail when delivering the information so necessary to the operations of the fleet.

There are some log books with charming water-colour drawings of early steamships, and also some interesting "animated drawings" of engines, one of which shows very clearly the action of the peculiar valve motion of the side-lever engine.

The models of early turret ships, such as HM Ships *Warrior*, *Devastation*, *Inflexible* and *Sans Pareil*, are most interesting, as is also the block-making machine, one of the earliest examples of mass production.

It would take pages to describe all the good things to be seen, and my advice to ship modellers is to make a point of visiting the exhibition and of allowing all the time possible for it. It will be time profitably spent. To quote from the leaflet prepared for the exhibition:

"Much sentiment has been expended on the romance of sailing ships, but credit should also be paid to the evolution of the steamship. Steam navigation was introduced by engineers, practical men, generally against the advice of the seamen and shipbuilders, steeped in traditional lore. . . ."

Our American visitors

I AM told that CPR 29 has *inside* inlet valves. "You can verify it by noting where the rocker is set," declared Hubert S. Gowan from Windsor, Ontario, when he called on us in Noel Street.

There has been some argument about the valves of CPR 29, and perhaps the battle will continue—if Mr Gowan has failed to bring a lasting peace—when Fred Massey's Atlantic Live Steamers hold their big New Brunswick meet at the Saint John Exhibition in August.

Mr Gowan, himself a live steamer, is building a Grand Trunk locomotive from drawings which he was able to get. He also brought us pictures of interesting work by Dave Mullings of Wolfville, Nova Scotia, Jack Hewitson of Montreal, and Bob Braid of Halifax who gave the Customs something to think about when he came across from England with a handsome model locomotive in his luggage.

As a guest of Malden SME, Mr

Smoke Rings . . .

Gowan drove a 7¼ in. gauge locomotive for the first time in his life. He had, of course, driven models of a larger gauge in Canada.

At the headquarters of SMEE he met K. N. Harris and a number of other model engineers well-known to him on the other side. He was also hoping to meet Ernest Fraser and H. Dawson Bond of the Luton society (and the old Aylesbury Gang) before he returned in the CPR *Empress of France*. "And then there's Herbert Dyer," he said. "I would like to go down to Penzance and see Mr Dyer at Mousehole."

Mr Gowan is not the first overseas visitor at Noel Street to mention this fine craftsman in copper, the author of two Percival Marshall books.

All prepared

BILL DOAKES, 678 Third Street, Billsville, Ohio. 60 per cent. M; three fellows all together. Will try to bring wives; advising later. Hudson 2½, all equipment. 1 ride truck, 3½. 4¾ tank 0-4-0, ride truck, 1 pass truck. 4¾ loco; trucks all 3½.

During the last week of August the Atlantic Live Steamers are meeting at the Saint John Exhibition in New Brunswick. The mysterious message which I have quoted represents part of a sample form sent to possible or intending visitors. With the help of information from Carl Purinton of Boxford, Massachusetts, Fred Massey of Rothesay, New Brunswick (his full address) is communicating with the key men and clubs in Canada and the USA.

The potential visitor is asked whether he is married or single, what accommodation he requires (hotel or motel), how many will be with him, and so forth. Does he want bulletins to be mailed? And how great is the likelihood that he will attend?

The certainty, probability or possibility that a particular visitor will be coming to the meet is expressed on the form as a percentage. Bill Doakes of Billsville thinks it 60 per cent likely that he will come.

This is thoroughness for you! Whenever any kind of meeting is planned, the people in North America try to have everything well-prepared. No one arrives as a stranger; he finds himself treated as though he were the most welcome of old friends.

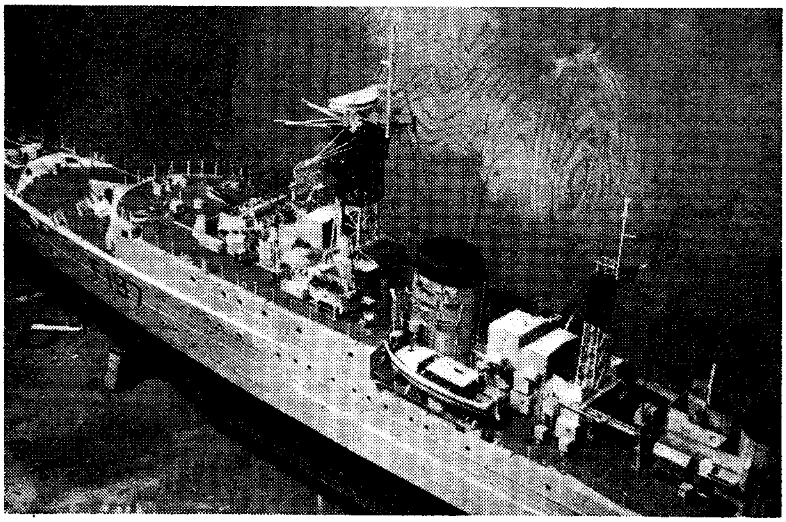
In the general planning of such an event as an exhibition or live-steam meet, the same care is taken with all the details. One cannot say the same of every event in England.

Plain Mr Jones

I have been surprised, in particular, at the casual attitude of some modelling societies in England towards the Press. Excellent opportunities for publicity are ignored, attractive news stories are allowed to pass, and the reporter is expected to get his information the hard way—rummaging for prizewinners through lists which may or may not be accurate.

It is curious that men who pride themselves on working to a thousandth of an inch should be indifferent to such important details as initials. After all, a man's initials are part of his name. Yet as often as not a club secretary is content with Mr Smith, Mr Jones, Mr Robinson, even when he knows them as Tom, Dick and Cuthbert. Usually, too, he knows the full initials—for most of us have two.

This casual attitude towards the Press is parochial and out-dated. Nowadays if you do not bother much about the Press, the Press will not bother much about you. The idea that a local newspaper will never give a modelling club the kind of publicity that it wants is absurd. If the club finds its own news and presents it well the newspaper will print it happily.



Cover picture

The PRINCE *of* 1670 *carried the flag of the Lord High Admiral—the future King James II—at the Battle of Solebay. This 17th century model, a favourite with ship-lovers at the Science Museum in London, was identified by Dr R. C. Anderson, as Joseph Martin relates on another page. The picture is Crown Copyright.*

Model in steel

FOR the past three years Norman M. Peters of Wallington, Surrey, has been visiting Chatham on Navy Days. These happy occasions will presumably disappear with the closing of the naval dockyards, but the business which took Mr Peters to Chatham is now completed. He was studying the frigate *Grenville* at first-hand for the beautifully-detailed steel model which is pictured here.

This anti-submarine craft is his first electrically-driven model and at some time will probably be fitted with radio-control. The drawings were made from a silhouette used with some pictures from Wright and Logan, and Julian Glossop of the Imperial War Museum, London, helped with rough sketches of standard fittings, some of which are of wood, plastic, wire and light alloy. Visits to the actual ship, and photographs from the quayside, supplied the detail as accurately as possible.

Mr Peters, a Civil Servant in the middle forties, has been building models since the war in a moderately-equipped workshop. At the 1951 ME Exhibition he was the winner of the Willis Cup with a steam-driven Battle-class destroyer, and when the Duke of Edinburgh opened the Exhibition he built the mast for the presentation model of *Magpie*.

Membership of the Sutton and Croydon clubs, and of The Guild of Model Shipwrights in the past, have kept him well in touch with the movement.

Midlands society celebrates its coming of age with a fine display of live steam

EXHIBITION AT BIRMINGHAM

Reported by
JOSEPH MARTIN

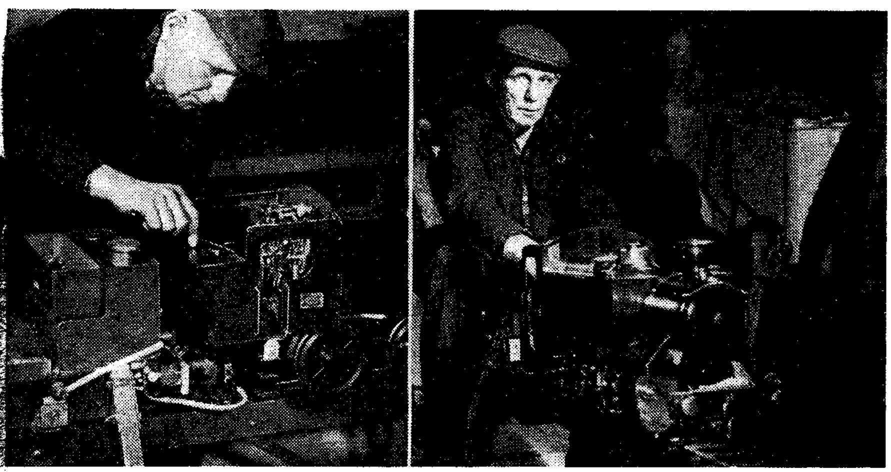
RELAXING a moment, Harry G. Barr of British Railways pushed back his cap and grinned. "Someone," he said, "must take the Scotsman north tonight, and I'm the someone! Between you and me, I'd much rather be here."

Driver Barr was at the controls of a GWR 0-6-0 tank. Behind him sat his passengers, six eager boys and girls of Birmingham who had helter-skeltered to Bingley Hall in the first half hour of their Whitsun holidays. While a little short-sleeved fellow tried rather desperately to stuff an ice lollipop into his trousers pocket, this quietly cheerful veteran of the footplate told me of his love for miniature locomotives. "I like to build them as well as drive them," he said. "My last one I've given to my grandson. He's a fireman and is just as much interested as I am. It runs in the family, so to speak."

The alert blue eyes which had seen hundreds of thousands of miles rush past—for Harry Barr has a driving experience of 30 years—looked keenly down the 90 ft track. A sure hand reached for the whistle control; the little boy wriggled with an air of worried surprise; and the Bingley Hall holiday train pulled out on yet another journey.

None of the children, and few of the adults, at the 21st birthday exhibition held by Birmingham Society of Model Engineers, knew that the man behind the tiny green engine on the steam track was a seasonal driver of the main line. I discovered his secret through stopping for a chat with Sally Campbell.

No one could miss Sally! Miniature steam locomotives are driven by all sorts of people, but seldom do we see one driven by a child of eight. Old-time drivers who speak of their skill in hushed tones, as a kind of sacred mystery, may be surprised or shocked to know that Sally had learnt the controls that morning from a demonstration cab lent to the exhibition by the Curator of Historical Relics, British Transport Commission. Her engine, the GWR tank, was the sturdy No 35 which Frank Shrieves built five years ago and numbered after his house in Sutton Coldfield. Helped by Mr Barr as second driver (which made a difference) she drove with her pigtails flicking the coal; and not Casey Jones himself had a neater hand with the whistle!

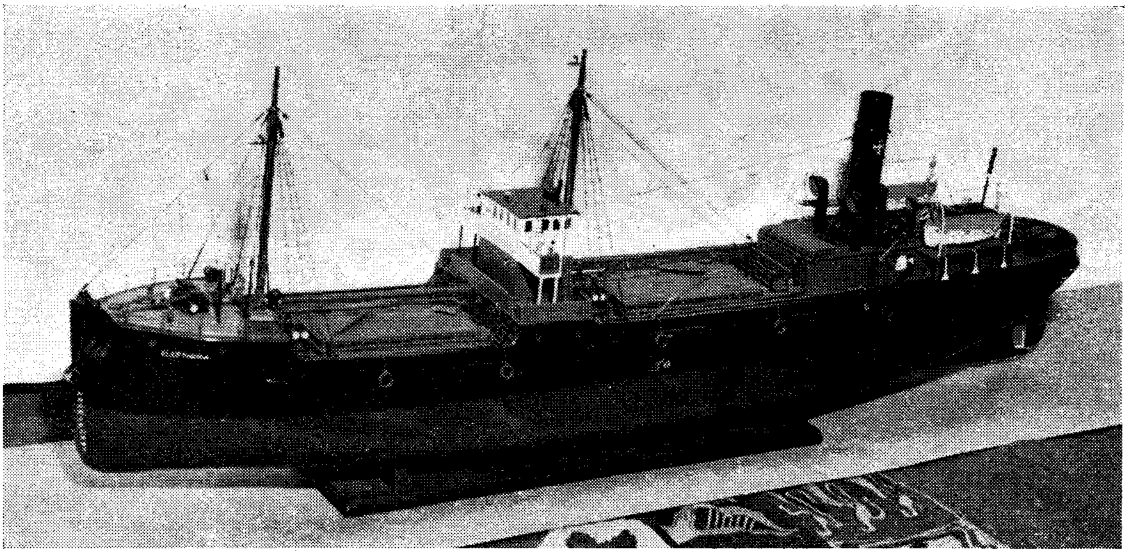


The veteran—Harry G. Barr with No 35

The briefest glance at the exhibition was enough to explain the enthusiasm of Harry Barr and his fellow stalwart Ernie Guy, who drives express freight traffic. Live steam dominated the show. Never had I seen so many model locomotives. Like Wordsworth's daffodils, they stretched in never-ending line, steam locomotives of almost every type and period from the primitive and picturesque to the graceful giants of the pre-diesel twilight. They numbered exactly 138 in the catalogue, and I wish that LBSC had been there to see them; not least because they were, with very few exceptions, the children of his genius. Many of them could not be called new, but the five years since the last exhibition had softened familiarity; if we had been here before it was quite a long time ago.

With so many locomotives on display, all of them beautifully made, and all interesting in one way or another, I can do no more than pick a representative few, almost at random. Some, of course, demand one's special attention. First among them I place *The Empress* of Sir Gilbert Claughton, an 8¼ in. gauge 2-4-0 Ramsbottom express locomotive with Allan valve gear.

Gilbert Henry Claughton, son of a Bishop of St Albans, was apprenticed in the 1860s to Beyer Peacock, who were then building engines for the LNWR. After serving his time, he went as a draughtsman to Lord Dudley's engineering works at Tipton. Lord Dudley was his

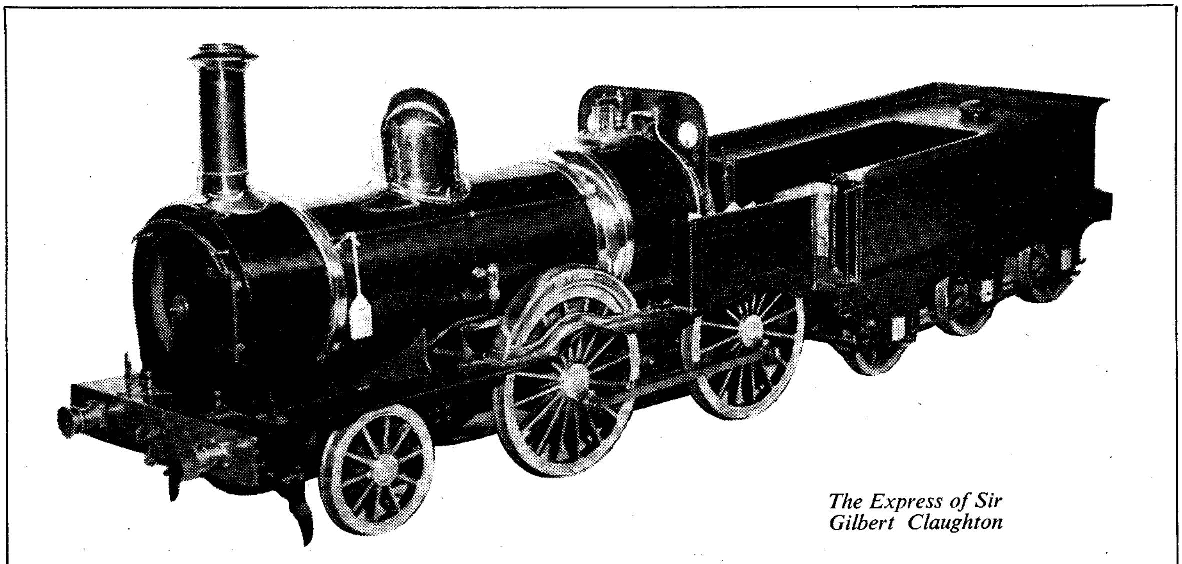


A. T. Judd's coaster—ELEFTHERIA

cousin, and while he was living at Himley Hall, the present seat of the Earl, he scaled down some drawings of full-size locomotives. The model of *The Empress* bears the date 1879. According to R. S. Mantle of Stourbridge, steel rails were laid for her in Himley Park and she steamed well, with a load of from 12 to 16 adults, until she came to rest in Sir Gilbert's dining room at the Priory Grange, Dudley. From Sir Gilbert's nephew, General J. V. Campbell, VC, she passed to R. T. Evans. Picture her in livery of brown and red with a shining dome and wheels, a reminder of what we have lost on the road of Progress.

There were, as we would expect, many such reminders at the Birmingham show. I liked the freelance old timer *Joseph*, an 0-4-0 built by H. M. Savage and named for Joseph Maunsell the inventor, in 2½ in. gauge. This small neat engine looks purely ornamental, but she has hauled a child of seven. Mr Savage made the pressure gauge without a lathe, as he also made the chimney of his GNR Stirling Single No 1006, a model on which he has so far worked for ten years, or 3,800 hours. The chassis now has its fifth coat of paint.

Mr Savage was a friend of the late Douglas Picknell, a first class modeller whose son is following him in the tradition of meticulous craftsmanship. I met another veteran in Herbert Clark who began on his 4-6-0 *Cordley Hall* at the time of the Munich crisis and finished it in time for the peace. Another of his models on show was of the huge GWR *King James I*, a project from which he turned to rebuild a Baltic tank. The Baltic,



The Express of Sir Gilbert Claughton

a model of 40 years ago, is named for T. W. Averill in memory, he says, of days gone by.

Mr Herbert Clark introduced himself as Old Bert and I was glad to hear Old Bert speak in praise of the young men and their work. Look at the 3½ in. gauge *Vale of Rheidol* locomotive by Brian Hughes, who is one of the younger modellers. Note the deflector plate, the washout plug, the twin feeds, and you will not hastily say that craftsmanship is dying out and that the young want only quick results with little effort. The dome of the Rheidol was hammered out of a piece of brass 18 in. in diameter.

President's engine

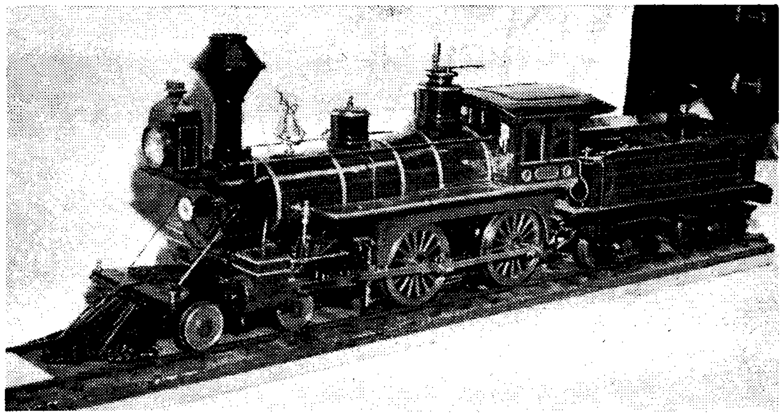
An engine which had run hundreds of miles and carried thousands of passengers was the 5 in. gauge Halton tank built by W. H. Heaton and exhibited by J. D. Campbell. As the work of a past president of the society, she was fittingly shown next to a 2½ in. gauge 2-8-0 GWR locomotive and tender by Sidney F. Jarrams, who leads the society, and leads it admirably, at the present time. Officials of the society were well represented. My wish for W. A. Lowe, the busy Press officer, is that he will soon have time to finish his Liverpool and Manchester *Lion*.

Fifty years ago, at the time that the pioneers of the first Birmingham Society began to meet, the woodburning Grant locomotive was already of antique interest. The original of S. D. Baker's blue-liveried model travelled in the America of Jesse James when it was an extraordinary relief to arrive at one's destination. Mr Baker had a scattering of logs in the tender.

Winners of old

Several of the locomotives had won prizes at the ME Exhibition or had been on the ME front cover. M. D. Picknell's *Marina*, for instance, won a second prize in 1946, while T. Bott's *Duchess of Buccleuch* gained the Championship Cup in 1951. As another interesting link with ME we had the original 5 in. gauge 0-6-0 *Twin Sisters* built by J. I. Austen-Walton and described in these pages.

J. H. Balleny's chassis for a 3 in. gauge 4-2-2 GWR locomotive was thought by some to be as fine a piece of work as any in the hall. Mr Balleny exhibited three model locomotives, but to have three on view was by no means remarkable. There were three each, in this section, from S. F. Jarrams, W. H. Heaton, K. G. Bayliss, H. Lockley, J. A. Woodroffe, J. H. Owen and F. Shrieves; four from T. H. Clark, B. G. Hughes and W. Finch, and five from S. D. Baker. E. Prouts' nine (seven locomotives



An original woodburning model Grant locomotive from the American Civil War

and two dining cars) together with all the Picknell exhibits in the hall, could have made quite a show on their own!

F. P. Middleton sent seven exhibits for the stationary engines section, among them a Greenly 1903 undertype and a rebuilt organ engine as designed by R. Tidman and Sons of Norwich. Harry Lockley showed an organ blower engine at half size and a horizontal mill engine. The vertical and horizontal engines from Rubery Owen and Co. and the Grasshopper engines by R. Stelfox were well worth seeing; and so, of course, were Murdoch's original rotary engine and the Tangye Colonial, two treasures from the Birmingham Museum of Science and Industry.

Yes, we had traction engines too, eight of them, thanks to K. G. Bayliss, J. D. Campbell, A. E. Phillips, F. Lippiatt, G. S. Madeley, A. J. Roberts, P. V. Stimpson and L. E. Boll. The models ranged from Mr Roberts' spirit-fired creation at ¾ in. scale, with a driver on duty, to the 2 in. scale Burrell showman's road locomotive under construction by Mr Madeley. The catalogue listed two Allchins, two Fowlers, and an ME road roller.

Tribute to the horse

In the road transport section J. Francis paid tribute to the horse with a set of eight delightful models, including a hansom cab and a farm wagon. Another set, from the Midland Red company, offered us the charming contrast of a horse bus halted on its way to Shirley beside a gleaming modern vehicle.

Without tramcars the 21st birthday exhibition of Birmingham SME would have been unworthy of the Midlands. A Birmingham Corporation tram of the 361-400 class by F. Bond, a Llandudno and Colwyn Bay tram by D. Thomas, a Wolverhampton tram by D. F. Felton—these and four models from P. Hammond, brought back the past for thousands of Midland folk. I heard a deeply interested little girl ask her mother what a tramcar was!

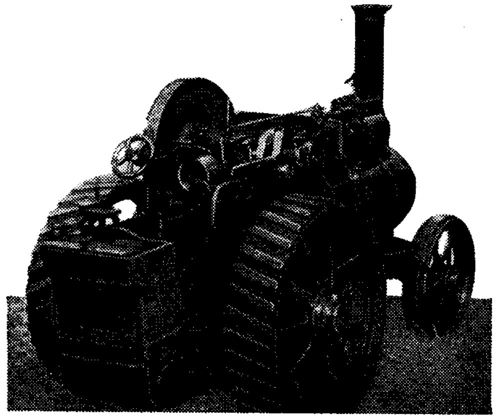
Some very tiny models, all oddly fascinating, formed part of the display for shiplovers. The Birmingham Ship Model Society and the Museum of Science and Industry provided most of the exhibits in this section, while the enthusiasts for power boats and hydroplanes had 14 exhibits in a section of their own.

A pride of locos

Scores of other exhibits, beautifully fashioned, unusual and striking, deserve to be mentioned: the display by Birmingham Model Railway Club, the society's own stand and workshop, the IRCMS models, the excellent tools, the demonstration locomotive parts (such as Walschaerts valve gear in wood) by G. H. Clayton, the hydroplane and internal combustion engines, the steam launches, the motor ship *Cape Horn* by D. Jones, and many others.

It was a rich exhibition. When I left, Harry Barr and Sally were still travelling up and down, the veteran of 30 years with his cap tugged forward, the veteran of a day with her blue ribbons jigging in the tender. I thought it all happily expressive of the sheer enjoyment which modellers find in their craft; and so it was meant to be, a birthday parade of work that had given pleasure to the makers and was giving it now, without judges and awards, to the public. Outside, about a spanner's throw away, the evening sunlight glowed on the statues of Watt, Boulton and Murdoch, three giants of live steam who worked together at Soho; and thinking of the pride of locomotives in Bingley Hall I felt they would wish a happy birthday to Birmingham SME. ▣

Traction engine



After discussing the details of the platework Ernest A. Steel continues with notes on cylinders

Continued from **12** *June* **1958**, *pages* **750** *to* **752**

In the original series of articles published 25 years ago, no definite instructions were included for the construction of the tender, but a detailed assembly drawing was added to one of the blueprints later.

For the design of the full-size Davey Paxman traction engine, provision was made for a drawbar of steel channel section to extend across the back of the tender, to which deep straps were welded each side. Hence, the load was transmitted to the main hornplates and not to the comparatively weaker tender plates, which might cause tearing of riveted seams and leaks. A series of holes was drilled in the drawbar so that a draught pin could be placed in any position on a journey to facilitate turning sharp corners in towns. A steel guide for the draw iron was also fitted between the jaws of the channel drawbar.

For the model traction engine, the tender is divided into the usual three compartments: the water tank, fuel bunker and driver's platform. To quote from an old catalogue: "All the levers and handles for starting, stopping, reversing the motion, changing speed, regulating the draught of the fire, working the steerage and the brake, are within reach of the driver on the footplate, so that one man alone may work the engine when required." It should have added that the tool box was also immediately to hand, this important item being fitted to the rear of the bunker.

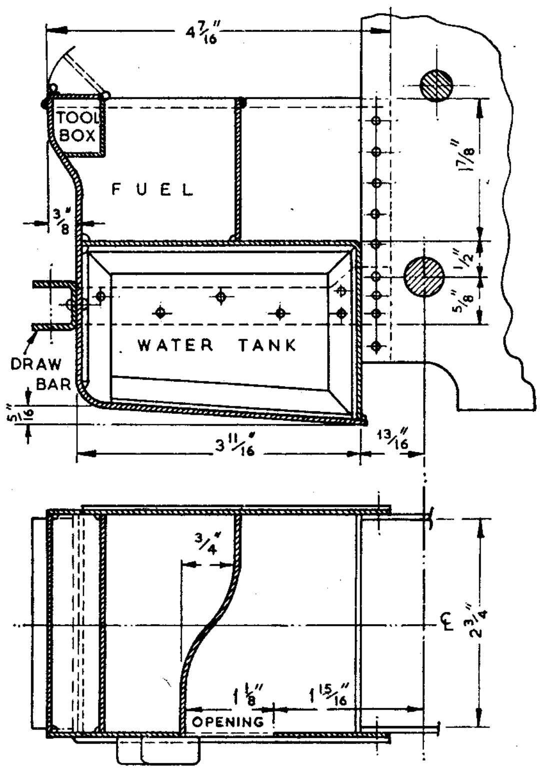


Fig. 1: *Tender platework*

Details of platework

The drag plate, or drawbar already mentioned is shown (Figs 1 and 2), and I have also shown the two steps and the cleaning hole in more detail than was originally illustrated. All sheet metal work is fabricated from 18 or 20 gauge brass, the back, bottom and front being formed of a single sheet 2¾ in. wide. This dimension should be checked against the outside dimension over the hornplates and then adjusted accordingly before cutting the material. The two side plates are then marked off to the dimensions and outlines shown on the drawing. Light section brass angle, to which the plates are riveted, is used throughout. The right-hand side plate is slotted to form the entrance and this is located immediately above the second step.

The dividing plate forming the front of the bunker is curved so as to compromise between the space required for fuel and that required for the driver's footplate. The seat is fitted to this plate and the bracket carrying the brake handle and shaft is bolted to the left-hand side plate. The tank is drilled for the feedwater pipe and the bypass feed from the pump.

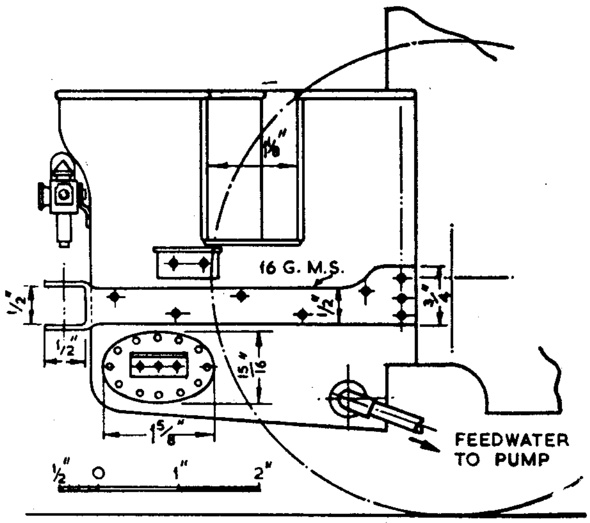


Fig. 2: Assembly of drawbar steps, coverplate and rear lamp

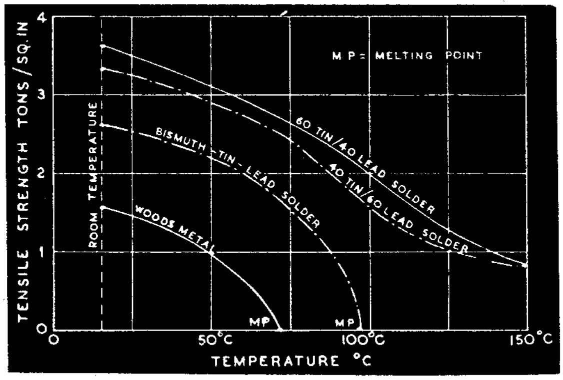


Fig. 3: Strengths of various solders

At an early stage in the assembly of the plates and angles for this part of the traction engine, consideration must be given to the effective sealing of all joints in the water tank by soft soldering.

Soldering information

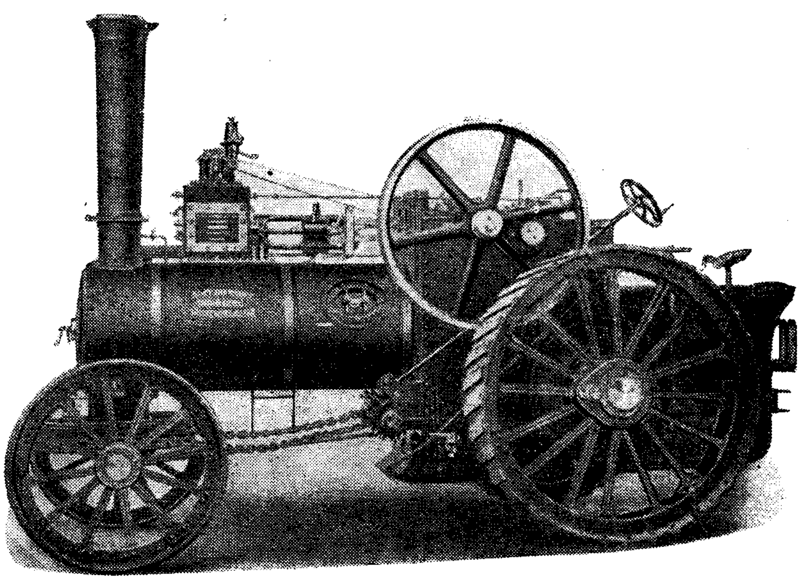
In one of the MODEL ENGINEER data supplements issued a few years ago on the subject of *Solders and Soldering*, it was assumed that the average model engineer was reasonably acquained with the technique and so in this instance I will do the same. The particular supplement also summarised practical data on various solders and fluxes with a special reference to their application. For the beginner having already received practical instruction in the art of soldering, I would recommend *Soldering and Brazing* by A. R. Turpin (Percival Marshall and Co. Ltd). Curves showing the strength of soldered joints ranging from ordinary room temperatures to 150 deg. C are shown in Fig. 3. The melting point of the general purpose, or what is known as 40/60 solder is 228 deg. C.

Further notes on cylinders

In an earlier article in this series, I promised to give consideration to the machining of the cylinder block from a stock bar as I know there are keen machinists and toolmakers who can make light of carving up blocks of metal rather than work on castings. The details I have shown in Fig. 4, are substantially the same as those for a casting except there are extra drilling operations and that the entire block is machined all over. All that is required is a suitable piece of brass bar 2 in. square. The sequence of machining operations can follow those described for the casting; templates and jigs being employed for the same purpose.

In the early days of traction engine construction it was the practice to cast the cylinders complete with a flanged saddle to fit over the cylindrical surface of the boiler. For example, the twin cylinders of Burrell's road locomotive of 1871—a three wheel arrangement—were fitted in this manner. At that period it was a case of the over-type engine superseding the then more common undertype class of road locomotive. Later in the nineteenth century cylinders with flat bases mounted on raised flanged steel saddles were being employed. In point of fact, the saddle functioned in the manner of a steam dome, steam being admitted direct from boiler to the cylinder steam chest. Such an arrangement does not lend itself very well for a 1 in scale model, but for the traction engine builder who wishes to adopt this method for his particular type of road locomotive I append a further drawing (Fig. 5).

There is another feature of slide bar cylinder design that has not yet received attention, and that is the tubular type of slide bar and cylindrical crosshead common to many traction engines including that of the Paxman design. While the ordinary twin bar type is quite satisfactory, there will be those model engineers who will have a preference for the more correct



Flywheel side of Davey Paxman single-cylinder agricultural locomotive

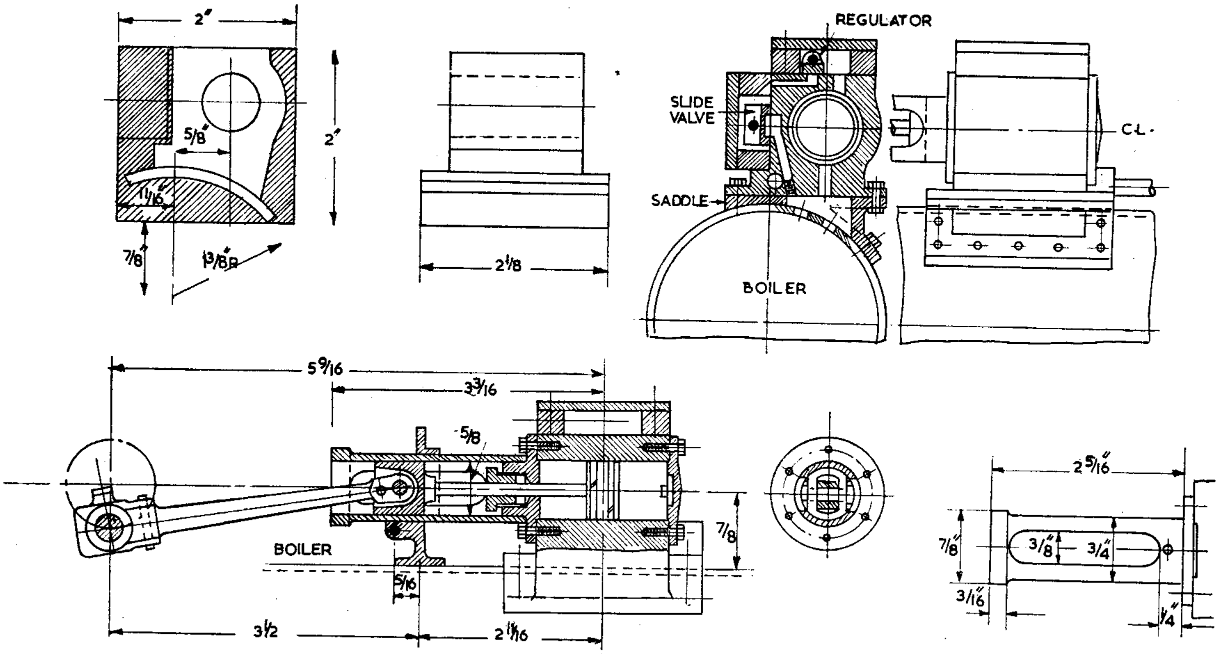


Fig. 4: Cylinder block machined out of stock bar. Fig. 5: Cylinder mounted on saddle. Fig. 6: Tubular guide for crosshead. Fig. 7: Detail of guide

pattern on this small engine. Fig. 6, therefore, shows the alternative arrangement and it will be noticed that both the rear cylinder cover and cast motion bracket will have to be modified accordingly.

The brass or gunmetal guide, is machined from $\frac{7}{8}$ in. round bar bored $\frac{5}{8}$ in. for the cylindrical crosshead. It is made to fit over the cylinder end cover as shown and is then secured in position with 8 BA countersunk screws. These latter should not be too evident in the finished model.

Care must be taken in machining the slots in the tube, so if there is any doubt on the part of the machinist in completing this operation in one step, it is better to scribe off and drill each end under size and remove the remainder of the metal by hacksawing. Having made a rough opening, the work can be completed at the bench by hand filing to size. However, given a vertical slide rest set up on the lathe the slots can be cut out with a $\frac{3}{8}$ in. endmill.

The rounded crosshead calls for but little comment as this small item can be machined from stock steel bar. It is a form of hollow piston which is cored by drilling, milling with a $\frac{1}{4}$ in. endmill, and finishing off by hand to provide a suitable housing for the connecting rod small end.

● *To be concluded on July* 10

IN NEXT WEEK'S ISSUE . . .

Model engineers cover a wide range of subjects—miniature steam engines, model ships and power boats, clocks, workshop equipment, to name a few. Constructing these items calls for a high degree of skill but occasionally someone with a desire to attempt an engineering exercise out of the ordinary tries something really difficult.

Such a personality is F. J. Newcombe, of Bedminster, who has recently been involved in the intricacies of a 35 mm. camera. Photographers, of course, will understand the kind of exacting work demanded in the construction of a precision camera. Yet Mr Newcombe successfully negotiated all the hazards and found his patience and dexterity rewarded with the award of the Silver Medal and Bradbury-Winter Cup at last year's ME Exhibition.

In the issue of July 3 he describes how he built his prize-winning camera, based on the world-renowned Leica design, and he illustrates his article with fully detailed drawings.

Edward Bowness, a famous personality in model ship circles, was at the waterside at the recent Poole regatta. He brings a shrewd mariner's eye to bear on the latest developments in radio control.

There will, of course, be the usual popular features by LBSC, Edgar T. Westbury, Exactus and Geometer, with Martin Evans, in addition to his Jubilee series, taking time off from constructional work for a spot of reporting at the Chingford locomotive trials. Incidentally, he found the Chingford method of testing locomotives very attractive.

CHECKING RACKS AND WORMS

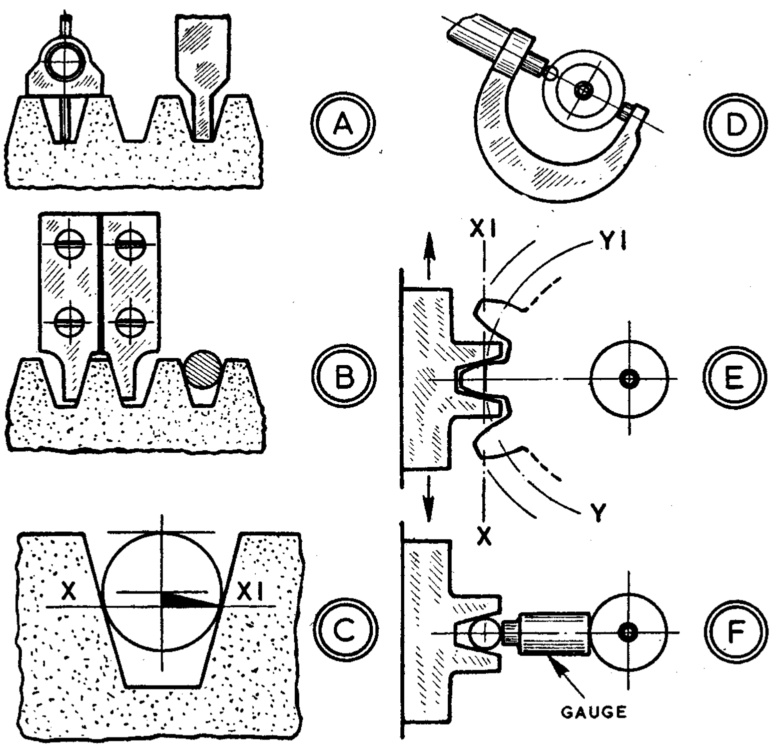
WORKSHOP HINTS and TIPS

By Geometer

GIVEN the pitch—and the proportions which relate to the pitch—of a standard rack or worm thread, the actual dimensions of the whole profile can be obtained by simple multiplication. Hence, in machining, one knows how far to go in certain directions; and when inspecting the result, its accuracy or errors may be realised.

In cutting a rack with a cutter carrying the tooth space profile, the two main considerations are the depth of tooth and the pitch. Depth of tooth may be arrived at by feeding the material the given amount, using a micrometer feed collar; while pitch can be obtained in a similar manner from a feed screw, or by using spacing blocks, or from a jaw fitting into finished teeth. Nevertheless, a cutter—even if originally correct—may wear, and there is always the possibility of spring or slight movement taking place.

In cutting a worm thread in the lathe, similar considerations apply. Depth of form can be taken from the cross feed micrometer collar, while pitch is obtained from the leadscrew and gearing. But owing to the virtual impossibility of employing a full-form tool for the work—from the cuts on three faces jamming—it is necessary to use a narrower tool, taking cuts first on one flank of the thread, and then on the other; which introduces the factor of possible variations in form—a thread either wider or narrower than standard.



A check on depth of tooth or thread is possible using any simple depth gauge, as at *A*, left, first removing any burrs with a smooth file. Depth setting for such a gauge can be from a disc or ring faced in the lathe, filed, or lapped so it can be laid on the surface plate with the depth gauge on top.

Following this check, the width of the tooth space, or of the thread form at the bottom of the groove, can be verified with a small plate gauge, as at *A*, right—which in making can easily be checked with a micrometer for width. Ordinarily, the tooth space settles the result, with the cutter or tool of proper angle, and correct depth obtaining; and even when the profile checks correct in major features by other means, there can still be small errors in the bottom corners (owing to wear on the cutter or tool)—when a gauge of this type is of value in revealing them.

Uniformity of teeth or of a thread throughout its length can be checked by a simple plate gauge, as at *B*, left, made in two pieces adjustable on a backing plate for setting; while uniformity of the spaces or groove may be verified with a rod or ball, as at *B*, right.

A rod or wire making contact at the pitch line, as at *C*, *X-X1*, can ensure that tooth width and space are equal. The sloping side of the small black triangle passes at right-angles from the flank to the centre of the wire; and slope angle is half included angle (14$\frac{1}{2}$ deg. for 29 deg.), while base length is equal to $\frac{1}{4}$ pitch.

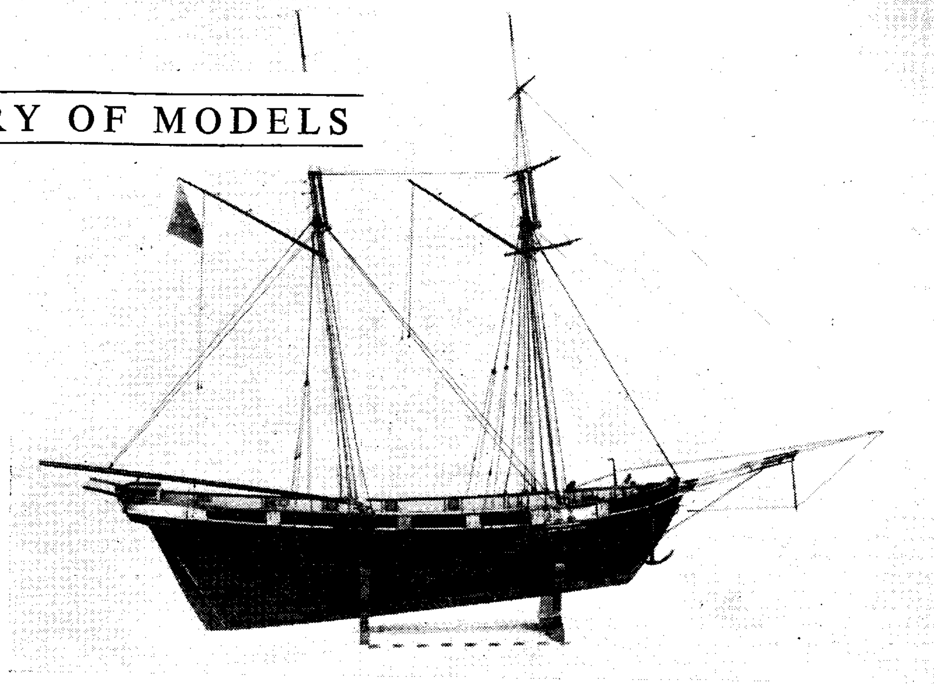
The ratio slope-length/base-length is the secant of the angle; so secant 14$\frac{1}{2}$ deg. × $\frac{1}{4}$ pitch is the radius of the wire. The height pitch line to centre is tangent × $\frac{1}{4}$ pitch—which added to radius of wire gives overall height.

For a worm thread, the spiral angle has an effect, but if it is single-start, large in diameter, and the wire is fitted slightly loose, results are reasonably accurate. A ball being used, as at *D*, grease holds it in place.

Any involute gear of the same pitch and variety will mesh with an involute rack; so an accurate test of gear teeth is possible, as at *E*, mounting the rack on the vertical slide, the gear on a mandrel in the lathe, their pitch lines *X-X1* and *Y-Y1* touching, from setting up as at *F*. ■

A CENTURY OF MODELS

When the British captured an American ship in the War of 1812 they sometimes copied her distinctive points—as JOSEPH MARTIN relates in another tour of the Science Museum, South Kensington



A Sidmouth schooner shows American influence — Crown copyright—Science Museum

Old world learns from the new

HORATIO NELSON was an enthusiast for live steam. The new power had shown its possibilities on water 17 years before his death, and had he lived to turn 60 he would have seen his faith grandly justified in the *Savannah* whose smoke led the Irish to believe that they were looking at a ship on fire.

The 320-ton *Savannah*, the first steam-propelled vessel to cross the Atlantic, was built at New York. This triumph for the young United States, a country sick of the Old World and eager to prove itself, must be accounted entirely fitting, for it was America in the following decades that took the general initiative at sea.

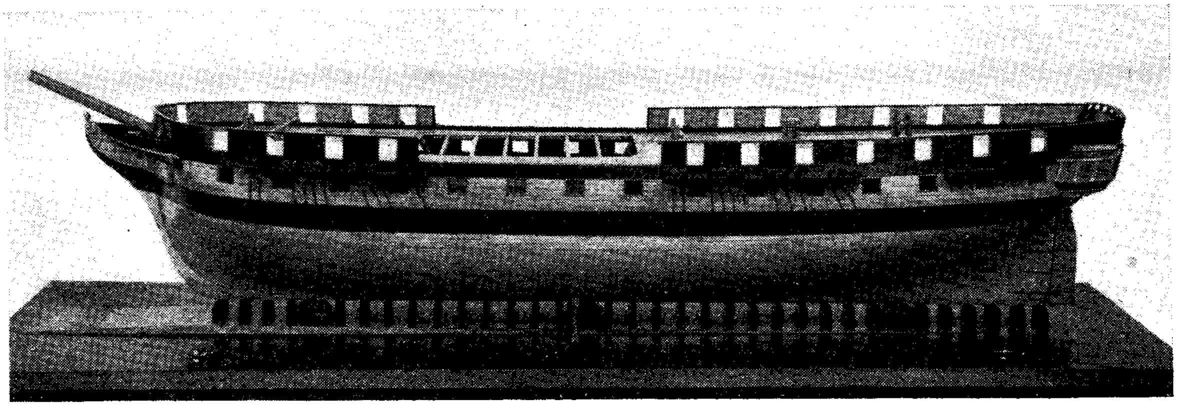
Although the British Navy began to use steam engines as early as 1821 the progress of shipbuilding from the Napoleonic period onwards did not necessarily imply the introduction or development of steam. On the contrary, the new power presented a challenge which brought about a magnificent final flowering of the old. In all the seventeenth century, an age of lovely ships and keen commercial enterprise, not a single important patent seems to have been registered for British ships. Merchant vessels, including those of the East India Company, tended to be small and old. The Navy, which needed 2,000 century-old oaks for every large warship, was gobbling up the timber, and owners were further discouraged by ridiculous restrictions, such as the order requiring every ship of more than 500 tons to carry a chaplain. The challenge of steam changed all this.

But it was not steam alone which shook the authorities from their comfortable sleep; the liveliness of America on the seas disturbed them even more. Yankee ships were formidable in battle and, as the years passed, in the century's increasing trade. With a world needing the wool of Australia and the nitrates of Chile, the Cape had to be rounded and the terrible Horn to be braved. The demand was for big ships and fast ships, and ships that would stand up to any wind that Heaven might send.

Competition was inevitable. As in all great rivalries between nations, victory depended essentially upon ideas. Here the Americans were at a natural advantage. Unhampered by the belief that anything which had existed since Adam or the Stuarts was unquestionably the best that could ever be achieved, they experimented and adapted with all the boldness that has characterised them down to the present day. Soon the old country was learning from the new. Even as early as 1812, when the two were locked in a particularly stupid war, an American vessel captured by the British had a value rather like that of a secret weapon in our own time. The British copied when they thought that imitation was profitable, but the Americans set the pace and for many years enjoyed a supremacy derived from ideas, enterprise and plenty of cheap wood.

To the ship modeller concerned with the nineteenth century, the tracing of American influence is not so much a study as a natural part of knowledge. It can best be illustrated by models.

Without such models the Ships Gallery of the Science Museum in South Kensington would be seriously



incomplete. If we do not find a great many of them—and who would expect a great many in a museum of this kind ?—those which we see are of interest and value both as examples of the modeller's craft and as illustrations to the proud history of ships.

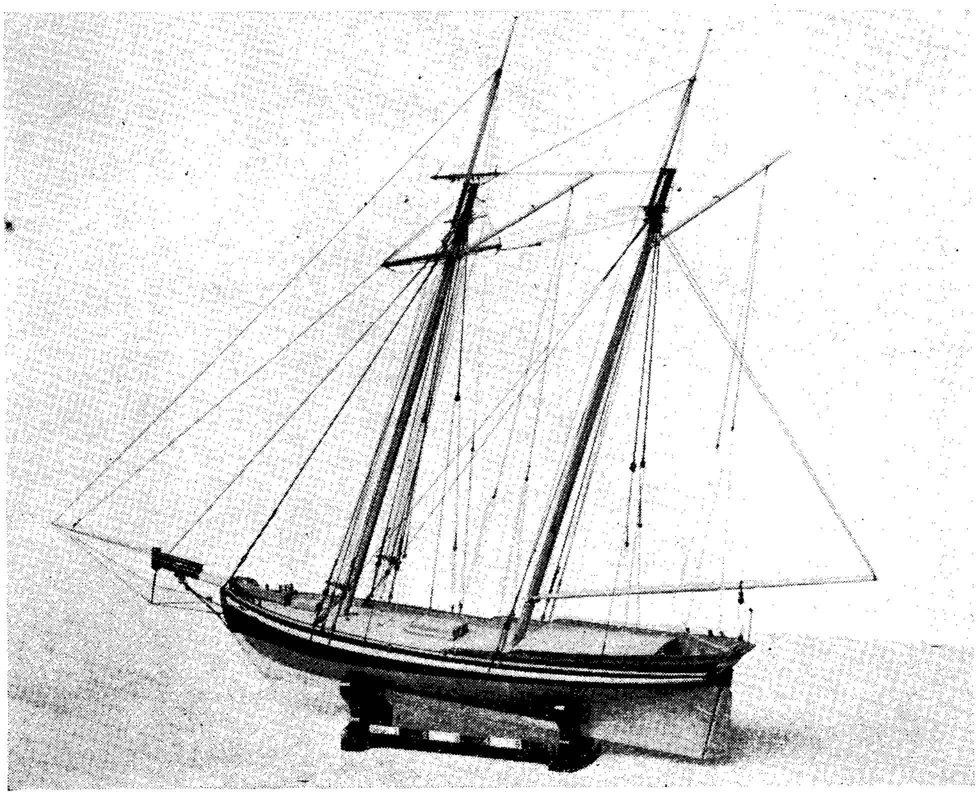
Here, to begin, are models of two American vessels taken during the war of 1812. The *Hannibal* of 1810, a Maryland merchant ship represented at 1 : 48 scale in a half-model presented by the Admiralty, was captured towards the beginning of the war and then served as a ship of the Royal Navy under the name *Andromeda* until she was sold in 1816. In British service she carried 195 men and an armament of 22 32-pdr. carronades and two 12-pdrs. Her burden was 812 tons, her breadth 37.5 ft and her depth 11 ft, with 129.6 ft of gun-deck.

A similar fate befell the *Frolic*, realised at 1 : 48 scale in another half-model from the Admiralty. The *Frolic*, a Charleston sloop of 20 guns, came into British hands in 1814, the year after she was built, and the Royal Navy took her over as *Florida*, a name which had been attached to a piece of America for exactly four centuries ! Under her new flag she had 18 32-pdr carronades and two 9-pdrs, with a complement of 135 men. Her length of gun-deck was 119.5 ft, her breadth 32 ft, her depth 14.2 ft and her burden 539 tons. She was broken up at Chatham in 1819.

I do not know if the British learnt anything from these two captures. But if we pass on to the *Express* of 1815, built at Plymouth by Thomas Roberts, we shall find an example of a British naval schooner which owed

Above: John Pratt had this idea for a frigate of 56 guns

Crown copyright—Science Museum



Right: Similar in line to the AMERICA*: the* 1815 EXPRESS

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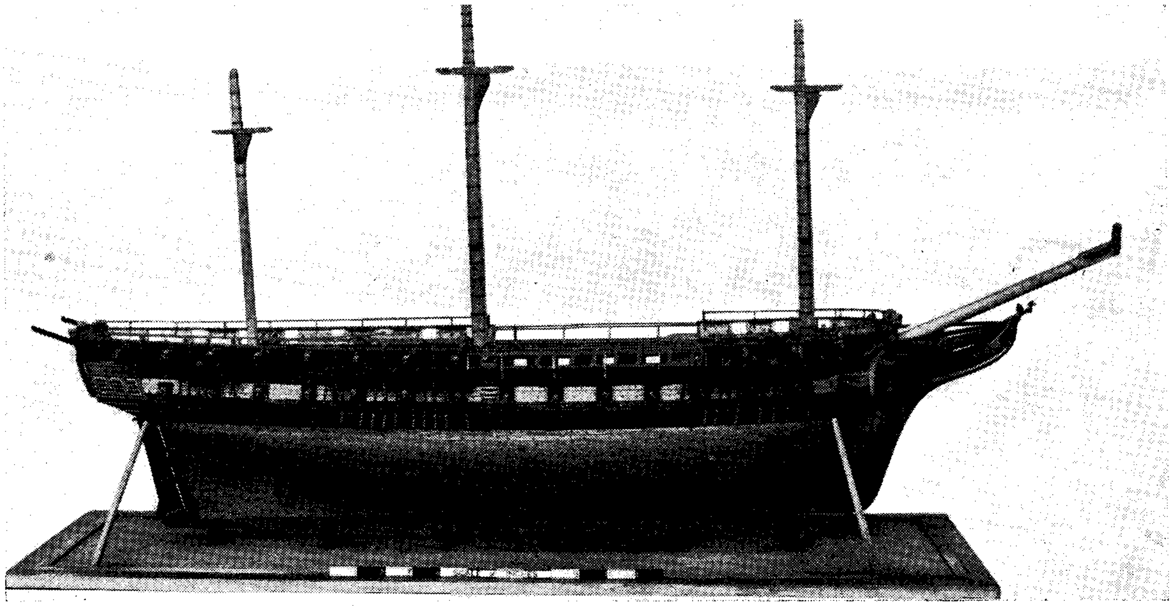

Britain needed heavy frigates that would stand up to Old Ironsides and ships like her
Crown copyright—Science Museum

much in design to the many American schooners which were seized by the Royal Navy. Although intended as a dispatch vessel for the West Indies she was sent to the Mediterranean and was present at the bombardment of the pirate stronghold of Algiers by the Cornishman Edward Pellew (Lord Exmouth) in August 1816. After continued service in the Mediterranean until 1829 she fetched £210 when sold at Malta. She was of 92 tons burden, with length in deck range 64.5 ft, length of keel for tonnage 53.6 ft, extreme breadth 18 ft and depth in hold 7.1 ft.

You can see a picture of the *Express* in the sixth volume of Sir William Laird Clowes's *History of the Royal Navy*, but to appreciate her in full detail you should study Robert Orr's rigged model built from the original draught at the Admiralty. Although the rake of the masts may strike you as extreme, it is in fact correct.

That Yankee rake

American ships were known for their pronounced rake, and the *Express* shows us plainly how the British could be influenced by their prizes. Apart from having a notably shorter bow, she resembles in line the famous yacht *America* built nearly 40 years later. But the English shipbuilders were so fond of the cutter design for small fast craft that nothing could convert them permanently from the straight bow and deep fore-foot.

You may like to compare the *Express* model with the rigged model of another naval schooner later in date by about 15 years. Here the American lines are not copied.

Go back now to the war of 1812. The American 44-gun frigates were worrying the British Navy. Old Ironsides, the U.S.S. *Constitution*, which in peacetime had successfully raced an English frigate for a cask of Madeira, was winning the prizes of war in one victory after another. Obviously the Royal Navy had to build bigger frigates or to suffer further humiliations from an upstart navy which had entered the war with only six frigates and 16 fighting ships in all. Accordingly, Sir William Rule, Surveyor of the Navy, designed the double-decked 60-gun *Leander* of 1,572 tons. The *Leander* and the *Newcastle*, a similar ship, were built on the Thames in 1813.

Among the many fine models with which F. C. Ihlee enriched the Ships Gallery is one of a heavy frigate whose dimensions, read from the scale of 1 : 48, agree to within a foot with those of the *Leander*. But some of the important details—such as the number of gun piercings and the gap in the model's bulwarks—do not agree, and the model may therefore illustrate not an actual ship but a project for a frigate capable of meeting the great American vessels on better terms.

Certainly another model in the museum is of this kind. It depicts a frigate of 56 guns, steep-decked and wide for her length. John Pratt, a shipwright at Deptford Dockyard, made the model during the war of 1812 to present his idea of a design for a heavy frigate, and the model descended to his grandson William E. Allum, who gave it to the Science Museum.

Fast with the fruit

American influence is markedly expressed in the contemporary rigged model of a Sidmouth trading schooner such as plied in the West Indies fruit trade. Built to a design which originated in America, the *Emma* nevertheless kept the characteristic deep heel of the fruit clippers which were, of course, built for speed. Steel's *Naval Architecture* has a picture of a Virginia-built boat fitted for a privateer which resembles a somewhat smaller *Emma* and also, more arrestingly, the 210-ton 12-gun American schooner *Non Pareil* which can be seen in half-model at the National Maritime Museum. The *Non Pareil* was seized in 1808 and perhaps those shrewd people down in Sidmouth took a good look at her. Rigged as a topsail-schooner, the *Emma* had a gaff-mainsail and gaff-topsail on her mainmast, a gaff-foresail on her foremast with a main-topmast staysail above it, and on bowsprit and jib-boom a fore-staysail, jib and fore-topmast staysail. Like the *Non Pareil* she was of about 210 tons.

● *To be continued*

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Progress with the masts and rigging brings the model to a point where we enjoy the clipper's full beauty

CUTTY SARK

By Edward Bowness

Continued from 12 June 1958, pages 757 to 759

When discussing the mast tops in the previous instalment I made no reference to the fact that they are not at right angles to the masts, although this was shown in the drawings Figs 37 and 38. Actually, they are arranged to be parallel with the waterline, presumably to provide a horizontal platform for the men working in the tops. This applies of course more particularly to work in port.

The same feature is found in the topmasts, the trestle trees and the spreaders for the backstays also being arranged parallel with the waterline. This feature was not universal in sailing ships, some builders setting the tops, trestle trees and spreaders at right angles to the masts. Personally I consider that the level tops add a touch of smartness to a ship, especially when the masts are raked to any considerable extent.

The mast caps, however, at both lower and topmasts are set at right angles to the masts, this being a simpler and more mechanical arrangement, especially as strength is the main requirement and looks are not affected.

Rake of the masts

In *Cutty Sark* the rake aft of the foremast is 4 deg., that of the mainmast 5 deg., and that of the mizen 6 deg., giving the angles for the tops of 94, 95 and 96 deg., respectively as shown in Fig. 37.

At one period the bowsprit cap was always fitted so as to lie in a vertical plane, but by the mid-19th century this custom was dying out and the cap was often fitted at right angles to the bowsprit. In *Cutty Sark* this is certainly the case.

At this stage, the modeller should decide on his plan of action with regard to the rigging of his model. Some builders prefer to prepare all the bits and pieces before they start to rig the model, having the masts and spars rigged before they erect them on the hull. To my mind this deprives one of much of the fascination of ship modelling, which for me is to watch the model growing and becoming more like the finished ship as the work proceeds. I find the same pleasure in watching progress in the shipyard. From the day the frames are being put into position one can visualise the finished ship, and when she ultimately reaches the fitting out basin the work becomes still more fascinating, especially when the final painting is being done and the finishing touches applied.

This was seen in *Cutty Sark* herself during her restoration. For months, and even years, there seemed to the eye to be very little progress, but towards the completion when the masts were being rigged and the yards crossed, progress seemed very rapid. The interest increased continually until she was completed.

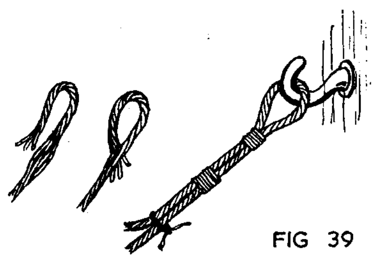


FIG 39

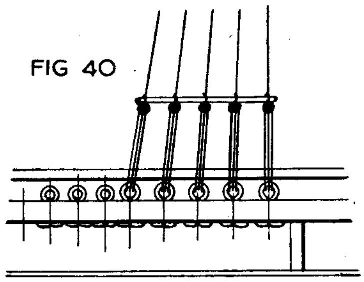


FIG 40

Fig. 39: *Methods for making eyes*
Fig. 40: *Sheer poles and deadeyes*

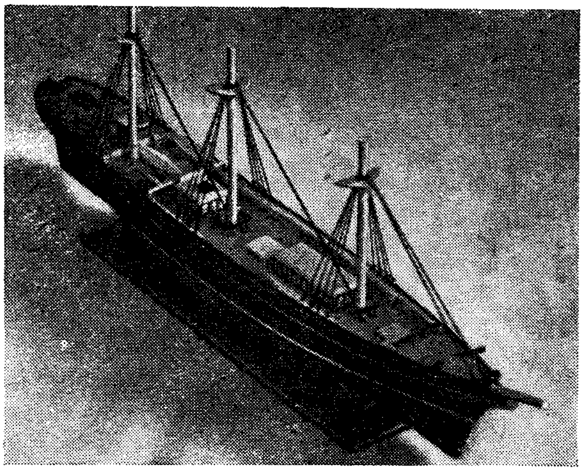
Shrouds and stays

Before actually stepping the lower masts, the shrouds and stays should be prepared. These are made of black linen thread, not cotton as it is too fluffy. Most, if not all, of the standing rigging of *Cutty Sark* is of wire, so it must be kept fine in the model. No 16 thread if used for the lower shrouds and stays is overscale in diameter, but it could be used with Nos 24, 36 and 40 thread for the upper rigging, as otherwise the rigging will appear to be all of the same diameter. For the finest items in the rigging surgical silk was always recommended, and I have used it in repairing bone models, but in these days some extremely fine varieties of nylon thread are available.

There are five shrouds on each side of each of the three masts. Five lengths of thread should be cut off for each mast, those for the fore and main being 11 in. long, and for the mizen 10 in. Four lengths for each mast should be folded in the middle and an eye $\frac{1}{4}$ in. long made by seizing—binding the neck of the eye with fine cotton or Sylko. The fifth length should have an eye splice or a cut splice in the middle, but at the small scale of our model it will be sufficient to take a turn around the masthead and lead the ends down on either side. The stays, which are of the same thread as the shrouds, are double for the fore and mainmasts and single for the mizen. The fore and mainstays have an eye about $\frac{5}{8}$ in. long in the middle, but the mizen stay has an eye at its upper end only. This must be made by splicing or seizing.

Splicing (model fashion)

Many ship modellers fight shy of making a splice but it is not really difficult, in fact it is often easier than making an eye by seizing. If the thread is twisted back against its normal twist at the correct distance from the end the strands will open up, after which the strands at the end of the thread can be worked into the openings. Apply a spot of adhesive and press the protruding ends close to the thread as it sets and you will have an eye which is both strong and seamanlike. Where seizing is necessary, the loop should be formed with a long end which can be secured temporarily by knotting a thread over it. The seizing can then be put on at the correct place using Sylko or very fine thread, after which the long end



In this picture by Angus Bowness the lower masts are in position

can be cut off neatly. It is essential that the looped end be held securely in a hook or similar contrivance while the seizing is being bound on (Fig. 39).

Erection of lower masts

To erect the lower masts, insert them into their respective holes after having first put a spot of adhesive at the base of each. The holes should not be too tight for the masts, as it is an advantage to be able to adjust the angle of the mast when setting up the shrouds and stays. Beginning with the mizenmast, loop a pair of the shrouds over the masthead and bring the ends down on the starboard side through the hole provided in the mast top, securing them temporarily into the eye at the end of the pinrail and the next one further aft. The next pair is then looped over the masthead and brought down on the port side through the hole in the top and secured in the corresponding eyes. The next two pairs should be treated similarly, fitting the starboard first, and then the port, and securing the ends on each side in the third and fourth eyes. The fifth shroud, as already stated, should take a turn around the masthead, crossing the ends on the after side of the mast. The ends should then be brought down on either side through the holes in the mast top and secured in the fifth eye on each side.

Spacing of the shrouds

At this point I must apologise for a slight discrepancy which has crept into my drawing of the pinrail (Fig. 10, March 20) I have shown the five shrouds for the fore and mainmasts spread over a width of $\frac{3}{4}$ in., and the first of the smaller dots which represent the eys for the backstays between the fourth and fifth shrouds. This was usual practice on most sailing ships but apparently not on *Cutty Sark*, as I discovered on a recent visit to the ship. It is important that the spacing of the shrouds should be equal, so that if the eyes have been put in the rail strictly as shown on the drawing, the backstay from the cap should be secured at the small eye between the fourth and fifth shrouds, crossing over the fifth shroud. In this way it will at least represent the more usual practice.

To get back to our mast. Now that the shrouds are temporarily in position they should be pulled tight until the mast is truly vertical when viewed from forward or aft, and each one securely knotted to its eye. Do not cut off the ends at this stage. The rake as viewed from the sides should be a little more than the correct figure so that when the stay is fitted and pulled tight it will pull up to the correct angle and at the same time tighten the shrouds.

Mizen stay

We must now fit the mizen stay. A tiny pin—the broken off point of a needle is useful here—should be driven in the after side of the mast $\frac{1}{4}$ in. above the mast top to prevent the loop of the stay from slipping down. The stay should now be looped over the masthead and led down to the afterside of the main-mast, where it is secured $\frac{7}{16}$ in. above the deck. A tiny staple should be driven into the mast to receive it. Check the rake of the mast when adjusting the tension of the stay.

The erection of the main lower mast follows the same procedure as that for the mizen, except for the difference in the stay. The stay is double, and the lower ends are secured to the deck on each side. As showing the strain taken by these stays, they are continued below deck in the actual ship in the form of a pair of long bolts which are secured lower down in the fabric of the hull. These bolts should be noticed when one visits the ship, being clearly visible in the 'tween decks.

The neatest way to fix the lower end of the stays in the model is to make a small hole in the correct position, using a fine bradawl or a shoemaker's awl. Having previously shaped a small stick or a slip of bamboo to a fine point, put a spot of Durofix on the point and, holding the stay tight, press it into the hole. A slight sideways movement breaks off the point of the stick and leaves it in the hole with the thread. Later the stick can be trimmed flush and the end of the thread cut off. Having fixed both ends of the stay in this manner, put on a seizing just aft of the foremast, drawing them together and further tightening them. A little adhesive on the seizings will ensure their permanence.

Erecting the foremast

The erection of the foremast is similar to that of the mainmast. The lower ends of the stay are fixed in the deck in the same way but space is rather limited. On the ship they are fixed to eyes in the after side of the knightheads as will be seen in the photograph on page 289 (March 6), passing over the pinrail to do so. The ends of the stays are provided with hearts, and hauled tight with lanyards. In the model I suggest we peg them down to the deck to avoid splitting the knightheads. To do this, they should be passed under the pinrail and pegged down immediately forward of it on each side of the bowsprit. It will be noted that the ends of this stay are not seized together as was the case with the mainstay.

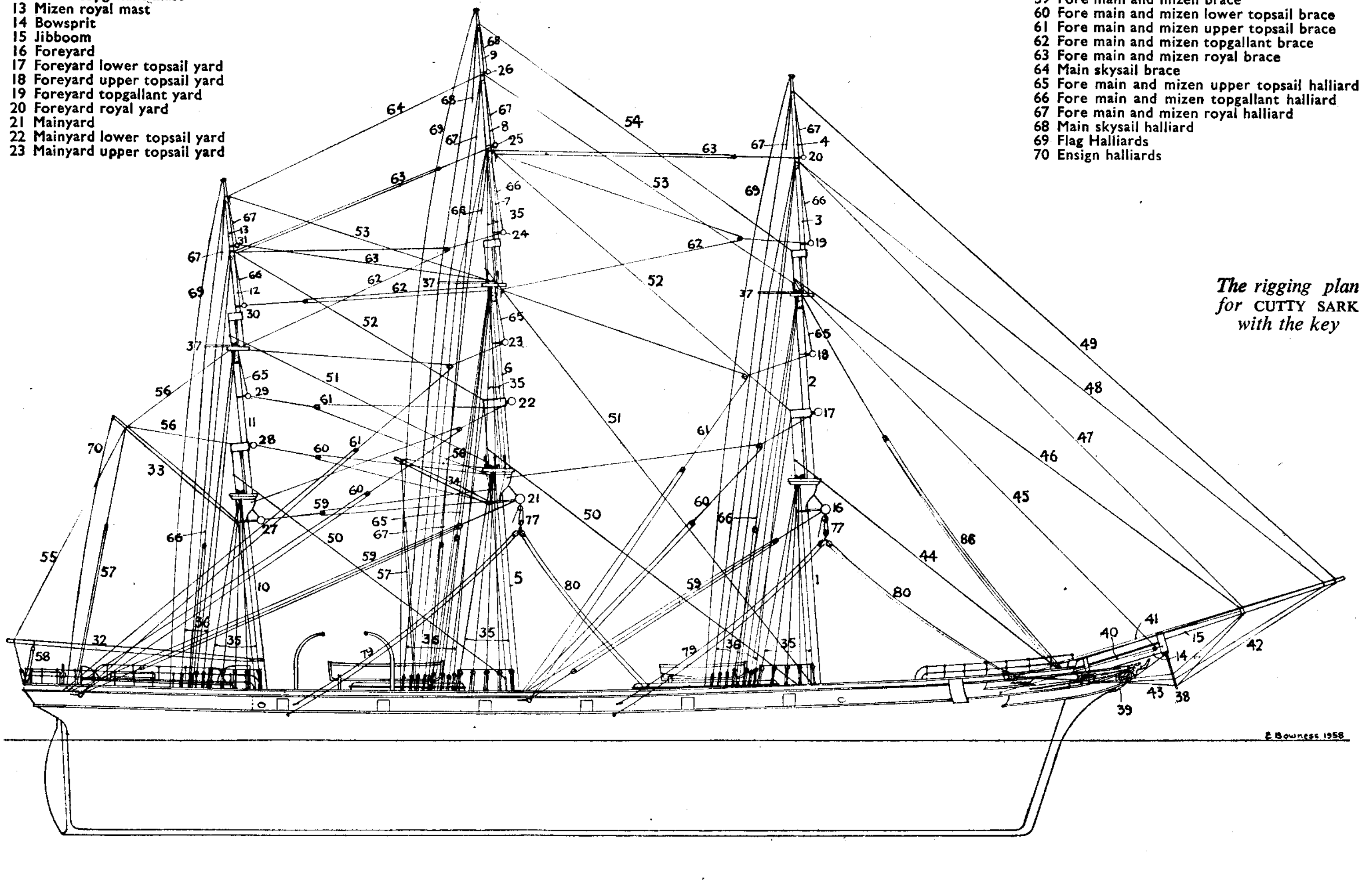
Sheer poles are fixed in the shrouds immediately above the deadeyes, (Fig. 40), for these, six pieces are of fine wire 23/32 in. long and should be cut off and glued on the shrouds $\frac{3}{16}$ in. above the rail. The ends of the shrouds should then be brought up and tied in a series of knots at the sheer pole, so as to secure it to the shrouds. If the knot is touched with a spot of Durofix, this can be rounded off with a pointed instrument as it sets so as to represent the deadeye. The double, or treble thread will suggest the lanyard.

The model has now reached the stage of the model in the photograph and is already something interesting to have around and something which suggests the beauty of the ship as a whole. In the Rigging Plan (Fig. 41) the shrouds have been omitted from the fore and mizenmasts for the sake of clearness.

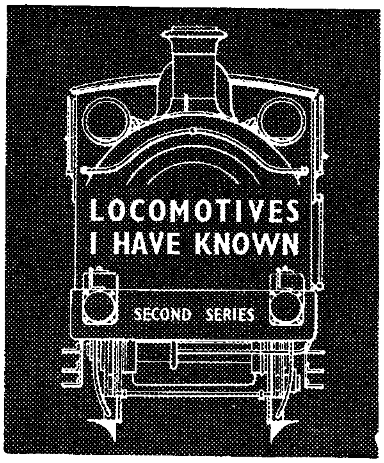
● *To be continued on July 10*

Key to Rigging Plan

1 Foremast
2 Foremast topmast
3 Foremast topgallant mast
4 Foremast royal mast
5 Mainmast
6 Mainmast t opmast
7 Mainmast topgallant mast
8 Mainmast royal mast
9 Mainmast skysail mast
10 Mizenmast
11 Mizen topmast
12 Mizen topgallant mast
13 Mizen royal mast
14 Bowsprit
15 Jibboom
16 Foreyard
17 Foreyard lower topsail yard
18 Foreyard upper topsail yard
19 Foreyard topgallant yard
20 Foreyard royal yard
21 Mainyard
22 Mainyard lower topsail yard
23 Mainyard upper topsail yard
24 Mainyard topgallant yard
25 Mainyard royal yard
26 Mainyard skysail yard
27 Mizen or cro' jack yard
28 Mizen lower topsail yard
29 Mizen upper topsail yard
30 Mizen topgallant yard
31 Mizen royal yard
32 Spanker boom
33 Spanker gaff
34 Spencer gaff
35 Shrouds
36 Backstays
37 Spreaders
38 Martingale
39 Bobstay
40 Bowsprit shrouds
41 Jibboom guys
42 Martingale stays
43 Martingale guys
44 Fore stay
45 Fore topmast stay
46 Jib stay
47 Fore topgallant stay
48 Fore jib stay
49 Fore royal stay
50 Main and mizen stay
51 Main and mizen topmast stay
52 Main and mizen topgallant stay
53 Main and mizen royal stay
54 Main skysail stay
55 Spanker boom topping lift
56 Spanker and spencer gaff topping lift
57 Spanker and spencer gaff vangs
58 Spanker sheet
59 Fore main and mizen brace
60 Fore main and mizen lower topsail brace
61 Fore main and mizen upper topsail brace
62 Fore main and mizen topgallant brace
63 Fore main and mizen royal brace
64 Main skysail brace
65 Fore main and mizen upper topsail halliard
66 Fore main and mizen topgallant halliard
67 Fore main and mizen royal halliard
68 Main skysail halliard
69 Flag Halliards
70 Ensign halliards



The rigging plan for CUTTY SARK *with the key*



By J. N. MASKELYNE

LBSC
Stroudley's Bi
goods en

BETWEEN 1882 and 1887, W. Stroudley, who loved to do things on a big scale, built 12 very fine 0-6-0 tender engines, primarily for working the heaviest goods trains on the LBSCR.

The engines, known as the Large C class, were numbered **421** to **432** and were built in three batches: Nos **421** to **426** between June and November, 1882; Nos **427** to **429** in May, 1884, and Nos **430** to **432** in June 1887. At the time, these were the largest 0-6-0s that had been seen on a British railway, and their advent caused considerable interest in railway circles.

Officially, this class was designated C1; to the staff the engines were known as Jumbos, with a certain amount of justification. They were the most powerful engines on the line, if not in the country, when they were new, and they worked the heaviest goods trains with unqualified success. At the same time, they were all fitted with the Westinghouse air brake so that they could be used on passenger trains when required.

As a boy, I was much impressed by these engines; their boilers were the largest that Stroudley ever designed, which gave the engines a grand, massive aspect that could hardly fail to attract attention. In later years, I often regretted that nobody, apparently, thought of rebuilding the 0-4-2 Gladstones with C1 boilers; there would have been no difficulty, from the technical point of view, but probably the weight would have been too great for the frames. In any case, the centre line would have had to be pitched higher, so as to clear the 6 ft 6 in. coupled wheels, and that may have been one of the reasons why the Big Jumbo boiler was never used for the Gladstone class.

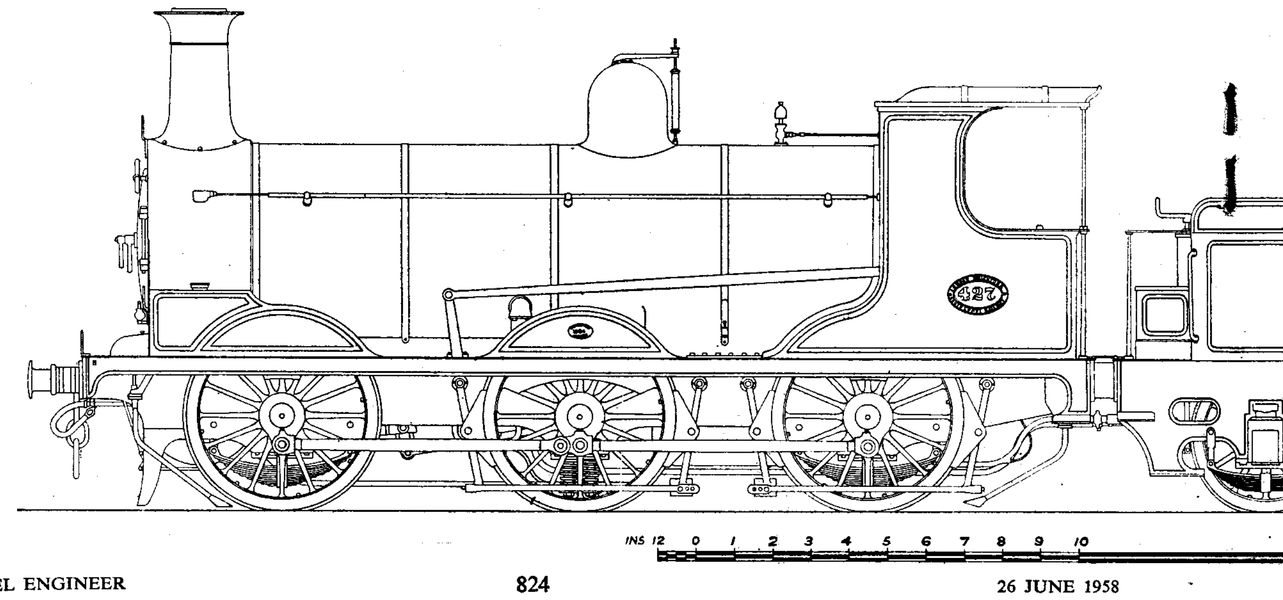
The C1 class engines had the following dimensions: cylinders 18¼ in. dia. and 26 in. stroke, cast together in one piece with the steam chest which was underneath the cylinders; it was, in fact, the same casting as was used in the Gladstone class. The inclination of the cylinders, downwards from the front, was 1 in 11½, while that of the valves, upwards, was 1 in 15; this arrangement gave a direct drive from the main cranks, as well as from the valve eccentrics to the valves, and did away with any necessity for rocking shafts.

The steam ports were 1⅜ in. × 15 in. and the exhaust ports 2 in. × 15 in., the latter being somewhat on the small side for such large cylinders; but since the engines were not intended to run at express train speeds, the comparatively small exhaust ports would probably be no handicap.

The main frames were of steel, 1 in. thick, and the wheels were 5 ft dia. The wheelbase was 15 ft 3 in. divided into 7 ft 9 in. plus 7 ft 6 in., and the overhangs were 5 ft 1½ in. at the front, and 5 ft 10¼ in. at the back, the total length of the frames being 26 ft 2¾ in.

The boiler barrel was made in three rings, 4 ft 5¾ in., 4 ft 6⅞ in. and 4 ft 8 in. dia., respectively; its length was 10 ft 2 in. and its centre line was 7 ft 1 in. above rail level. A big firebox, 6 ft 8¼ in. long and 4 ft 1 in. wide, was provided; the grate sloped steeply, being 5 ft deep at the front, rising to 3 ft 4 in. depth at the back so as to clear the trailing axle. The grate area was 20.95 sq. ft.

There were 317 tubes of 1½ in. dia., giving a heating surface of 1,312 sq. ft.; the heating surface of the firebox was 101 sq. ft. so that the total amounted to 1,413 sq. ft. As was customary on Stroudley's engines, the dome was mounted on the back ring of the boiler barrel, and carried two salter spring balanced safety valves set to blow at 150 p.s.i.



SCR

Big Jumbo

engines

In working order, the engine weight was 40 tons 7 cwt, the leading axle supporting 13 tons 14 cwt, the driving axle 14 tons, and the trailing axle 12 tons 13 cwt; these weights are surprisingly low for such a large engine, but none of Stroudley's engines was really heavy.

Another interesting point was that the 12 engines of this class had only ten tenders between them, and all these were secondhand. This was due to the fact that the singlewheelers *Grosvenor* and *Abergavenny*, four of the 6 ft 6 in. 0-4-2 engines of Class D3 and four of the 5 ft 6 in. engines of class D2 had all acquired new tenders of the standard inside framed passenger type, releasing the former outside framed tenders for use on the C1 goods engines. About ten years later, C1 class engine No 423 was supplied with one of the inside framed passenger tenders from an engine that had been scrapped, thereby reducing the deficiency to one. Fully loaded, the outside framed tender weighed 32 tons 15 cwt, so that the total weight of an engine and tender, was 73 tons 2 cwt.

These tenders, by the way, were quite interesting, and it is worth noting that, when Dugald Drummond left the post of Stroudley's chief draughtsman at Brighton, to become locomotive engineer of the North British Railway, he adopted precisely the same type of tender. The capacity was for 2,520 gallons of water and 6½ tons of coal; the wheelbase was 12 ft equally divided, and the overhangs were 4 ft 3¼ in. in front and 3 ft 9¼ in. at the back. The overall length of engine and tender was 48 ft 7 in.

The C1 class engines were painted in the usual goods engine livery, which was a dark olive green picked out with black striping, having a fine red line on each side of it in the case of those engines equipped with the Westinghouse brake. Except for the fine copper cap for the chimney, decoration was not lavish. The wheels were olive green with black tyres, and the axle ends, where they showed in the bosses, were black. A nice little touch was that the coupling rods were painted olive green along their length up to within 3 in. of the coupling rod pins, where they were left bright.

The reach rod was bright steel, and I must add that in engines 421 to 426 it was behind the firebox lagging, emerging into view just above the driving splasher; in engines 427 to 432, it was outside the lagging, as seen in my drawing. The bufferbeams were vermilion with a narrow black margin having a white line on its inner edge, the buffer sockets were olive green with black striping and red lines.

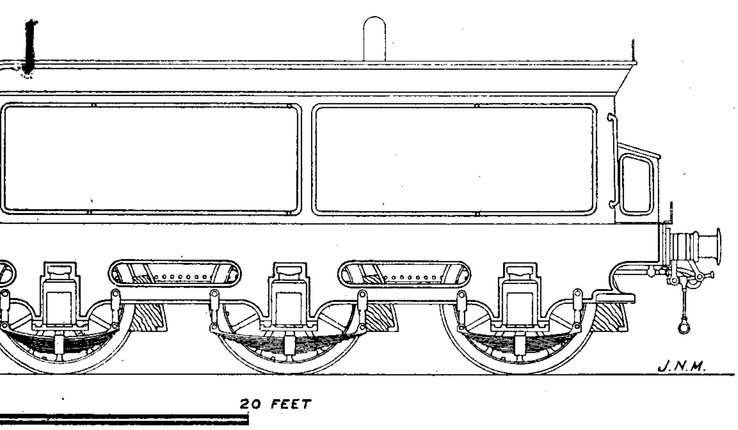
The numberplates were brass castings, the company's title set between two oval black lines, being rendered in sunk black letters on the polished border; the figures of the engine's number were slightly raised and polished on a sky blue background. On the tender coping, at the back, the engine's number appeared in beautiful little hand painted miniatures of the figures on the numberplates.

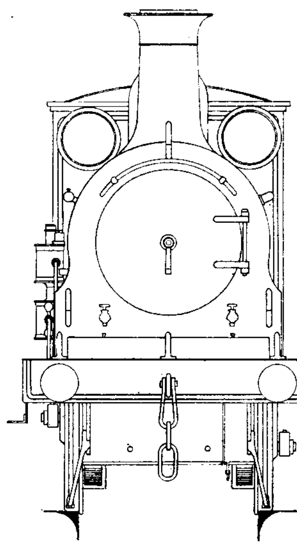
The main frames of the engine were black; those of the tender were olive green with the edges and cutouts bordered with a narrow black stripe and red line. The coal well, top of the tender tank and the exhaust steam dome were painted red oxide colour, just the plain shop colour without any special finish. The inside of the cab was light brown, down to waist level, and black below that.

These very fine 0-6-0s were not very often to be seen; they seemed to do most of their work at night, and matters were not helped by the fact that by no means all the class was stationed in London. A few were at Battersea and New Cross, but the rest were at Brighton and Portsmouth (Fratton), and possibly some of these did not come nearer to London than Norwood yards.

No 428 was sold to the Stratford-on Avon and Midland Junction Railway in 1920, eventually becoming LMSR No 2303; I used to see her sometimes at Fenny Compton, when on my way to Birmingham. On the SMJR she was No 7.

In December 1914, No 430 was used to work a special troop train all the way from Brighton to Doncaster, Yorks, via London Bridge, Metropolitan Junction, Farringdon Street and Kings Cross. The same engine was the last survivor of this class, remaining in service until 1925, whereas all the others, except No 428, had been withdrawn between 1907 and 1911. ▣





PANSY

LBSC concludes instructions for the eccentric straps and rods and goes on to the remaining parts of the valve gear

Continued from 12 June 1958, pages 762 to 764

CONTINUING with the description of the eccentric straps and rods, smooth off any saw marks, screw the halves together, chuck in the four-jaw with the corehole running as truly as possible, face off, and bore to a nice running fit on the sheaves.

Use a piece of $1\frac{3}{4}$ in. round steel, such as an offcut of shafting, for a gauge. Then clamp the strap on the end of the gauge with its own screws, putting a piece of paper or thin foil between gauge and strap to prevent slipping, chuck the gauge in the three-jaw and face off the other side of the strap until it is a bare $\frac{1}{4}$ in. thick.

Before parting, mark the lugs on one side so that the strap can be put together again as machined. Drill and counterbore the oil holes in the steps, and mill away half of the lugs to which the rods will be attached. Note that two have the right-hand half milled off, and two the left-hand half, otherwise you'll find when erecting, that one or more of the oil holes will be upside down. Mistakes are very easy to make !

The rods are made from pieces of $\frac{1}{2}$ in. × $\frac{3}{8}$ in. mild steel a little under 4 in. long. First put a No 14 drill through the wider side of one end of each, at $\frac{1}{4}$ in. from the end. Then if a milling machine isn't available, clamp each under the slide rest tool holder packing to centre height, and run it up to a $\frac{3}{16}$ in. wide saw type cutter on a stub mandrel held in the three-jaw. A thinner cutter can be used if a $\frac{3}{16}$ in. isn't in stock, by taking two or more cuts and using a piece of $\frac{3}{16}$ in. flat steel as a gauge.

The rods can then be milled to shape by the same process described for coupling rods, or they may be hand filed. Note particularly the different offsets of the forks in relation to the rods. The two fore-gear rods have the slots in the forks in line with the thin part of the rods, so that an equal amount should be taken off both sides of the blank when milling or filing. The back gear rods have one side completely straight, the centre line of the fork being $\frac{3}{16}$ in. off the straight side, so that all the milling has to be done on the one side. The ends of the forks can either be rounded off by the coupling rod process, or hand filed, in which case a simple filing jig such as I have described several times, should be used to ensure nicely rounded ends.

The exact distance between the centre of the strap and the hole in the fork should be $4\frac{5}{8}$ in. and as all four must be exactly alike, the assembly should be done on a simple jig. I always use one made up as follows. For the job in hand, get a piece of bar 6 in. long, and about 1 in. × $\frac{1}{8}$ in. section. Scribe a line down the middle, and at about $\frac{3}{8}$ in. from one end, make a centrepop. At $4\frac{5}{8}$ in. distance make another, and drill them both to No 31. Turn a piece of $\frac{3}{16}$ in. round steel to a push fit in the eccentric rod forks, reduce the end to a tight fit in the hole nearest the end of the bar, part off at about $\frac{1}{2}$ in. from the shoulder, and press it into the bar.

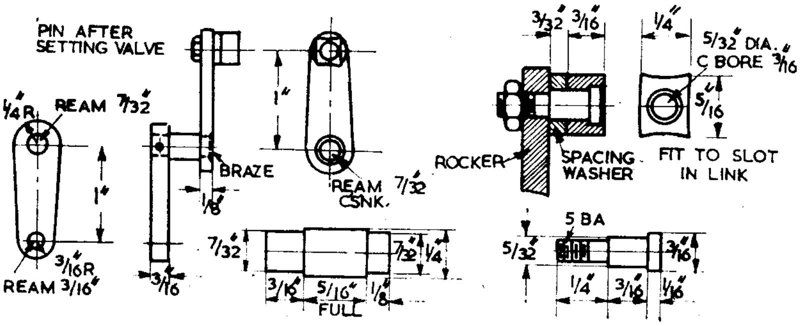
Part off a slice of $1\frac{3}{4}$ in. rod (you can use a slice off the bit used for gauging the bore of the straps), chuck it in the three-jaw, centre and drill No 31, and rivet it to the other end of the bar with a bit of $\frac{1}{8}$ in. round steel instead of an iron or copper rivet. The centres of the disc and pin being the same as the finished eccentric strap and rod, all you have to do is to slip the strap over the disc, put the holes in the fork over the pin, and trim off the wide end of the rod until it fits nicely in the rebate in the side lug of the strap.

May I emphasise once more, take care to get the correct side of the rod fitted to the corresponding rebate in the strap, as shown in the plan view of both fore-gear and back-gear assemblies. To make certain that there is no shifting, sweat them in place with solder before taking the strap and rod off the jig; that will prevent any shifting antics. Then drill two No 43 holes through the lug and rod, countersink both sides, drive in little bits of 3/32 in. mild steel, rivet the ends into the countersinks, and file off flush. Finally, put a $\frac{3}{16}$ in. parallel reamer through the holes in the forks of the fore-gear rods.

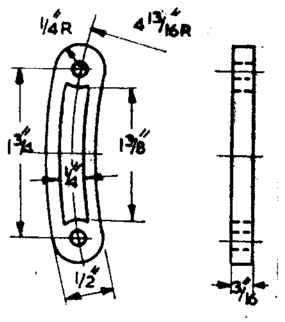
The expansion links on this engine are very simple, as there are no separate lifting blocks and pins to attach to them. The lifting and lowering is done by attaching the lifting links to the end of the pin in each upper eccentric rod fork, as shown in the drawing of the whole gear erected.

The best material to use for the expansion links is cast steel, the kind used for gauge making and known in the trade as ground flat stock. This can be hardened and tempered, and links made from it are next door to unwearable. Failing that, ordinary mild steel can be used, but it will need case-hardening to resist wear. On a piece $\frac{3}{16}$ in. thick, mark out very carefully the outline of the two links, and drill the pinholes with a No 14 drill.

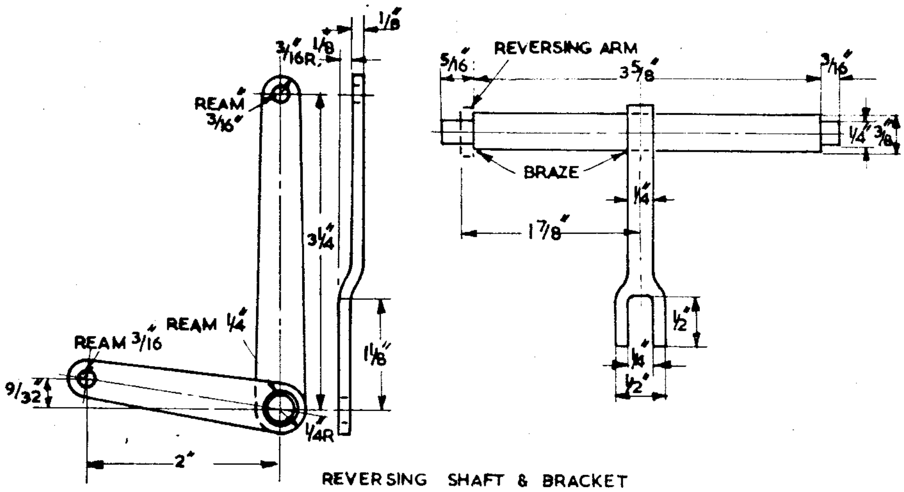
To machine the link slots in the lathe would need an elaborate set-up involving the use of a drilling spindle driven from an overhead shaft, or a separate motor, and when there are only two slots to cut, the job can be



ROCKING SHAFT AND DIE BLOCK



EXPANSION LINK



REVERSING SHAFT & BRACKET

done far quicker by hand. I find it so, anyway. Drill a series of 15/64 in. holes on the centre line of each slot, as close together as possible, and run them into a slot with a $\frac{3}{16}$ in. rat tail file. With a small half-round file, smooth off the sides of the slots until a piece of $\frac{1}{4}$ in. round silver steel can be run from end to end of each slot easily but without shake Ease off the ends to the shape shown.

May I remind beginners that it is advisable to cut the slot first. If spoiled in any way, only the small amount of work is wasted, but spoiling a slot in a link filed to shape would be just too bad! When you have the slots right, file the outside of each link to given dimensions, and put a $\frac{3}{16}$ in. parallel reamer through the pinholes. The links can then be hardened. If cast steel has been used, heat to medium red and plunge into clean cold water. Rub one side of each on a piece of fine emerycloth, lay them on a piece of sheet iron, heat over a gas or spirit flame until the bright parts turn dark yellow, then tip them off into the water.

Rocking shafts

If mild steel is used, heat the links to bright red, roll them in Kasenit, Pearlite or any other good case-hardening powder, taking care to fill up the pinholes, reheat until the powder has fused and the yellow flame died away, and quench in cold water. Clean up, and take care to remove all traces of the powder from the pinholes and slots.

The lower arms of the rocking shaft are milled or filed from $\frac{3}{16}$ in. × $\frac{1}{2}$ in mild steel to size shown. Take care to drill and ream the holes exactly at right angles to the arms. The upper arms can be made similarly from $\frac{1}{2}$ in. × $\frac{1}{8}$ in. mild steel, the hole in the smaller end being drilled to No 30. Countersink the hole in the larger end.

The shaft is turned from $\frac{1}{4}$ in. round silver steel. Chuck a length and turn down $\frac{1}{8}$ in. of the end to a push fit in the hole in the end of the upper arm. Part off at a shade over $\frac{1}{2}$ in. from the shoulder, rechuck and turn the $\frac{3}{16}$ in. length to a very tight fit in the hole in the lower arm. File a couple of small flats on the shorter spigot, and fit it into the upper arm on the side opposite to the countersink. Braze the joint, applying wet flux to the bottom of the arm and filling the countersink. Heat to bright red and touch the joint with a bit of thin soft brass wire, which will melt and run into the countersink and the flats. Be careful to avoid getting any brass on the pin. Let it cool to black, quench in clean cold water, and clean up, filing the surface of the arm quite smooth, so that only the ring of brass around the end of the pin is visible.

The small end of the upper arm carries the die block and a spacer washer. The die block is made from the same kind of steel as the expansion link, and is a simple filing job. It should slide easily from end to end of the slot in the link, but without appreciable shake. Drill a 5/32 in. hole through the middle, and counter-bore it to a depth of 3/32 in. with a $\frac{3}{16}$ in. pin drill. The head of the pin must be well in the counterbore, to avoid fouling the lifting links. The die blocks are hardened in the same way as the expansion links.

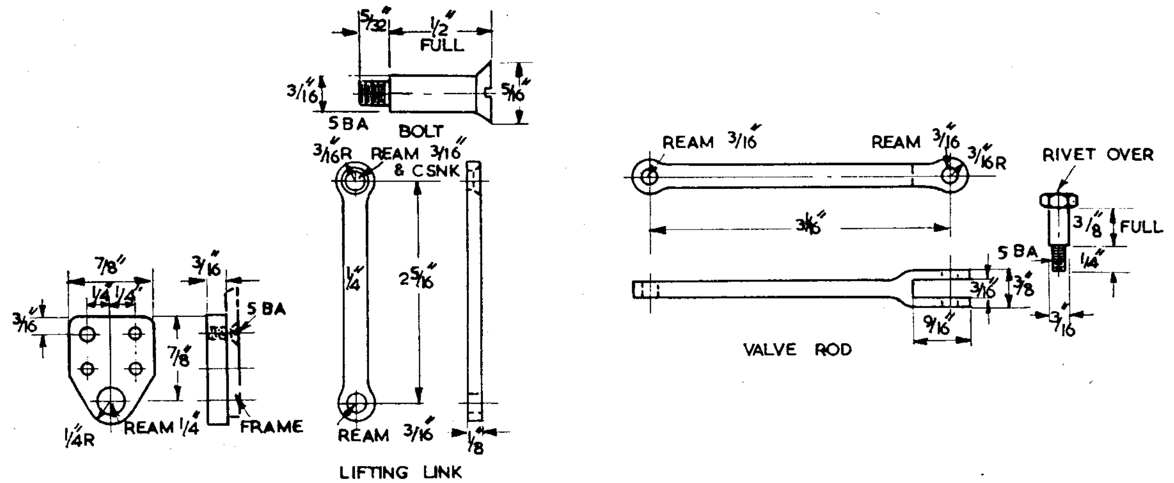
The spacer washer is just a 3/32 in. slice of $\frac{5}{16}$ in. round rod with a No 21 hole in the middle. The pin should be turned from $\frac{3}{16}$ in. silver steel. Chuck a piece and turn it $\frac{1}{4}$ in. length to $\frac{1}{8}$ in. dia. to fit tightly in the hole at the top of the upper arm. Put about $\frac{3}{16}$ in. of $\frac{1}{8}$ in. or 5 BA thread on it. Now turn a full $\frac{3}{16}$ in. length to fit the hole in the die block without shake, and aim for the smoothest possible finish that you can get. One trick is to turn it to a tight fit, and then ease it with a dead smooth flat file or an emery stick. Part off at $\frac{1}{16}$ in. full from the shoulder.

Assemble as shown in the section. Note that the die block must be quite free to oscillate on the pin, without any side shake. If too tight, deepen the counterbore just a shade, until the die block is free when the nut is screwed up tight. Put the shaft through the hole in the bracket on the motion plate with the brazed-on arm nearest centre, and put the other arm on the outer end directly opposite to it. Don't fix it permanently, as the valve setting adjustment is made on this arm before pinning it to the shaft.

Valve rods

The valve rods are made in the same way as described for the eccentric rods, so there is no need to give full details again. The material is $\frac{3}{8}$ in. square mild steel, and all the dimensions are shown in the drawing. If the eye end is case-hardened, and the pin made from $\frac{3}{16}$ in. silver steel, it will be many moons before any wear becomes apparent.

To make the pin, chuck a piece of $\frac{3}{16}$ in. silver steel in the three-jaw, turn $\frac{3}{16}$ in. length to $\frac{1}{8}$ in. dia. and screw $\frac{1}{8}$ in. or 5 BA. Part off at a full $\frac{5}{8}$ in. from the shoulder, rechuck and repeat turning and screwing, but for $\frac{1}{4}$ in. length. Screw a $\frac{1}{8}$ in. or 5 BA commercial nut on the shorter end, and rivet over the projecting bit of thread, so that the nut becomes a fixed head. Pins for all the forked



joints in the valve gear of any engine can be made in the same way, and will give every satisfaction.

Reversing shaft

The reversing shaft, or weighbar shaft as most enginemen call it, is made from a piece of $\frac{3}{8}$ in. round mild steel squared off at each end to an overall length of $4\frac{1}{8}$ in. Chuck in the three-jaw and turn $\frac{5}{16}$ in. of one end to $\frac{1}{4}$ in. dia. then reverse it and turn $\frac{3}{16}$ in. of the other end likewise.

The reversing arm goes on the longer end. Owing to the shaft being below the motion, the reversing arm is a lengthy specimen instead of the usual short one, but is made in the same way, from $\frac{1}{2}$ in. $\times$ $\frac{1}{8}$ in. mild steel strip, to dimensions as shown. At approximately $1\frac{1}{8}$ in. from the centre of the hole in the wider end, put a $\frac{1}{8}$ in. offset in the arm, so that it will lie close to the frame when the shaft is erected.

Only one lifting arm is needed, for reasons which I have already explained, and this is made from $\frac{1}{2}$ in. square mild steel, the process being the same as used in making the eccentric and valve rods. The hole through the plain end should be reamed $\frac{3}{8}$ in. so as to be a tight fit on the shaft. It is located exactly in the centre of the shaft, and before pressing it on, file two small flats on the shaft to allow the brazing material to penetrate right through the joint. I always either do this, or make two or three nicks in the hole, and have never had a joint come loose.

Put the reverse arm on the longer spigot at the end of the shaft, and set it at the angle shown in the side view, so that when it stands vertically, the hole in the forked end of the lifting arm is 9/32 in. above the horizontal. Both lifting and reversing arms may then be brazed to the shaft. Apply wet flux to the inner side of the reversing arm and both sides of the lifting arm; heat to bright red, and touch the joints with a bit of $\frac{1}{16}$ in. brass wire or a $\frac{1}{16}$ in. Sifbronze rod. The result should be a nice neat fillet around each joint. Don't get any brazing material on the spigot projecting beyond the reversing arm. Clean up with fine emerycloth. An old friend, Tom Glazebrook, who served his time as an instrument maker, gets a real bobby dazzle on the valve gears of his engines by finishing the parts on fine emerycloth treated with beeswax.

The brackets carrying the shaft can be made from $\frac{3}{16}$ in. plate, either steel or brass as desired. The dimensions are shown in the drawing, but just drill the screwholes with a No 40 drill until the position of the brackets on the frame has been located.

Lifting links

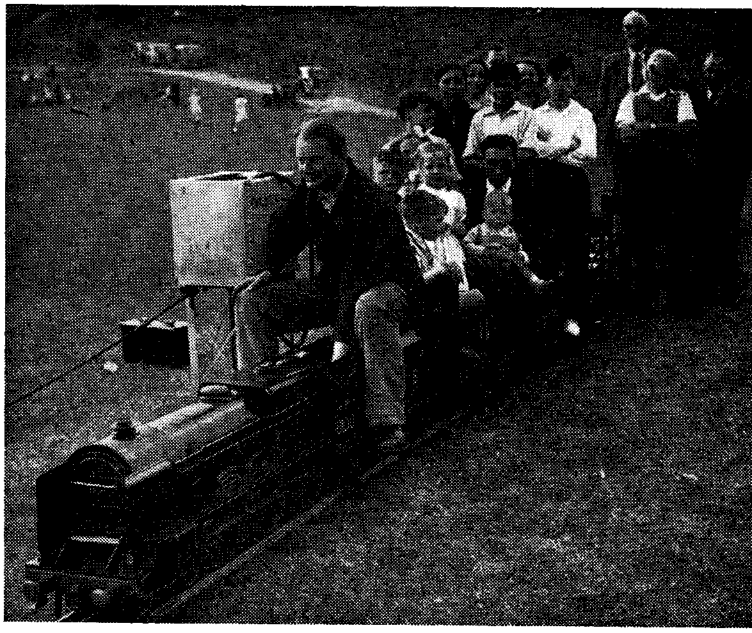
The lifting links are the easiest to make of all the blobs and gadgets, being simply two strips of $\frac{1}{8}$ in. $\times$ $\frac{3}{8}$ in. mild steel milled or filed to the shape shown. Note that the hole at one end of each is countersunk. The bolt can be turned from $\frac{5}{16}$ in. silver steel. Chuck a piece of $\frac{5}{16}$ in. dia., face the end and turn 5/32 in. length to $\frac{1}{8}$ in. dia., screwing $\frac{1}{8}$ in. or 5 BA. Turn the next $\frac{7}{16}$ in. to $\frac{3}{16}$ in. dia., making it a nice working fit in the holes in the fore gear eccentric rod forks and the hole at the upper end of the expansion link. Part off at a full $\frac{1}{2}$ in. from the shoulder, rechuck by the turned part, carefully bevel off the head to fit the countersink in the lifting link, and cut a slot with a fine hacksaw, so that a screwdriver can be used to prevent the bolt from turning when tightening the nut.

First fit the reversing shaft brackets to the frame. The exact location was given in the drawing of the valve gear assembled, viz. the centre of the hole to be 3 in. ahead of the centre of the driving axle, and 5/32 in. above the bottom of the frame. Set a bracket in this position on the outside of the frame, and clamp it temporarily with a toolmakers' cramp. Run a No 40 drill through the holes in the bracket and carry on right through the frame.

Remove the bracket, then open out the holes in the frame with a No 30 drill and countersink them. Tap the holes in the bracket $\frac{1}{8}$ in. or 5 BA and mark it *R* or *L* as the case may be. Most folk do the right-hand side first, for some unknown reason. Ditto repeato operations on the other bracket. Finally put the brackets on the ends of the reverse shaft, push the lot up into place as shown in the recent illustration of the whole valve gear erected, the brackets going inside the frame this time, and fix the brackets with $\frac{1}{8}$ in. or 5 BA countersunk head screws as shown in the detail sketch. Note the reverse arm should be on the right-hand side.

As the forks of the back-gear eccentric rods work between the upper arm of the rocking shaft and the lifting link, no projecting bolts or pins can be used. Put the lower end of the expansion link in the jaws of the fork, and squeeze a piece of $\frac{3}{16}$ in. silver steel through the lot. This should be tight in the holes of the fork, but a nice working fit in the hole in the link. If the pin is slack in the fork, as it may be if the drill has cut large, slightly countersink the holes in the fork and rivet the ends of the pin just sufficiently to prevent it coming out. Both ends of the pin must be filed flush with the fork.

Continued on page 838



Eric Hawkesworth at the controls of his LMS ROYAL SCOT, *No.* 6100 [*By courtesy of DerbyshireTimes*]

Problems of portability

Follow these tips by ERIC HAWKESWORTH and reduce the back-aching work of erecting and dismantling a portable track

MINIATURE railway portability, particularly as applied to the larger passenger-hauling scales, presents many problems to the regular operator of live-steam enterprises.

Heavy engines need specialised equipment to handle them if the job is not to become a back-breaking one. A little forethought during design and construction of a suitable low-loading trailer with geared winch attached solves most of the problems connected with lifting and towing an 8 cwt engine.

Such a trailer was described in MODEL ENGINEER about two years ago and was originally intended to haul a locomotive only. However, a change from running on a permanent track to operation as a portable outfit for fetes and galas, caused me to devise ways and means of fitting up the trailer so that it would handle engine, track and cars at one go. This article is intended to show how this was accomplished, giving a completely mobile $7\frac{1}{4}$ in. gauge railway.

The trailer is a lightweight one built to comply with the no-brakes-under-two-hundredweight ruling. It is of all-steel construction being 30 in. wide across its main members and 12 ft long. Solid bar axle is sprung to the chassis via eight double coil springs and wheels are industrial 4 in. × 16 in. type running on ball races and carrying 25 lb. air pressure apiece. The engine and tender are mounted on a pair of angles laid down the middle of the frame leaving only 8 in. each side.

Outrigger brackets made of 2 in. steel angles (Fig. 1) are bolted permanently at front and back to carry the cars in an upside down position—one truck each side of the engine. Since the trailer mudguards project at a point where the car centre seat backs hang down, these seat backs had to be made to pivot out of the way. Fig. 2 shows in detail how the tubular arm rests provide the pivot points for the folding backs. A long brass locking rod passing through the pivoted back angles and small lugs bolted to the seat angles holds the back in place.

Wingnuts are used to hold the locking rods in position; one is riveted, the other is free. From experience I find that the least one needs spanners the better!

When the first two cars are mounted on the trailer, two steel angles are bolted across their ends to hold everything rigid. A third truck can now be fitted into these angle pieces, upside down like the others. Strips of old rubber inner tube are glued inside the angles to stop chafing the paintwork of the seat backs.

The end view of the loaded trailer shows how the engine fits between two cars with a third car mounted above. Sections of the straight track are carried each side of the top car and the load is held secure by a couple of ropes spanning the lot.

Considerable saving of time is achieved by not having to uncouple the tender from the engine when loading on to the trailer. Fig. 3 depicts the sharp angle of incline between trailer and track and shows how extra clearances were obtained by filing away the mouth of the engine drag-box opening and countersinking the pin hole in the drawbar itself.

Flexible feed pipes between tender and cab ensure easy action when the winch is operated. Prior to this modification, the two units had had to be separated. Fore and aft shackles—bent in the form of U-bolts and anchored to the chassis by wing-nutted bolts—hook round the engine and tender coupling hooks and fix the locomotive firmly to the trailer.

At the time of building the trailer, no suitable winch was commercially available for mounting on the raised platform at the trailer two-bar end. So I decided to go ahead and construct my own winch using the gears from a scrapped hand brace working in conjunction with an ex-WD worm and wheel pairing. Crown and pinion bevel set gave a three to one ratio and the worm pair a six to one ratio, eighteen to one combined.

End plates are of $\frac{3}{16}$ in. m.s. plate and have a base and height to apex of 6 in. Three tie bars, shouldered and tapped quarter BSF, act as spacers to hold the plates at the right distance apart—6 in.

The cable winding drum is built up from quarter plate discs $2\frac{1}{2}$ in. dia. and having eight $\frac{1}{2}$ in. dia. pins let into each disc. These pins are 4 in. long. Heads of pins are riveted flush into countersunk holes. Half-inch holes for the drum spindle are bored centrally and a 6 in. bar is brazed therein.

Crown bevel gear has its centre hole opened up to $\frac{1}{2}$ in. and is fitted over drum spindle and secured to the drum disc with three bolts. Pinion bevel gear and worm wheel are mounted together on a $\frac{5}{16}$ in. lay-shaft spindle as shown. Both gears are pegged firmly to the shaft. Layshaft bracket is cut from a piece of 2 in. channel section steel and bolted to the end plate. All spindle and shaft holes are bronzed bushed, and bronze spacers are used to locate the end movement of the drum and layshaft.

Worm gear is fixed on a $\frac{3}{8}$ in. shaft which is located between its bearing bushes by fixed collars pinned to the shaft. This shaft protrudes through one end bush for a distance of $1\frac{1}{2}$ in. and the actual winch handle bolts to this extension.

Hauling cable is $\frac{3}{16}$ in. dia. stranded wire 12 ft long. Both ends are spliced into loops—one hooks over the engine coupling, the other over a drum pin.

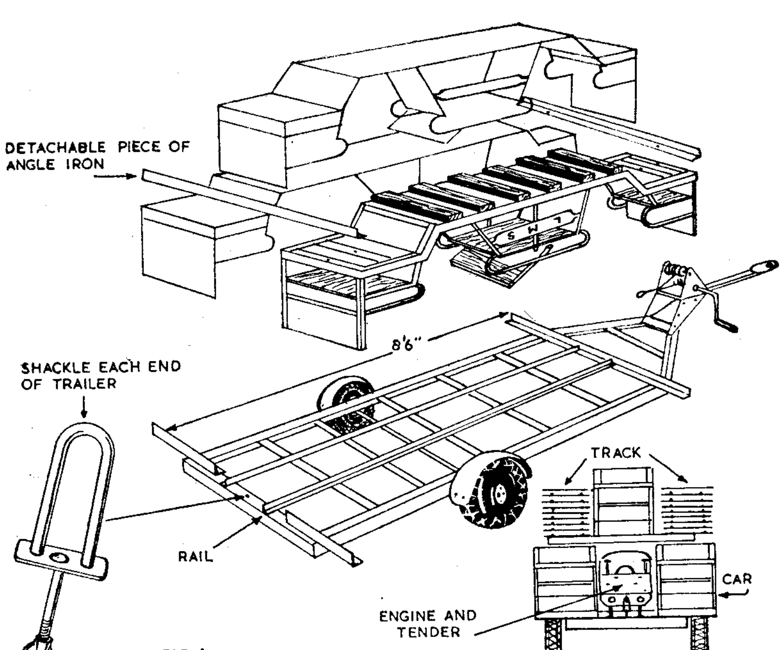


FIG. 1

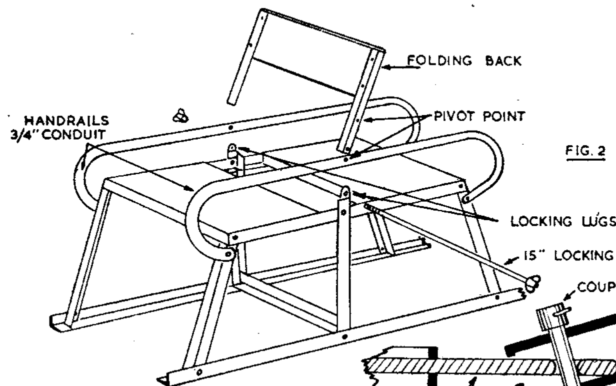


FIG. 2

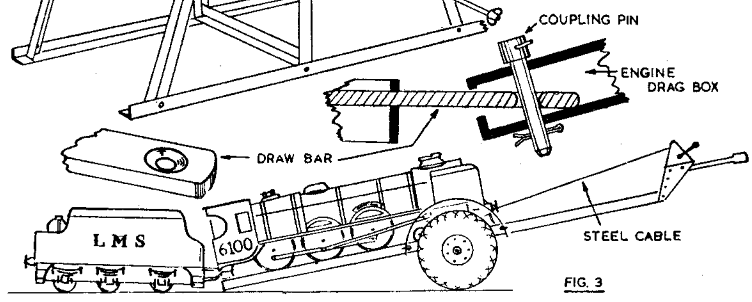


FIG. 3

Four angle-iron feet are the means by which the winch is bolted to the trailer. No ratchet is necessary since the gears are non reversing.

Using the above equipment hauled by an Austin 18 saloon, it was possible to lay the track and have steam up inside an hour of arriving on a site. Half-an-hour after closing down, the trailer was loaded ready for home. ■

BOOK REVIEW

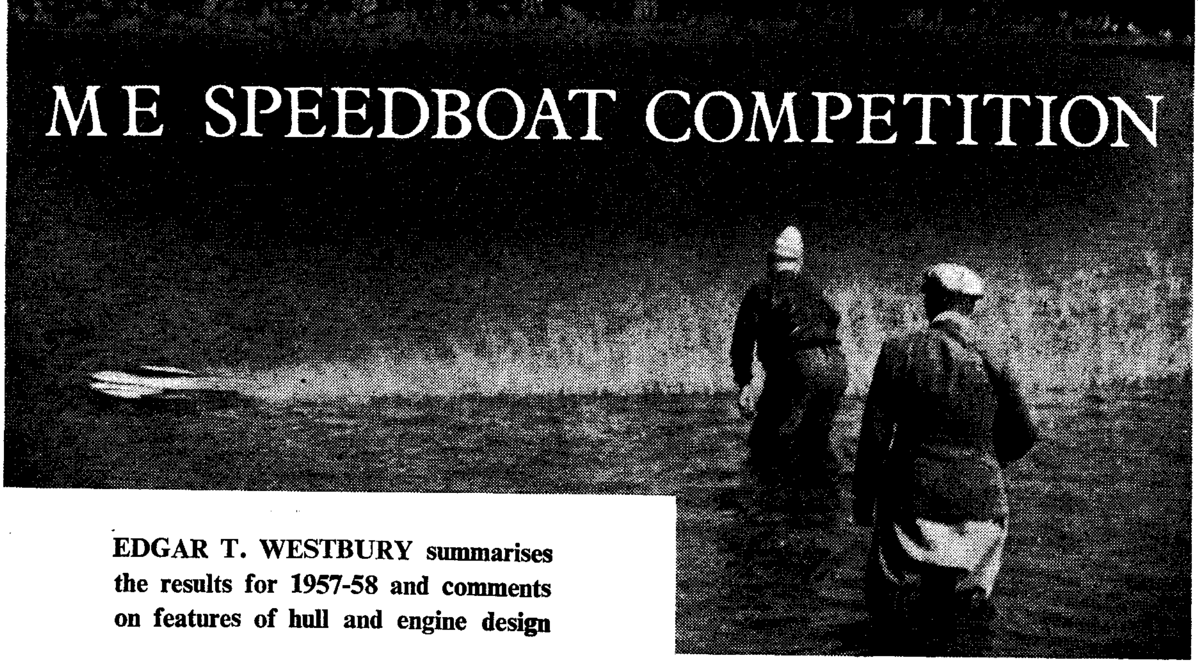
CAREERS

CAREERS ENCYCLOPEDIA, edited by G. H. Chaffe and P. J. Edmonds. (Cleaver Hume Press Ltd). Price 15s.

SOME 240 careers are dealt with, in nearly 700 pages and almost a quarter of a million words, but it is all so well indexed that it takes only a minute to find out what examinations hairdressers ought to take; that Customs Officers at Dover start at £540 per annum and rise to about £1,200; or that you can take Forestry at Bangor University College for a fee of some £63 a year.

The editors have gone to elaborate trouble to secure all these facts; they say that over 90 per cent—all that was possible, in fact—has been vetted by the official bodies. It will certainly be a godsend to teachers and officials and anyone professionally concerned.

ME SPEEDBOAT COMPETITION



EDGAR T. WESTBURY summarises the results for 1957-58 and comments on features of hull and engine design

ALTHOUGH model speedboats are still as popular as ever, the increasing difficulties of improving, or even maintaining the standards of performance set up by the most highly skilled and experienced exponents, tend to limit the number of new challengers; and it is, perhaps, for this reason that the entries in this year's competition are disappointing in number and also that no dark horses have made an appearance. a small margin over those recorded last year (June 6 issue) the general average is consistently higher.

Improvements are not, however, to be judged on speed performance alone. In accordance with the revision of rules put into effect for the first time last year, the ME Speedboat Competition recognises merit in design, workmanship and originality even though these factors may possibly have failed to produce, in full, their intended ultimate results.

Bearing in mind that throughout the years, the primary object of the design must be accorded equal importance; to throw the competition open to all-comers, without restriction as to the use of engines or hulls not made by the competitor(s), would no doubt swell the number of entries, but detract from the special and distinct function of its existence.

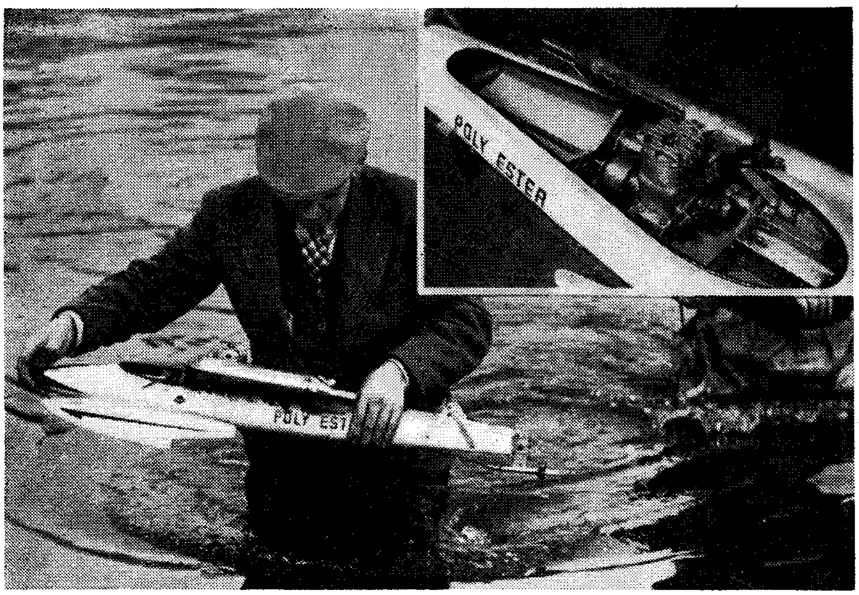
This does not imply any prejudice against the use of ready made products in this competitive field, or against the many races in which they are eligible to compete at club and international regattas during the season, in which speed alone is the arbiter

Name of boat		Owner	Total weight lb.	ENGINE		HULL		PROPELLER				
	c.c.			Bore in.	Stroke in.	Length in.	Max. beam in.	Dia. in.	Pitch in.	Area each blade sq. in.	Speed m.p.h.	Points (Max. 150)
* Poly Ester	30	S. H. Clifford	9¾	1 7/16	1⅛	36	14	3⅜	7	1.18	68.18	110
† Foz 2	10	R. R. Phillips	5	1.015	0.750	28½	12	2.187	7.5	0.42	69.1	105
Nipper 3	15	M. de B. Daly	5½	1⅛	⅞	29	11	3	6½	0.9	65.99	103
Mambo	10	J. W. Jones	4½	0.937	0.875	27½	10¾	2.75	5	0.6	54.3	95
Tally Ho	30	F. W. Waterton	9	1 7/16	1⅛	40	14	3¼	7	0.6	54	88

* Silver Medal. † Bronze Medal.

It may be said that this annual competition has now been established for over half a century, and the records of achievements have shown a steady upward tendency, with very few temporary downward kinks in the curve, throughout the entire period. The present competition shows no exception to this rule; although the maximum speeds achieved only show competition has been the encouragement of progress in experimental design of high performance boats, it will be appreciated that the investigation of promising departures in both the hull and engine must be given due recognition even though their full benefits do not materialise at once. For the same reason, individual enterprise in both these spheres of of success. It simply means that the ME Speedboat Competition remains, as it has always been, reserved for the individual experimenter and constructor who achieves results by his own unaided efforts.

The number of points awarded to each competitor is assessed on the various factors of speed, design, workmanship and originality, the



Two views of the POLY ESTER *owned by S. H. Clifford, showing her distinctive fibreglass hull*

aggregate in each case being shown in the accompanying table. Thus it will be seen that the first place has been won by a boat which, although very slightly below the highest standard in speed attainment, scores notably on other factors. In the remaining cases, all of which exhibit far more evenly matched merits, speed has been the deciding factor.

Hull design

It would, perhaps, be presumptuous to conclude that hull design is reaching finality, or that it does not give much scope for real originality, but it does seem that while the hulls do vary a great deal in external appearance and minor details, the underside design, on which planing efficiency mainly depends, follows general principles. The use of side supporting planes, located fairly well forward, is practically universal, though they are made variously in the form of pontoons, metal skates, or as part of the integral hull structure. The after end is provided with a narrow plane, which is necessary for flotation buoyancy, but usually inoperative under running conditions, as the tail is clear of the water, and is said to plane on the propeller tips.

The modern surface propeller, and the mode of tethering hulls by a fore-and-aft bridle, sometimes supplemented by a stabilising line attached to the engine cylinder or any other high level fixture, undoubtedly encourages this form of hull design, which is peculiar to model speedboats, and gives plenty of ammunition to the critics who condemn them as bearing no resemblance to any full-size boat on earth. At the same time, the modest and patient researches of their experimenters have furnished a great deal of useful data applicable to the design of full-size speed craft, as careful observation of some of the world's fastest boats will prove.

Constructional methods, and hull features do not show much change, generally speaking, as framed hulls with three-ply stressed skin seem to be still most popular, but one really modern innovation is the fibreglass hull, which is at present the subject of much discussion and experiment, and its materialisation in a successful form is exemplified by S. H. Clifford's *Poly Ester*.

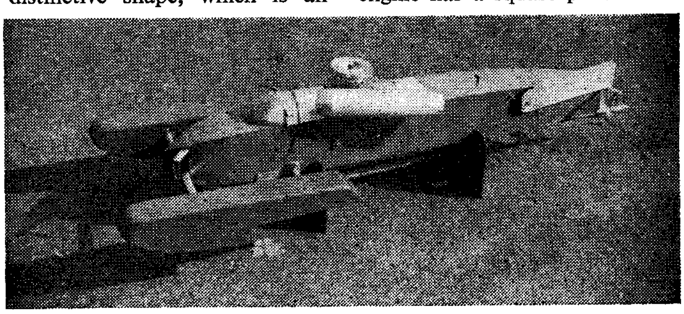
This boat is outstanding, not only as an advance in constructional technique, but also for its graceful and distinctive shape, which is an object lesson in streamlining. It is in this respect, apart from mechanical strength and lightness, that plastic hulls offer entirely new possibilities over wooden construction, though the latter can be improved in shape to reduce air resistance, as shown in F. W. Waterton's *Tally Ho*, and also in that hardy annual, R. Phillips' *Foz* 2, which continues to improve in performance after over five years of really hard work and many mishaps.

Engines

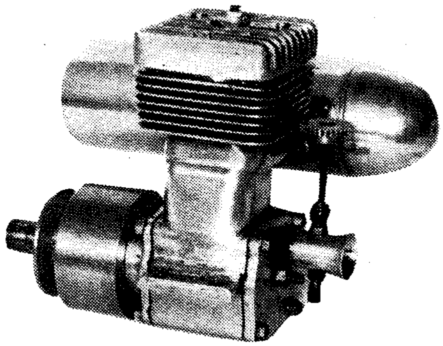
The two-stroke engine appears to reign supreme in this sphere of operation, and the examples entered in this competition are typical in design, with no very distinctive features. In most cases, disc rotary admission valves are employed, the exception being in the 30 c.c. engine of *Poly Ester*, which has a petal type reed valve. At present, the rival merits of the rotary valve and the reed valve—which, by the way, is a modern form of the suction-operated automatic inlet valve used on the earliest types of i.c. engines—are the subject of much discussion in model speedboat circles. It is, however, interesting to observe that in M. de B. Daly's *Nipper* 3, a rotary valve is used, though *Nipper* 2, in last year's competition, had a reed valve fitted.

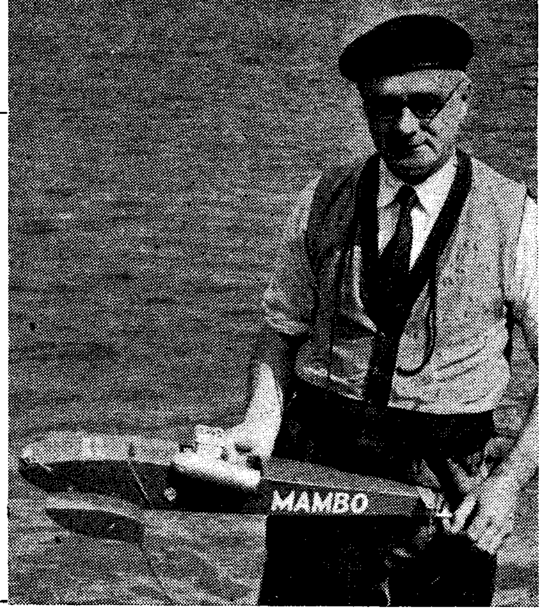
Glow plug ignition is used in all the engines, in conjunction with special fuels, incorporating lubricants and other additives such as nitromethane. There is no doubt that fuel developments have contributed greatly to the improved performance of engines, not only enabling high compression to be used most effectively, but also acting as internal coolants, and thus avoiding many mechanical troubles previously encountered.

A distinctive feature in the appearance of the engine in J. W. Jones' *Mambo* is the rectangular finning of the cylinder, the object of which appears to be to permit deep fins to be employed with minimum air friction at the roots; it is hoped that no readers will imagine that this engine has a square piston!



M. de B. Daly's NIPPER 3 *which is fitted with a rotary valve*





Above: *The* 10 *c.c. engine of* MAMBO, *showing the rectangular finning, and, right*: *J. W. Jones preparing to launch* MAMBO

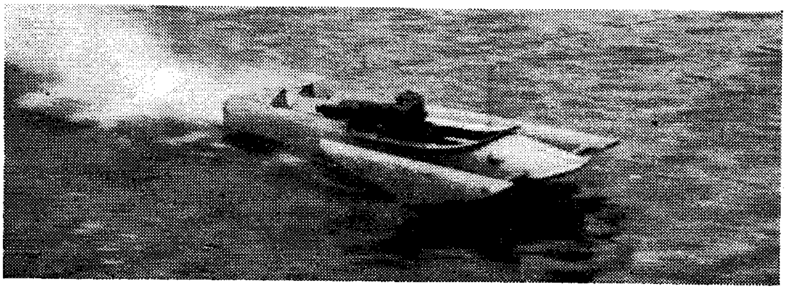
The four-stroke engine seems to be completely out of favour nowadays for model speedboat engines, but it should not be thought that this proves its inferiority for the particular duty. A still more deplorable default is that of the flash steamer, which seems to have become practically an extinct species. In view of the important, and indeed brilliant part which flash steam played in the early development of model speedboats, this can only be regarded as a tragedy; though the praises of flash steam are sung at every pond side, and its virtues just as loudly extolled, none of its devotees seem to follow up their convictions by practical activity.

Propellers

The surface propeller is now universally employed, and according to reports by M. de B. Daly, who has conducted many accurately observed tests, its efficiency can be reasonably high, contrary to general opinion. As described in the report of last year's competition, Mr Daly employs a very ingenious engine speed indicator, in which reduction gearing is employed to alternately raise and lower a signal flag, so that r.p.m. can be counted while the boat is actually running. Knowing the pitch of the propeller, and the distance it should theoretically propel the boat at 100 per cent efficiency, this can be checked against actual speed to calculate the amount of slip.

Using the same propeller as fitted to *Nipper* 2, the propeller slip has been found to be the same on the newer boat, namely 22 per cent, under comparable conditions; but in the run actually recorded, which was under rough water conditions at Victoria Park, the slip was 23.5 per cent. Other propellers have been tested, with pitches up to 9 in. but with smaller blade area, all having swept-back blades, and it is interesting to note that although some of them produce much greater slip, up to 40 per cent, the speed of the boat remains much the same.

Of the propellers fitted to other boats, it will be seen that there is a good deal of divergence in respect of diameter, pitch and blade area, and that these factors are not directly related to the size of the hull or the capacity of the engine. All are of the surface type, two-bladed, and of fabricated construction.



F. W. Waterton's TALLY HO *shown at speed*

All the competitors are well known in model power boat circles and have a record of long experience and perseverance. S. H. Clifford needs no introduction to readers of long standing, in view of his early achievements with the *Chatterbox* series of flash steamers; in later years he has forsaken this form of motive power in favour of i.c. engines. His success has not always been in proportion to the effort and skill devoted to this work but all his boats have had very original and interesting features. For many years a Victoria club member, he is now one of the St Albans team, which appears to hold a monopoly of talent in this field at present.

Speed and prototype

Both Dick Phillips and Frank Waterton are also Verulamians, though the former started with the South London club, and the latter with Altrincham. Whereas one has devoted his attention exclusively to speed, the other has experimented very successfully with prototype craft as well; his tug *Acklam Cross* has traversed nearly all the ponds since well before the war. *Tally Ho* is a new boat, and not yet out of the teething stage; it may well be expected to put up higher speeds during the coming season.

M. de B. Daly is a South London club member and is noted for his methodical approach to technical problems. J. W. Jones appears to be the sole representative of speed in the Maghull club and has persistently ploughed a lone furrow for several years; such success as he has attained is well deserved.

All competitors qualify for certificates of performance, having attained speeds well above the minimum specified for this award. ■

IN THE ME WORKSHOP

Marking out irregular shapes for machining

EXACTUS describes a method of marking out and preparing a casting ready for machining

THE machining of irregular objects always presents its own peculiar problems. Unlike a piece of work that can be gripped in the three-jaw chuck and turned, there is the problem of how the work is to be held, and what to machine first.

To many amateurs, looking at a casting for the first time, it is a little bewildering not knowing just where to start. There is no need, however, to fight shy of the start, for like all things, there is a method of procedure and once you are acquainted with it the problem is half way to being solved.

The first thing before tackling any casting is to study the drawing and take particular notice of the dimensions that are closely related and find a common place from which they can be taken. This position is better known as the datum face, line or hole, and it is from here that all important dimensions are worked.

On drawings used in engineering workshops the datum is clearly marked but on drawings used by model engineers it is conspicuous by its absence. Nevertheless, you will find it a lot easier by deciding on your own datum and following the method used in full-size practice.

For example, imagine that a hole has to be bored in a casting to take a bush (Fig. 1). The important dimension is the height of the bush hole from the base. As the hole is to be bored in a boss protruding from the casting the aim should be to get the hole as symmetrical as possible with the boss.

Apart from the fact that it greatly improves the appearance, if the bush is a press fit, it is not likely to work loose in a hole that can exert even pressure all round. If the face from which the dimensions are to be taken is not flat, or the taper where it is drawn from the mould rather pronounced, correct this first. Usually, a file will do all that is required, but with the taper it may be found necessary to set it up in the lathe and take a light cut.

With a good casting, a liberal allowance of material is made for such early machining, so there is no fear that your casting will finish under size. Once the casting is ready for marking out as in Fig. 1 the first thing to ascertain is the height of the boss.

To do this the scriber is set level, or just touching it at its highest point. The scribing block is then transferred to the rule and a note made of the reading where the scriber touches it. A little tip to make this task easier: fix a toolmaker's clamp to the end of the rule to provide a base. This leaves both hands free for adjusting the scribing block. The rule seen (Fig 4) is held in this manner.

After the reading has been noted the scriber is then reset to a measurement below this, equal to one half the diameter. At this setting the scriber is drawn across the face of the boss making a clear and distinct line. Now that the centre of the boss is marked, a check can be made by comparing this with the finished size by placing the rule against it. Any difference between the finished dimension, and the scribed line is the amount to be removed from the base.

Another way of checking the height against the finished size, is to set the scriber to this size and scribe another line across the face of the boss. The difference between the two lines is the amount to be removed. In either case, the point to remember is that the finished dimension must be below the centre of the boss and not above it. If this is the case, it is quite likely that the casting is scrap.

This is a straightforward example of marking off one hole correctly for height, and central with the boss. With a casting that has several faces and bosses to machine in correct relation to one another there is no need to lose confidence. The procedure is exactly the same and as long as care is exercised in marking out each position there is no reason why it should not turn out satisfactorily.

Let me give another example. In Fig. 2 a crankcase casting is being marked off before any machining is attempted. This casting has a large cored hole which is to be bored to fit the cylinder. With castings of this nature it will be necessary to plug the hole with a wooden bung before marking out.

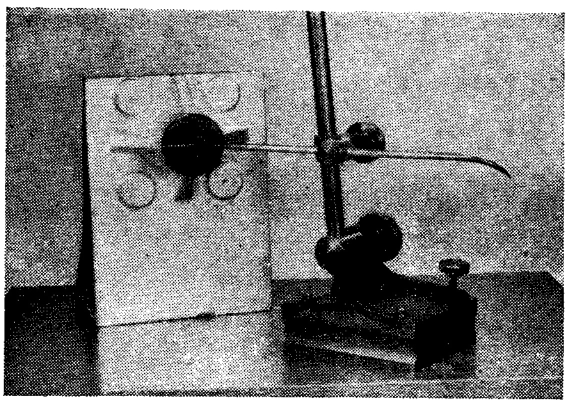


Fig. 1: Marking centre of the boss (Blower support bracket)

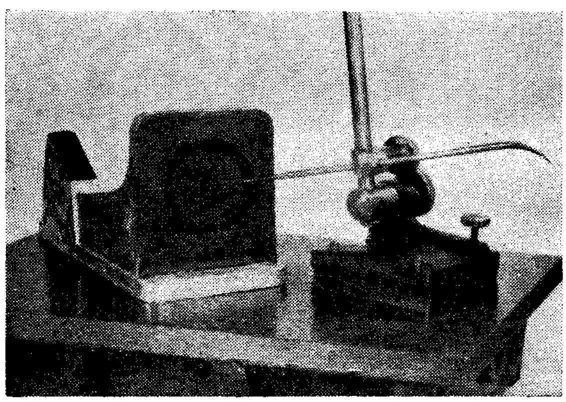


Fig. 2: Marking centre of cored cylinder hole (Centaur gas engine body)

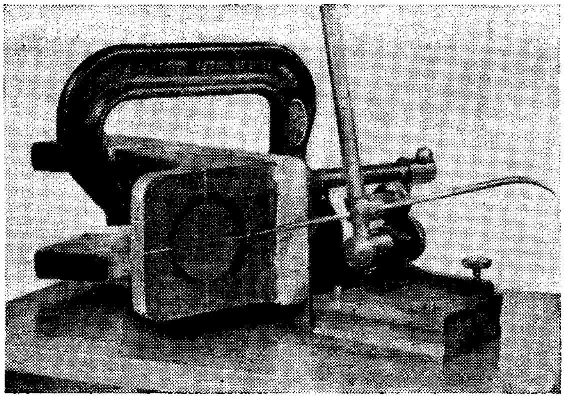


Fig. 3: *Casting on angleplate intersecting scribe line*

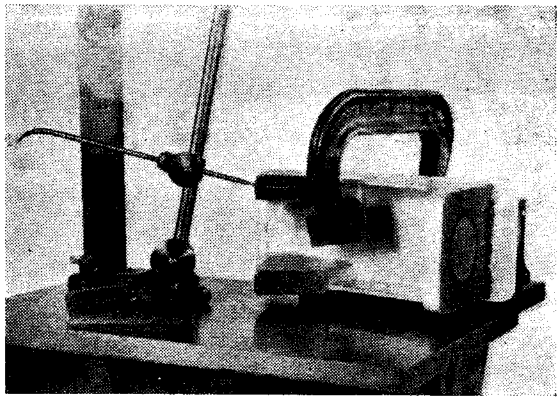


Fig. 4: *Marking position of bolts for main bearings*

The first operation is to mark the centre of the cylinder from the base followed by the position of the fixing holes. The centre is marked in a similar fashion to that used for the boss. The scriber is then set level with the top of the cored hole and then lowered half its diameter and a line scribed across the face (Fig. 2).

When this line is checked with the finished size, and it comes above the scribed line, it does not necessarily mean that the casting is scrap. It means that the boring will have to be done off centre of the cored hole and nothing removed from the base. It is as well to make sure that the base is flat by using a file before the actual boring position is finally marked.

The position of the line finally decided on can be called the datum line, and is scribed along the sides of the casting for marking the position of the main bearings. When all the positions have been marked according to the drawing the casting is then mounted on an angleplate to intersect these lines to give the true position of the holes to be machined. By clamping the casting to the plate by its base, it ensures that all lines now scribed will be at right angles to the previous ones. Fig. 3 shows the centre of the cored hole being scribed intersecting the previous line. This line is also a datum and from it are marked the remaining dimensions of the main bearings (Fig. 4).

With a casting like this, and the two datum lines established, there should be no further difficulty in the remainder of the marking out. When machining commences the right amount will be taken off in the right place and nothing left to guesswork.

As a final example I have chosen a forged crankshaft. The work that is required is the machining of two diameters, the shaft, and the crankpin, and offset in correct relation to each other.

The position of the throw must be marked out before attempting to machine it, as there is a possibility of one of the diameters not cleaning up and the shaft being scrapped. Fig. 5 shows a crankshaft set up in V-blocks for marking out the centres. The crankpin is set at the top or 12 o'clock position by eye, or if one wishes to be more exact the tips of the balanceweight can be set the exact height from the surface plate with the use of the scribing block. Once positioned correctly, the clamp on the V-block is then tightened.

The first position to be marked out is the centre of the shaft, and the procedure is much the same as that used in the boss of the first casting. The scriber is then set at such a height that it just touches either the underside or the top of the shaft, and is then checked alongside the rule. It is reset at a higher or lower level, to a measurement equal to one half the diameter of the shaft, and a line scribed across both ends.

Next, the centre of the crankpin is marked in relation to the shaft, or as some know it better, the throw. Noting the measurement at which the scriber is set, the dimensions of the throw is added, and the scriber reset to it. A line is then scribed across the end of the crankpin and the lug for machining purposes at the other end. Should this line be a lot off the centre, proving that the forging was not very accurate, it may be sufficient to prevent the pin from machining up to its full diameter.

In this case, any alteration that is necessary will also have to be made to the shaft, otherwise the centre of the throw will not be maintained. When these lines are satisfactory, they can be intersected to give the true centres for turning the journals.

The clamp on the V-block is slackened, and the shaft turned 90 deg., the scribed line at the end of the crankpin is lined up to a square on the surface plate, to assist setting. The V-block clamp is then tightened and the same procedure as already described is adopted for intersecting the lines.

When the centres have been marked at both ends they are centrepopped ready for drilling.

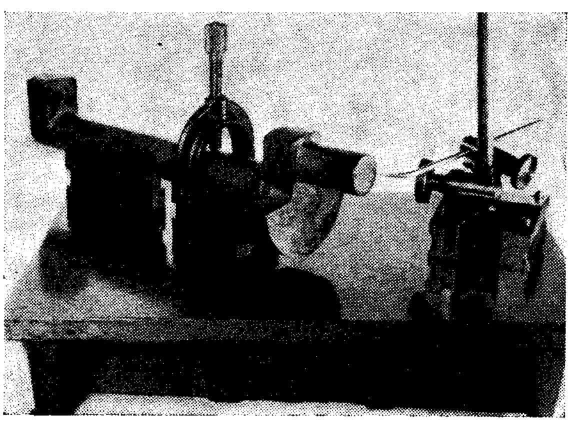


Fig. 5: *Scribing end of crankpin*

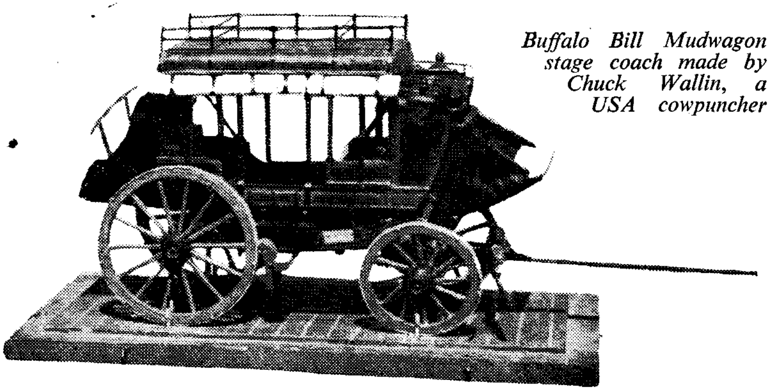
● *To be continued*

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

SIT UP!

SIR,—Vulcan's paragraph, in Smoke Rings of May 22, on "Driving Position" prompts me to tell your readers that this subject has been expertly dealt with by Dr James Cyriax in the May issue of *Family Doctor*, the magazine published by the British Medical Association. Dr Cyriax's article, entitled "Anatomy and Horsepower," has excellent drawings showing what happens to the spine in the driving seat of a car. If any of your readers find that after two or three hours in the driving seat they are dead beat and racked with pain and fatigue, I advise them to get hold of *Family Doctor* (May 1958) and consult this article.



Buffalo Bill Mudwagon stage coach made by Chuck Wallin, a USA cowpuncher

Incidentally, I am wondering whether Vulcan has ever seen anybody really drive with "arms akimbo". It must have been a remarkable feat!

King's Lynn, Norfolk. ROGER NORTH.

MADE IN GERMANY?

SIR,—I have recently purchased second-hand a $6\frac{1}{2}$ in. Trident lathe No 22033/17, manufactured by or for B. Elliot and Co., Willesden. I have written to this firm for any information regarding the lathe—date of manufacture, spares situation, etc., and they have replied that they could not tell me when it was built and also that they had no spares.

Perhaps some of your readers may know something of these machines, and also whether anyone has any spare gears for the gearbox in the headstock pedestal—they appear to be module system gears. The shafts are dimensioned in millimetres which seems to point to German manufacture for B. Elliot, but all threads are Whitworth! Can anyone help me, please?

Dry Sandford, Berks. T. H. MITCHELL.

A WORKSHOP JESTER?

SIR,—Two brilliant scholars of one of our famous schools, deadly rivals in all things, including model engineering and incidentally each other, collected their ABCs and XYZs at the end of their schooling and sallied forth into a world, to conquer. One chose the Navy for his career, the other religion. The years rolled by, and with them a good many of those happy assemblies at the Horticultural Hall, until last Saturday, when our second character, now a bishop, stood in full regalia before the train departure indicator at Waterloo Station. Like most of us at some time or other, his Grace found all those figures a trifle befogging, so casting his eyes about him for a porter, who should he see but his old rival of yester-year, now resplendent in the much braided uniform of a Fleet Admiral.

This was a long awaited opportunity, so summoning all the dignity which goes with so great a calling, he bore down on the Navy, who was quite surprised to hear an edged voice demand, what time is the next train to Southampton, porter? But the Navy is never found wanting in moments of stress, even such as this one, and his smiling reply of, "I do not know," was turned into a shattering broadside by the heavily emphasised final word "Madam."

Is there a snigger in the sunless city, or a heavy frown? If you are about to say you fell out of your high chair laughing that one off, pray don't tempt me to add the obvious. It's easy to see how our bright and interesting Postbag could so easily drift into something guaranteed to split the camp. For humour, like love, is a many splendoured thing, and what has the North in tucks of laughter, just leaves others stone cold. Let's keep Postbag as it is, bright, controversial and informative. So far we have staved off other threatened invasions to our pages, and with these I include, yes, would be humorists. No one will deny the fact that model engineering is a wonderful mental relaxation, and, personally speaking, I find it great fun in itself, and thus have no need for a workshop jester. Not even the L and MR.

Sedlescombe, Sussex. GEORGE W. EVES.

EDWARDIAN ALLIGATOR

SIR,—As a subscriber to the No 1 issue of ME, I was interested to read in the May 22 issue about the Alligator hand-planer.

I bought one in 1910 from the late Hesketh Walker at his shop in Liverpool. The machine had just come on to the market and the price was £5 10s. at that time. Mr Walker told me he had the machine on show at the ME Exhibition in 1910, and how his poor arm ached demonstrating it on the stand.

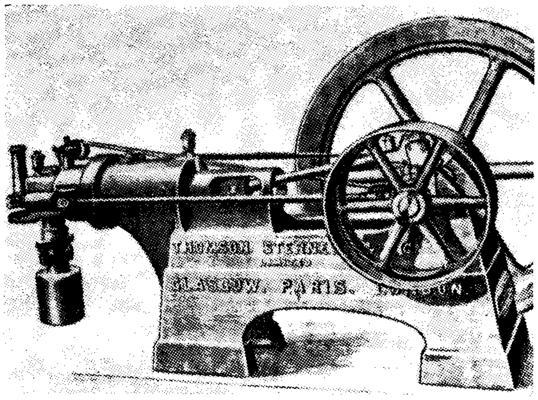
I still have the machine. It is in good order and very useful.

Bebington, Cheshire. A. C. S. JONES.

GAS ENGINE IN 1882

SIR,—When I read the remarks by LBSC on little gas engines in workshops I was reminded of the examples illustrated in an old book on my shelves, *The Metal Turners Handbook* dated 1882, by Paul N. Hasluck, on lathes, tools and power units for the amateur.

The ordinary Crossley engine, on the four-stroke Otto principle, is shown, and also the invention by Mr,



Clerk's two-stroke gas engine by Thomson Sterne and Co., developed in 1881

later Sir, Dugald Clerk, developed and manufactured by Thomson Sterne and Co. of Glasgow, London and Paris in 1881-82, of which an illustration is here reproduced of the two-stroke gas engine.

The engraving shows the engine had two bores, air and gas being mixed and compressed in the first part of the cylinder, then pushed into the smaller second bore and there fired by the tube ignition. Although this machine has two bores in one cylinder, the author of the manual states that originally the compression was done in a second cylinder, with a piston driven from a pin in the flywheel. Observe the valve driven by direct eccentric rod. There was no need for 1 to 2 reduction gear on these engines, and there is screw adjustment to the eccentric rod.

It is evident from the illustration that the stock patterns for a small steam engine were used, and the only special pattern wanted was that for the complicated cylinder with its cored passages. This engine ought to have given much more power than a four-stroke power unit, with gas of the same quality, and on the same floor area, but owing to the two bores, the circular crosshead and abnormal piston, the engine was far more expensive than the Otto type, and its production in small sizes soon ceased. It was, however, developed up to very large sizes to enable lean gas from blast furnaces and producers fed with very poor fuel to be employed.

In these days, such a poor gas would probably be enriched with oil-gas, but this was not thought of in the last century.

The lubricators are plain brass cups; there are no sight feeds, and the ignition tube is to be seen in a stove with a tray underneath to catch any burning soot which might fall down and burn the floor.

Of course, the gas engine was not a practical proposition until petroleum lubricants were on the market, and as these products were developed at the same period, the speed of the engines could be progressively increased, and a new industry was created. It should, of course, be realised that there would have been no working gas engines without the Ramsbottom piston rings introduced years before on the LNWR, the earliest form being shown in *The Practical Mechanic's Journal* in 1855, from the specification in the Patent Office.

Mill Hill, NW7 H. H. NICHOLLS.

TWIN-CYLINDER

SIR,—Fellow readers of ME may be interested in the freelance twin-cylinder traction engine shown here, approximately 20 per cent full size. The entire machine is fabricated, much of it from junk, such as the wheels. The drive is 24-1, by chain to a jack shaft in front of the throatplate. A lawn mower gearing is used, with a right-hand spur welded to a jack shaft and the left-hand side free-in-reverse.

The boiler is 6 in. o.d. × 11-gauge × 33 in. seamless steel with 5 in. off for the smokebox and 10 in. opened up for the firebox area. The rest of the firebox sides are, of course, welded on. Grate area is approximately 5 in. × 9 in. Twelve $\frac{1}{2}$ in. × $\frac{3}{8}$ in. × 20 in. flue tubes are used. It has been hydro tested to 300 lb. (no weep !). All welding is d.c., deep penetration, non-porous.

The twin-cylinder block is 2 in. × 2 in. × 4 in. brass, bushed with commercial bronze. Bore is $1\frac{1}{4}$ in., stroke $1\frac{3}{4}$ in. Valve and throttle faces are $\frac{1}{8}$ in. stainless, with bronze valves. It has Stephenson reversing; all proportions are self-designed. About 500 hours of working time was required. I have a self-made *Juliet*, *Maisie* and *Virginia* and desired this model to try a freelance project to use the splendid schooling of LBSC.

The picture includes my two grandsons, ages $5\frac{1}{2}$ and 4 years.

Wooster, Ohio, USA. ROBERT T. EBERT.

Twin-cylinder traction engine made partly from junk. See Mr Ebert's letter

CALLING MILWAUKEE

SIR,—During the war an American company, The Delta Manufacturing Co., 600-634 E Vienna Avenue, Milwaukee, Wisconsin, made some fine tools for the British War Office, some of which I have.

I have been trying to contact the firm, but my letter has been returned marked: "Address not in directory."

I wondered if this company has been swallowed up by a big combine ?

POSTBAG . . .

If so, perhaps one of your American readers could help me with information.

Congratulations on a fine magazine.

Much Hadham, Herts. R. D. GENT.

ADDING COLOUR

SIR,—Splendid comment in Smoke Rings on the American scene of spindle-wheeled Hubers and Bakers rocking away under the dark blue Ohio dusk! We of the National Traction Engine Club gladly salute the National Threshers *en fete*. We will also take up the challenge for more colour at our British rallies. Entertainment tax liability precludes a cinema show, but we have small exhibitions of pictures.

National Traction Engine Club. HAROLD BONNETT.

ELECTRIC DRILLS

SIR,—Thank you for publishing such an excellent magazine as MODEL ENGINEER. May we have a few more articles on model power boats of the cabin cruiser variety, preferably with radio control, and electric or diesel propulsion?

I have noticed two things in Postbag on which I should like to comment. First, a reader commented on the noise produced by electric drills of the home handyman variety. I am the proud possessor of a Black and Decker type D500 only a few weeks old. It has a grease packed gearbox with helical gearing, and is quite silent in operation (Or are my ears so used to the factory hum that the noise does not register?). The motor is a real precision job, and the chuck is a proper Jacobs geared type. Apart from two points, I am very pleased with it, and I find that it saves me much soul-destroying labour. The two criticisms I would like to make are:

1 There is no provision for oiling the bearings, but the drill doesn't seem to worry at all about this. The omission may be to prevent people from swamping the shaft with oil and getting the brushes and commutator oiled up.

2 The chuck cannot be removed often without dismantling the drill to grip the shaft from behind, as it tightens up in use. Surely the makers could bring the chuck spindle about $\frac{1}{8}$ in. or so out of the case and provide two flats to get a thin spanner on?

Secondly, I have noticed that the material PTFE has been mentioned. This is sometimes turned in the machine shop where I work. I notice that smoking is always banned (at least I have never seen anyone smoking when turning PTFE). I have never known anyone to suffer from ill effects when machining PTFE, and a dust extractor plant is not usually employed. Usually, though, the turner tends to turn the air slightly bluish in colour as he likens its machining properties to those of the domestic candle. On one job some bobbins of PTFE were called for with walls 5 thou thick. As the under-cut in the bobbin was formed the outer wall tended to curl neatly up, leaving the unfortunate turner to straighten it up as best he could by eye!

I feel I must comment on Mr R. L. Graper's statement in A Mixed Bag, June 5. He says that Perspex is one of the finest materials for short-wave work. I remember an article some time ago in a radio magazine where it was stated that Perspex was suitable only for d.c. and audio-frequency work. At high frequency, losses become excessive in this material; thus it is not suitable for short-wave work. This statement has, I believe, been made from time to time in other radio periodicals and books. Was Mr Graper thinking of polythene? This is about the best radio frequency insulator obtainable. It looks in the clear state like clear Perspex and melts at about the same temperature, I believe.

Eastleigh, Hants. DAVID R. COAD.

ULTRA PLEASURE

SIR,—A. A. Sherwood's articles are a real boost to the fine scale fraternity. We "Steam Mice" now have some good tips for practical locomotives in small scales.

Mr Sherwood's advice on burners, cylinder values and ball bearings, are worth noting. I am using all micro ball bearings in a gauge O scale steam locomotive primarily to minimise power losses.

I note more active interest in gauge O steam in ME and though many constructors are "lone wolves," there is a small band of us in the Gauge O Guild who are making progress.

It is not easy, but it is possible with care and patience to get "steam and scene" in small scale.

I think I can say that LBSC has fathered almost all our interests. I hope we shall hear from other model engineers about this rather specialised experience.

Laleham, Middx. W. E. COOPER.

PANSY . . .

Continued from page 828

The motion plate with the rocking shafts attached, may then be erected permanently, as per directions given two weeks ago. Next put the links over the die blocks, free ends upwards, and fit the eccentric straps to the two inner eccentric sheaves. Then fit the other eccentric straps to the outer sheaves, and the forks at the ends of the rods should drop easily over the upper ends of the expansion links, if the parts have all been properly made. I've been often amused by beginners telling me in their letters, that the bits all fitted like pieces of a jigsaw puzzle!

The next item is to fit the two lifting links between the expansion links, the countersunk holes at the top, and facing towards centre. Line up the top of the lifting link, the fore gear eccentric fork, and the top of the expansion link. Put one of the countersunk head bolts through the lot, and secure with a nut. The lower ends of the lifting links are fitted in the fork at the end of the lifting arm, and secured by a bolt made from a piece of $\frac{3}{16}$ in. silver steel turned down and screwed $\frac{1}{8}$ in. or 5 BA at both ends, and fixed with commercial nuts. The bolt must be free to turn by finger pressure when both nuts are tight.

With average workmanship, the valve gear should reverse easily by operating the reversing arm, with the wheels at any part of their revolution. If it doesn't, you've probably got one of the bolts too tight, or maybe one of the eccentric straps has slightly distorted and is gripping the tumbler like a band brake. Anyway, a little careful observation while operating the reversing arm, will soon reveal any fault. The eccentric sheaves, by the way, should be set by eye in the positions shown in the end view of the assembly in last week's notes on a $2\frac{1}{2}$ in. gauge version of *Pansy*. This will ensure that the expansion links take up the approximate positions that they will do when the engine is at work.

The final assembly job is to couple up the forks on the valve spindles to the free ends of the lower rocking levers with the two valve rods, using pins made from $\frac{3}{16}$ in. silver steel as previously mentioned. All pins should be free to turn in the forks when the nuts are tightened up, so that the jaws are not pinched in and the joints made stiff. The valve setting can be left until the reversing lever has been made and fitted, and this will be the next job.

● *To be continued*

LBSC writes every week

This free advice service is open to all readers. Queries must be of a practical nature on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope with each query. Mark envelope clearly "Query," Model Engineer, 19-20 Noel Street, London W1.

READERS' QUERIES

DO NOT FORGET THE QUERY COUPON ON THE LAST PAGE OF THIS ISSUE

Boiler chimneys

When turning funnels, domes and safety valves for 7 mm. locomotives can you tell me how the part that sits on the smokebox or boiler is managed? The commercial ones seem to be drilled out with a very large drill, but even this does not explain the double curves.—A.H.P., Banbury, Oxon.

▲ *There are several different ways of shaping chimneys, domes, etc., to fit the boiler. The method we prefer is to first take a piece of round brass rod of a diameter slightly over the maximum diameter of the base of the chimney or dome (in 7 mm. scale about 0.015 in. larger), clamp this under the toolholder of the lathe exactly at centre height and flycut the base to the exact radius required.*

Next, chuck the brass rod and turn the outside diameter, drill or bore the inside and part off.

Obtain a piece of round brass or steel rod of the same diameter as the boiler, fix the unfinished chimney to this by a bolt and washer through the middle and file away the raised lip with small round and half-round needle files. Finish with fine emerycloth.

Finally, remount the chimney in the lathe and polish around the base with fine emery.

Baker valve gear

Can Baker valve gear be adapted to *Tich*? LBSC says it is an easier valve gear for beginners as there are no slotted links and die blocks. My problem is getting the gear frames in the right place. Is it possible to shorten the eccentric rod, and if so, by how much? Will this affect the return crank measurement?—J.F.M., Wembley, Middx.

▲ *Baker valve gear could be fitted to* TICH, *but it is not ideal owing to the short distance between cylinders and main crankpin.*

The best way to decide the essential dimensions is to lay it out on paper at least twice full size, both in plan and elevation, the necessary lengths of the various levers being determined from the amount of movement required on the radius rod. The length of the eccentric rod follows from the distance between the radius bar in its mid-position and the centre of the driving axle. It cannot be any other length.

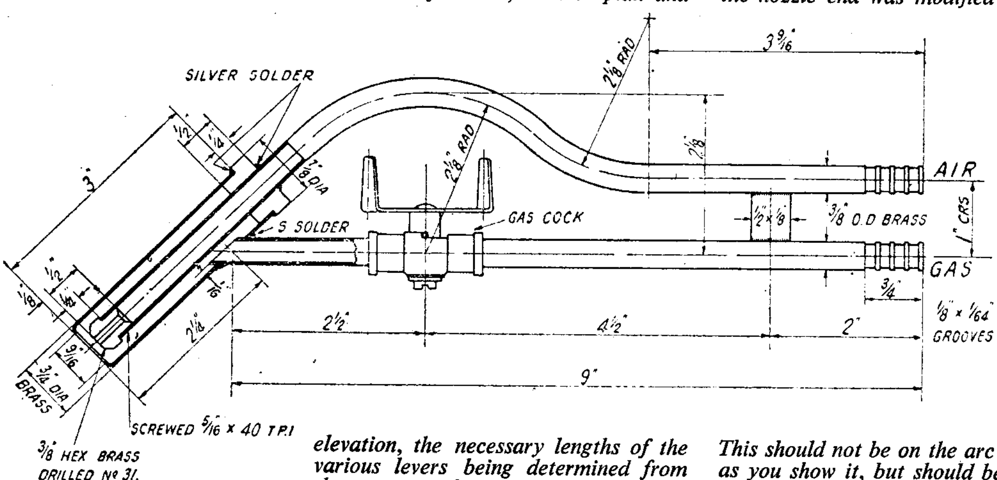
The length of the return crank is decided from the movement required. It, therefore, depends on the amount of swing required on the radius lever. In other words, it is a question of working backwards, starting from the valve travel of the cylinders. One important point: the return crank using Baker gear is longer than with Walschaerts, as the former requires a large eccentric rod movement.

Simple gas blowpipe

May I have suggestions for the best way of making a small powerful gas/air blowpipe capable of brazing and silver soldering a 3 in. dia. locomotive boiler with air supplied by a rotary blower (vane circle 4 in. dia.)?

Also can you advise me on reconditioning an oxy-acetylene blowpipe which I acquired with a damaged (squashed) midsection?—G.E.S., Shipley, Yorks.

▲ *An article on a simple gas blowpipe appeared in* MODEL ENGINEER *of* 15 *October* 1942 *and a sketch is reproduced here. The blowpipe shown in your sketch would not, in our opinion, be highly satisfactory unless the nozzle end was modified in shape.*



This should not be on the arc of a bend as you show it, but should be straight, though the angle can be arranged to give a convenient holding position. If bent as shown in your sketch it would probably be rather difficult to ensure that the air jet was accurately centred and this is most important for getting a satisfactory flame. The relative position of the air and gas nozzles is also of great importance and some types of blowpipes have the outer nozzle adjustable to control the flame.

With reference to the repair of an oxy-acetylene blowpipe, we regret to advise you that we do not consider it at all desirable to attempt this. The fact is that there are many risks attendant on any modifications or alterations to blowpipes which use oxygen gas and in the event of any accident we might not be able to avoid some liability if we had given you any advice in this matter. We strongly recommend that a damaged blowpipe should be returned to the makers for repair.