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ONE SHILLING
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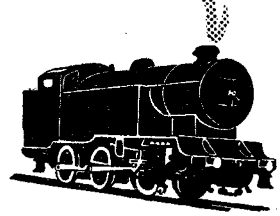
Smoke Rings



A WEEKLY COMMENTARY BY VULCAN

FOR the locomotive modeller, the model railway enthusiast and the student of railway history a track like the Bluebell Line can never completely die. The track and everything on it can be re-created in miniature, while on the printed page the events and atmosphere of the past can be brought alive.

It was the contractor Joseph Fairbank who built the Lewes-East Grinstead Railway for the Earl of Sheffield and other subscribers who became a corporate body under the Lewes-East Grinstead Railway Act of 1877. This Act stated that the London, Brighton and South Coast Railway should take over the line with the statutory obligation of running four trains a day.

At the beginning, enthusiasm for the line was so strong that even the land, it seems, was given to the company—by Lord Sheffield and the Rector of Barcombe. But enthusiasm did not extend to the actual speed of the trains. Although there were services from Brighton and London via Lewes, Horsted Keynes and East Grinstead, fast trains were not included.

Victorian

" There is no doubt," says the *Sussex Miniature Locomotive Society News* whose secretary doubts if the line was actually losing money, " that until the time of its first closure the services provided were such that they could not be called anything better than Victorian, and it is small wonder that it became a laughing stock in the district."

I am surprised to read these words —" anything better than Victorian " —from a miniature locomotive club. It was the Victorian character of the line, combined with Belloc countryside (" I never get between the pines but I smell the Sussex air ") which gave the Bluebell Line its charm. Can it be that a pretty, leisurely or picturesque railway is not quite the same thing if one happens to live near it?

Loss to the movement

I WAS sorry to hear of the deaths of two men prominent in the world of model engineering. The first was A. R. Turpin, author of *Soldering and Brazing*, the Percival Marshall handbook which is accepted as an authorative work on the subject. Mr Turpin also wrote many articles for ME; they too had the hallmark of technical knowledge which was apparent in all his work.

The second death was that of Mr J. H. Jepson, who was well known as a builder of model boats and model steam plants. He was a chauffeur and often said that much of his model work was carried out in the odd periods of waiting about in his job. Mr Jepson was a founder member of Blackheath Model Power Boat Club and was largely responsible for the development of the club and its activities.

Seven centuries

SEVEN centuries are covered by the " Growth of Shipping " Exhibition opened at Towneley Hall, Burnley, by Sir Ivan Thompson. One of the 50 models on view represents a ship of the Cinque Ports in the thirteenth century; another of the m.v. *Bamenda Palm*, built by Swan, Hunter and Wigham Richardson of Newcastle for the Palm Line in 1956. The Liverpool Public Museums have sent some lovely models of ships as historic as the *Marco Polo*, *Sirius*, *Great Western*, *Great Eastern* and *Turbinia*.

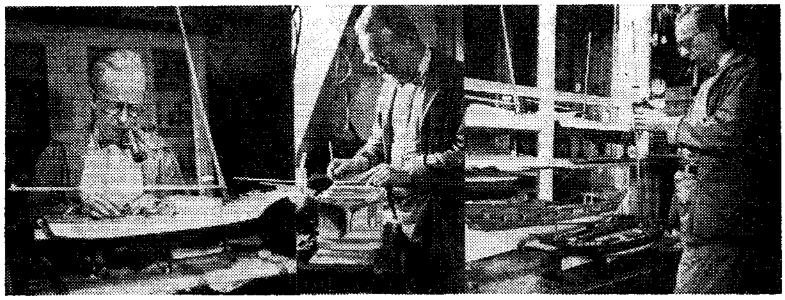
An amateur modeller, J. Gee of Poynton, Cheshire, contributes the nucleus of a whole section. Mr Gee served in the Royal Navy during the

Smoke Rings . . .

last war, and all the models in the naval collection at Towneley Hall are the fruits of his leisure.

"To us who live inland," says the introduction to the catalogue, "our knowledge of ships is in the main more or less dependent on books, pictures and the occasional visit to the sea. The average person gets little opportunity to study closely the steady improvements in maritime travel, or the impact of its growth on our daily lives."

As an inland town—though a town at the junction of two rivers—Burnley is setting an example on which curator H. C. Thornton and his committee are to be congratulated. As the exhibition remains open until July 12 there is plenty of opportunity for our Burnley readers to enjoy all that it offers.



Mr Brownell at work several years ago on the Atlantic coast fishermen for the Providence Public Library collection. Left: working on a Chesapeake Bay skipjack; centre, hull of a Gloucester sloop; right, Hudson River sloop. The privateer RATTLESNAKE *and other models are shown in the background*

Sailing ships in USA

THE public library in Providence, Rhode Island, has almost completed a unique collection of 12 pieces intended to preserve the memory of the principal types of sail-driven Atlantic coast fishing vessels.

These 12 distinct types were evolved beginning in colonial times to meet the individual needs of men fishing in such diverse areas as the sheltered waters of Long Island Sound, the often stormy ocean off the rugged Maine coast, in the shallow oyster bed area of the Chesapeake Bay, and so on.

The general introduction of power around 1900 marked the end of an era, and it was for this reason that it seemed important to make the collection while the memory of those boats remained fresh, and while, in fact, a number of the originals could still be found for reference.

Nine of these little craft are the work of Alfred S. Brownell of 107 Benevolent Street (next door to Brown University) in Providence.

He has now built about 25 marine models during the last 29 years. His contributions to the library collection include: Tancock whaler of 1890; Gloucester sloop of 1890; marblehead pinkey of 1820; Eastport (Maine) pinkey of 1890; Chesapeake Bay skipjack of 1900; colonial fishing schooner of about 1700; Block Island double ender of 1883, quoddy boat (Maine) of 1900, and New Haven (Conn.) sharpie of 1900.

Unusual method

Other boats in the collection are a Chesapeake Bay bugeye and a Friendship sloop by the late Robert B. Easton of Pawtucket, Rhode Island. The group will be completed soon by addition of one more vessel by Sarkis Bezigian, of Warsick, Rhode Island.

Model ship builders may be interested in Mr Brownell's method of hull construction. He builds these solid of lifts, generally using bass wood. Above the water line the hull is cut back 3/32 in. and the planking applied. He leaves a space between planks of 0.010 in. For planking he generally uses wood of one of the fruit trees, such as pear. For decks he favours holly, and for spars, lemon. He expects to start soon on a Pacific Ocean schooner for the Smithsonian Institute in Washington.

Incidentally, he estimates the nine boats built for the Providence Library by him represent a total of about 4,500 hours.

Unnecessary noise

MY electric drill has been put to a lot of work in the house recently and I was astonished at the tremendous noise it made. It is quite new and of the latest design, but it seemed to me that in the confines of a bedroom, where I was using it to rub down paint, the noise was much greater than in the workshop.

It is possible that the resonant properties of a house are much more well defined than those of a workshop; in fact the wooden flooring and wall-boarded ceiling of a modern house, such as mine, must produce a higher degree of reverberation than the tool-cluttered walls and concrete floor of the workshop.

I find, too, that vacuum cleaners, electric hair dryers and some washing machines are great offenders. Some hair dryers kick up a din out of all proportion to their diminutive nature.

Out of proportion

The manufacturers must surely be aware that these pieces of apparatus are likely to be used in houses where the sound-proofing is not all it should be desired; and also at hours when young children are trying to get to sleep. That they can be made quiet is demonstrated by the silence with which some washing machine motors run.

It is time the public rose in righteous indignation and demanded that much more attention be paid by manufacturers to this question of noise. Why should a little popping 150 c.c. scooter make more shindy than a 50 h.p. limousine? A few more cubic centimetres and an efficient silencer would solve the problem.

Why must food mixers make more noise than a Myford lathe? The contrast is utterly stupid and it is time in this enlightened age that it came to an end.

Cover picture

The handsome 2-6-4 LMS tank engine which is the subject of the latest ME model locomotive. Martin Evans, who is now constructing this in 3½ in. gauge, begins this new series on page 441.

The ME Exhibition

FROM several letters I have received it is obvious that some readers missed the announcement of the date of the Model Engineer Exhibition. It will be held at the New Horticultural Hall, Westminster, from August 20 to August 30. Entry forms will be ready next month and will be sent on request. Plans are already well under way and I am hoping for yet another exciting and challenging Exhibition.

JUBILEE

Introducing the new ME locomotive, a 3½ in. gauge scale model of the LMS Stanier two-cylinder 2-6-4 tank. She is so named in celebration of the magazine's diamond anniversary

By MARTIN EVANS

WATCHING the various types of locomotive working on club tracks or on the short "up and down" at the ME Exhibition, it has often struck me how seldom one sees an example of the large passenger tank type.

One exception to this is, of course, Mr Storey's huge 4-6-4 *Tilbury* tank which one can see year after year, pulling away with effortless ease.

Small tanks, *Mollies*, *Juliets*, industrial tanks—there are a-plenty. I believe the main reason for this is the generally-held belief that the normal type of tank engine with coal bunker at the rear is difficult to fire.

While this is true to some extent, I have come to the conclusion that what matters most is the distance between the top rear edge of the bunker and the firedoor and, of course, the relative height of these items. In other words the higher you can get the firedoor and the lower the rear edge of the bunker, and the greater the distance between these on the locomotive concerned, the more chance you will have of getting at things.

To this end I have spent some time studying outline drawings of various tank locomotives before deciding on the prototype of my next locomotive which, by the way, will be for the 3½ in. gauge.

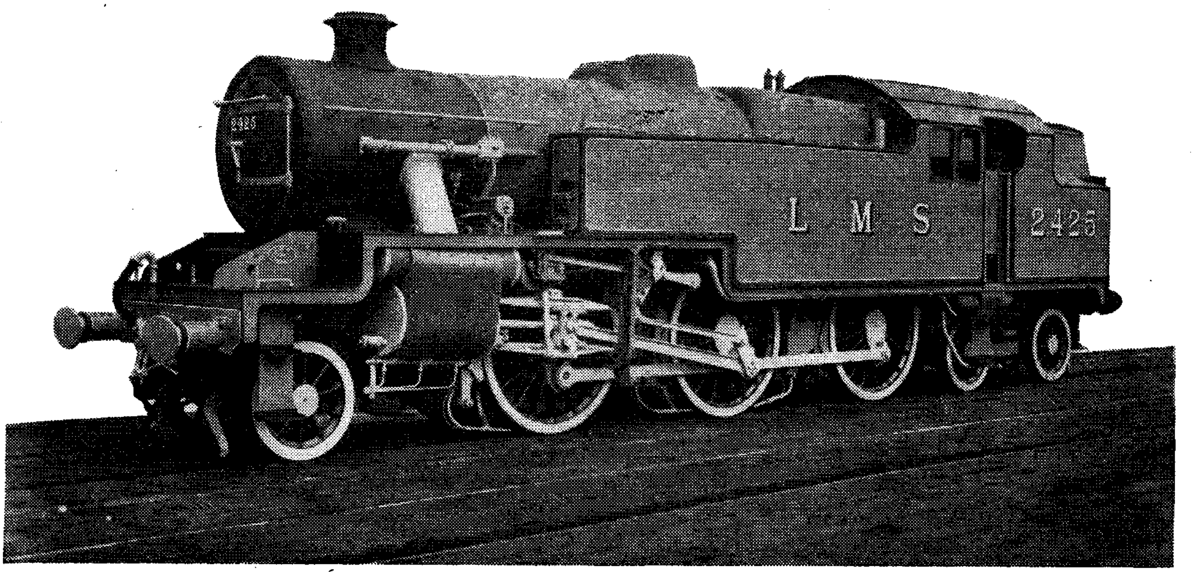
Those I have examined have included the ex-LNER V1 class 2-6-2T and L1 2-6-4T, the Great Western 61XX and the various Fowler and Stanier 2-6-2 and 2-6-4 passenger tanks.

At first I rather favoured the Collett 61XX, but I really wanted to use Walschaerts gear this time, and the Swindon cab and bunker wasn't altogether favourable to my purpose.

So I decided on the Stanier two-cylinder 2-6-4T, and I hope that this locomotive will be approved by the majority of readers.

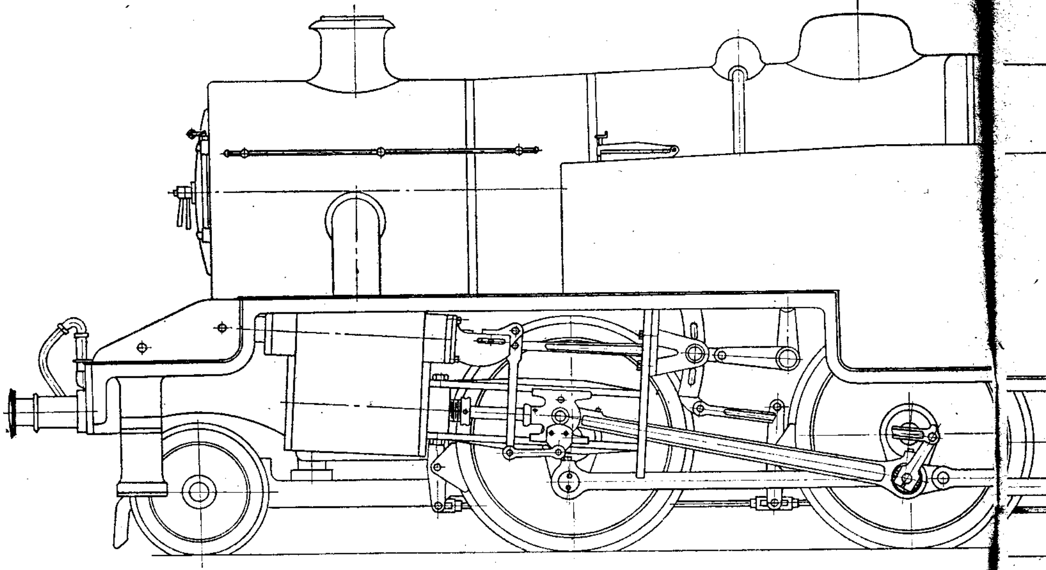
Before I come to consider the model, a few words on the prototype may be of general interest. Readers will remember that Stanier's first design of 2-6-4 tank locomotive was a three-cylinder type, introduced in 1934.

The principal dimensions of these engines were as follows: Cylinders 16 in. × 26 in.; driving wheels 5 ft 9 in. dia.; heating surface 1,148 sq. ft



JUBILEE

continued



superheater surface 160 sq. ft; grate area 25 sq. ft, working pressure 200 p.s.i.; coal capacity 3½ tons; water capacity 2,000 gallons; weight in working order 92¼ tons; adhesion weight 57 tons; tractive effort at 85 per cent of working pressure 24,600 lb.

The two-cylinder engines were introduced in 1936, the first batch being built by the North British Locomotive Co. Ltd.

The main differences in these locomotives as compared with the three-cylinder type were as follows: Cylinders 19⅝ in. × 26 in.; boiler heating surface 1,168 sq. ft; superheater surface 185 sq. ft; and weight in working order 91 tons.

The first locomotives of this type had the dome combined with the top-feed apparatus, but later engines had the dome placed just to the rear of the top feed, quite separate to it, and a very nice looking dome, too!

My outline drawing of the 3½ in. gauge edition shows this later type. Another interesting feature in the two-cylinder was the rear bunker, the top part of which sloped inwards slightly from the cab to the rear end, so giving a better lookout for the driver when running bunker first.

As to performance, many readers will have ridden behind these engines and will know their rapid acceleration and high maximum speed; over 80 m.p.h. is often reached between Euston and Watford and between St Pancras and St Albans on the Midland section. On a recent run between the latter two stations, the 20 miles were covered in 22 mins 50 secs, with a ten-coach load of 280 tons gross.

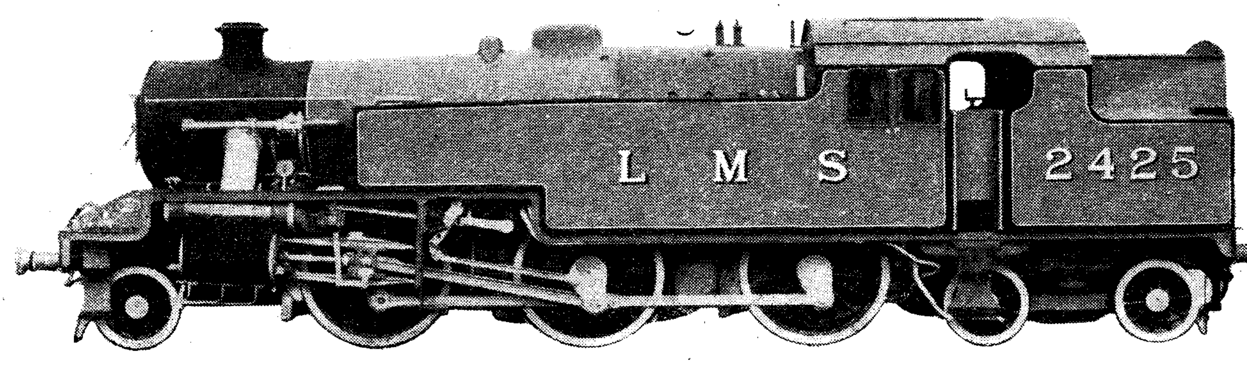
Keeping to the scale

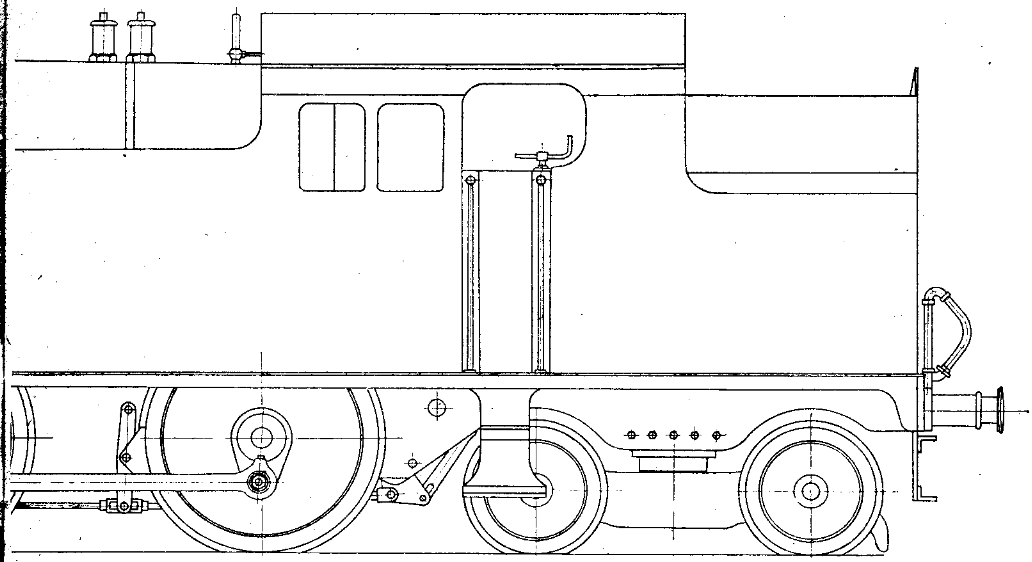
To come now to the model: my intention is to keep to scale as far as possible—especially as to outside appearance—but to modify the working parts so as to make the engine entirely suitable for heavy passenger-hauling.

Although I am all for an accurate scale appearance, I think it would be a great mistake to sacrifice good working qualities for "that odd sixteenth of an inch."

I am specifying slide valve cylinders, though these will be modified as far as possible as to external appearance. I believe many enthusiasts still prefer slide valves to piston valves (where gunmetal cylinders are concerned) and I think most readers will agree with me when I say that they are easier to make and keep steamtight.

The proportions of the valve gear, which is the usual outside Walschaerts type, will follow the full-size engine as closely as possible, and, while I am on the subject, here are the





"vital statistics" of the class as now running: lap $1\frac{1}{2}$ in.; lead $\frac{1}{4}$ in.; exhaust clearance $\frac{1}{16}$ in.; valve travel in full forward gear 6 7/32 in.; in full backward gear $6\frac{1}{16}$ in.; cut off in full gear 75 per cent.

As to the boiler, this will, of course, be coal-fired and will have the taper barrel and the correct shape of firebox, and should be as good a steamer in the model as in the full-size job.

As many features will follow the well-tried and proved ideas of LBSC, builders need have no worries as to whether the locomotive will do the needful.

Finally, a word about the castings required to build the engine. I have tried to work in as many as possible of those already available from ME advertisers for various LBSC designs.

For instance, the main horns are the standard "hot-pressed" type; the cylinder blocks and covers are as used for *Princess Marina* (though rather more metal will have to come off !), but the steam chest is different, and I have made a pattern for this.

There should be no difficulty over the wheels, but new patterns will probably be needed for the saddle, and one or two other small items.

● *To be continued*

Model Stationary and Marine Engines, K. N. Harris (Percival Marshall, 9s. 6d.).

THE steam engine, in all its many and varied forms, is of paramount interest to model engineers, many of whom have long sought a modern practical book on the subject.

This book, which defines and illustrates several typical examples of model engines well suited to amateur construction, introduces readers to fundamental principles and proceeds with the construction of simple oscillating engines followed by somewhat more advanced slide valve types. These include beam engines—horizontal and vertical—simple and compound engines, and specialised types for marine work.

The operation of the slide valve is explained in lucid terms, as are the various types of reversing gears, methods of lubrication, etc., and the final chapter deals in detail with miscellaneous items of steam engine equipment. A list of model steam engine bibliography and a subject index is included in the book.

Many of the engines described have been constructed by the author, and in several cases full working drawings are given. This is undoubtedly the most important contribution to model steam engine literature since Muncaster's classic handbook.

E.T.W.

NEWBURY DRAWINGS

The complete set of drawings for NEWBURY *is now available from the Percival Marshall plans department, 19-20 Noel Street, London W1 as follows:*

LO.22

Sheet 1 General arrangement, 3s.

Sheet 2 Frames, bogie, cylinders, etc., 4s.

Sheet 3 Boiler and boiler fittings, cab and superstructure, 4s.

Sheet 4 Locomotive footplate, boiler mountings, tender details, 4s.

Or the complete set at 13s. 6d.

Castings can be obtained, as follows:

Cylinders, wheels, eccentric straps: Bond's o' Euston Road Ltd, Euston Road, NW1.

Wheels, eccentric straps, smokebox door, chimney, dome, safety valve cover, tender axleboxes horns and springs, buffer bodies: P. E. Thomas Ltd, 123 Lower Richmond Road, Mortlake, SW14.

Eccentric straps, tender axleboxes (solid type) tender hand pump. A. J. Reeves and Co., 416 Moseley Road, Birmingham 12.

The caloric ship *ERICSSON*

The vessel—named after the famous Swedish marine engineer whom the Admiralty scorned—was of revolutionary design. Her engines, with others equally fascinating, are defined by H. E. RENDALL

I HAVE always thought that the construction of the *Ericsson* was one of the most courageous ventures in the realm of marine engineering, and though full success was not attained she can by no means be written off as a failure.

Ericsson was a Swede by birth and did his national service in a Swedish artillery unit before coming to seek his fortune in England. Perhaps he is best known to readers of ME as a partner with Braithwaite in the construction of *The Novelty* for the Rainhill trials.

Do we even know as much about *The Novelty* as we should? I well remember a very interesting article in a pre-war issue of the magazine by an author who came across some old papers and claimed that she had run at 60 m.p.h. for a short spell. Reference was also made to the look of astonishment on Stephenson's face when she sailed past *The Rocket*!

Ericsson, however, had other strings to his bow. One was the hot air or caloric engine, the other a screw propeller for steam vessels. But when he failed to dispose of the propeller to the Admiralty, he left in some disgust for America.

Before his departure he had constructed—in 1833—a 5 h.p. hot air engine. This very much resembled a side lever marine engine with two d.a. cylinders at each end of a beam, and both cylinders were fitted with slide valves.

The smaller right-hand one was water jacketed and delivered its air to a reservoir, through which passed hot exhaust pipes. The air, already partly warmed, went on to a heating coil of pipe over a small furnace and thence to a bigger power cylinder, whose exhaust was used to preheat the incoming charge before passing to the cooler and the cold cylinder suction.

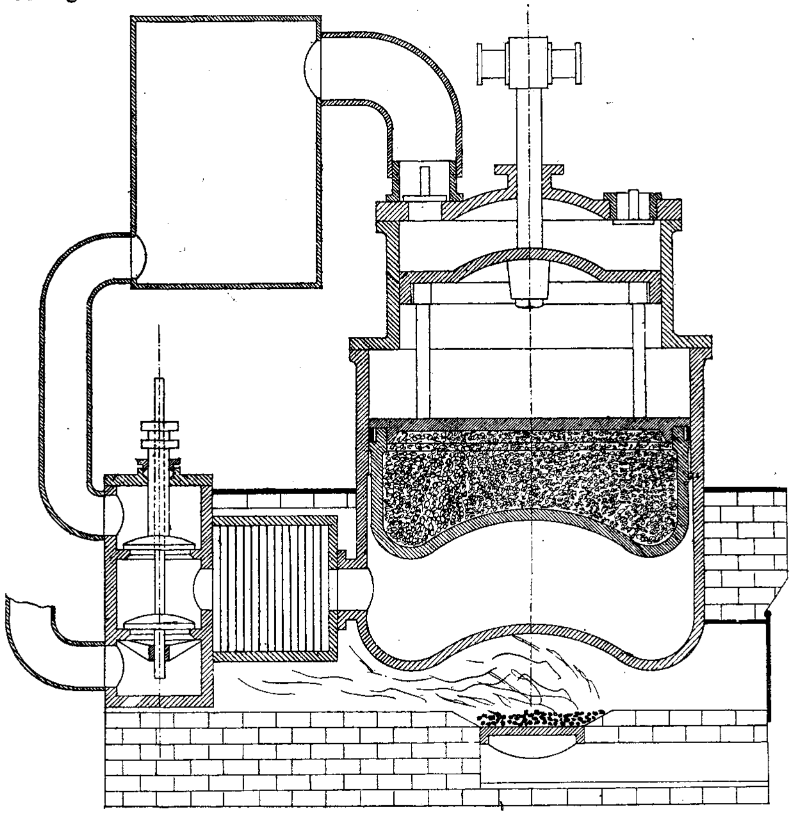
The design of Ericsson's various engines were all on this same principle—cold supply cylinder, regenerator and hot power cylinder. But he tried out differing arrangements so it will be understood that his air engine was very different to Stirling's. Another point is that this engine was on a closed cycle and, therefore, the system could have been charged with air at a higher pressure than atmospheric.

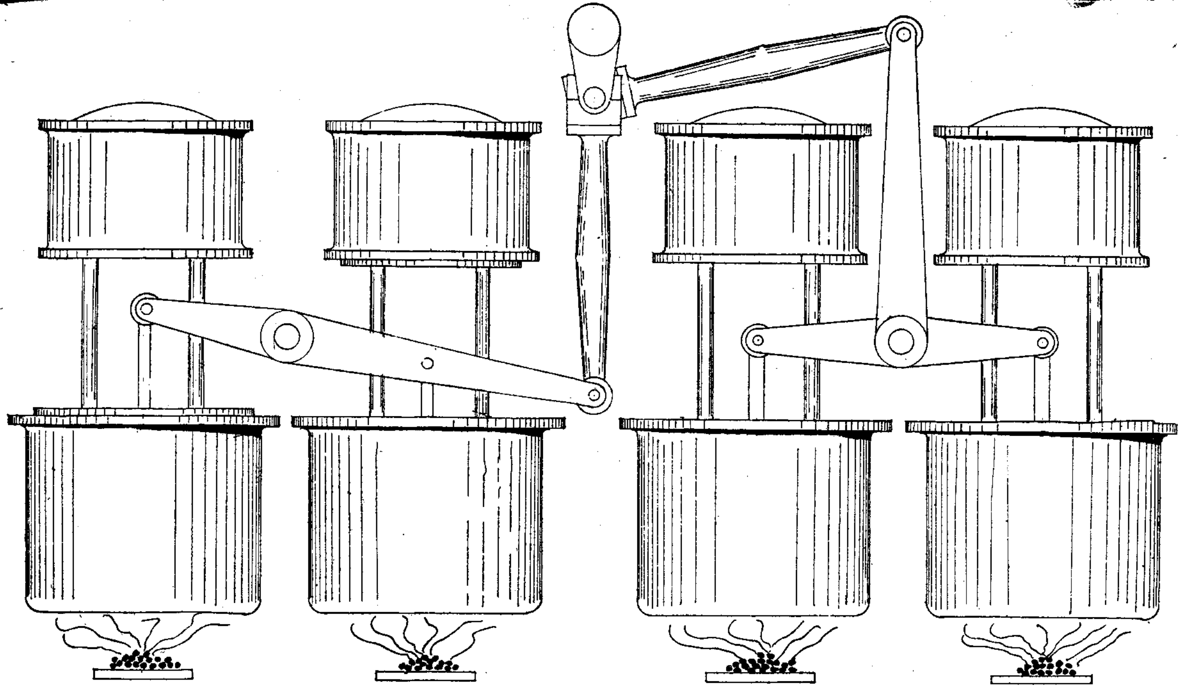
On arrival in America in 1839 he began to build hot air engines, gradually increasing in size. These now settled down to a standard design of a vertical engine with a cold supply cylinder above a hot power cylinder, the two pistons being joined together by twin pistons rods with the crankshaft between.

This Ericsson design was later adopted by other makers, notably the Bucket in which the cold air passed through the furnace. He found water cooling of the supply cylinder unnecessary and the power cylinder now exhausted direct into the atmosphere. Finally, he settled down to heating the bottom of the power cylinder, usually referred to as the "pot," direct.

All these engines were, of course, fitted with regenerators, a closed vessel packed with gauze or perforated steel plates, which absorbed the heat from the exhaust and gave it up to the incoming cold air.

By 1851 he had produced his ninth engine—a two cylinder engine, 2 ft stroke, bore of cylinders uncertain, which was stated to develop 60 h.p. With this experience he started on the grand experiment of the 4-unit engine





for the *Ericsson*, which had power cylinders 168 in. bore, supply cylinders 137 in. bore with a stroke of 6 ft, driving 32 ft paddle wheels at 9 r.p.m.

Fig. 1 is based on a contemporary woodcut of an 1852 air engine and gives, I think, a good impression of what these large air engines were like, though naturally it cannot give precise mechanical details. This engine differs from the marine in that it is designed for a crank overhead engine and drives through a single piston rod, working through the top cover.

The supply cylinder presents no special features except that the air inlet and delivery valves are worked automatically. In the marine engine the valves were 2 ft in dia., and I believe that the air inlet valve was in the centre of the cold cylinder.

The power cylinder has some rather special features. The piston and cylinder bore are machined at the top only; the lower extended piston has just sufficient clearance to obviate rubbing and is filled with insulating material, such as brick rubble, to keep the upper working part of the cylinder at a reasonable temperature.

Incidentally, we are told that the power cylinder had metallic packing, presumably a piston ring. This Ericsson long piston was adopted by other makers, notably the Rider engine—a very successful one in its day.

Even with this precaution I think that lubrication and damage to the cylinder bore by overheating was always an anxiety. The inlet and exhaust valves are clearly shown and were, of course, mechanically operated from the engine. It will be noted that the stem of the exhaust valve passes through the inlet valve, an arrangement found on early Watt beam engines.

The regenerator is placed between the valve box and the cylinder and, as well as taking up heat from the exhaust, it also receives heat from the furnace gases on their way up to the chimney.

In Ericsson's engine the cylinders were arranged in two pairs, two before the paddle shaft and two abaft. Fig. 2 is drawn from memory—the details coming from an old book I had access to 20 years ago. This diagram shows the way in which the pairs were linked together, but perhaps the proportions are not as they should be.

Each pair of pistons was connected by a rocking lever, giving the effect of one d.a. cylinder. In the after pair of cylinders the rocking beam was extended to drive the crank direct through a connecting-rod and in the foremost pair the beam had a bell crank to give the effect of a second d.a. cylinder with its crank at 90 deg.

If the arrangement of the levers was as shown in the diagram, the single crank of the engine would have to be to one side of the cylinders and the two beams for the connecting-rod would also have to be to one side of the piston connecting beams. But it is quite probable that Ericsson might have spaced the cylinders further apart to give a clearance for the bell crank to work between them. In this case the crank would be on the centre line of the engine. There was one common air container for all the cylinders.

The engines were made by Hogg and Delameter, of New York, who had previously built other air engines, notably the 60 h.p., and Ericsson especially noted the perfection of their iron castings. He also permitted himself to remark that the machinery of the *Great Eastern* sank into insignificance beside his giant engine. How was this monster started?

My own guess is that a large winch was used to turn her initially and she could be stopped by lifting the exhaust valves; probably there were no other controls.

Rankine in his book *A Manual of the Steam Engine* (1866) states that in the Ericsson type of engine the ratio of the volume of the supply cylinder to the power cylinder should be in proportion to the absolute temperatures of the cold and heated air.

Thus, if you decide to made a model air engine with a power cylinder $1\frac{1}{2}$ in. bore, temperature of the cold air 60 deg. F. (521 deg. abs.) air heated to 500 deg. F. (961 deg. abs.), and both cylinders have the same stroke, the area of the supply cylinder piston would be $\frac{521}{961} \times$ area of power cylinder and this would correspond to a bore of 1.136 in., say $1\frac{1}{8}$ in.

The proportions, chosen by Ericsson for his big marine engine suggest that he expected a temperature of about 430 deg. F. On test his engine ran at a pressure of 2.12 p.s.i.—perhaps this is more conveniently expressed by 305 p.s.f.—and it developed 307 h.p. The coal consumption was measured by Professor Norton to be 1.87 lb. per i.h.p. per hr.

Let us compare this figure with that of Stirling's big hot air engine at Dundee. This engine was charged with air at 150 p.s.i., used a maximum temperature of 650 deg. F. and the work performed by it against a dynamometer was 1,500,000 ft lb. per min., i.e. 45 h.p., and the fuel consumption was 83.3 lb. per hr, i.e. 1.85 lb. per h.p. per hr.—practically identical with that of the Ericsson engine.

It is to be greatly regretted that Ericsson did not experiment with dense air in his engines, by which he could have reduced their bulk enormously. My own guess is that he feared explosions. Compressed air, a red hot cylinder pot, a lubricating oil of unknown flashpoint, make a very dangerous combination. In fact, one of his engines did explode in Mexico. Instead he dreamed of an engine with 20 ft bore power cylinders.

One may ask, too, whether the engine was overloaded with the 10 ft 6 in. wide paddle wheels. Perhaps narrower wheels would have allowed the engine to run faster and develop more power. Be that as it may, on her trials in the summer of 1853 the engine gave the ship a speed of six knots, which was what the owners bargained for.

Fortunately, we still have some details of the vessel herself, through publication in the *New York Times*. She was a wooden frigate type of vessel: length 250 ft, beam 40 ft, registered tonnage, 1,093. We are told that instead of a single funnel, she had four chimneys, 30 in. dia., painted gaily white and gold, standing only 5 ft above the paddle boxes and mounted on octagonal supports. A great point was made of the fact that the compact form of the engine left a free space fore and aft for easy transition between all parts of the ship.

The nervous were reassured that "that precarious place, the fireroom, was paved with cast-iron plates so that there was no danger of fire." For some years she was employed by the US Government for trooping but, inevitably, came the demand for a higher speed.

Ericsson met this by fitting blowers to the furnaces, and on trial she made 12 r.p.m. and then—disaster ! She was anchored for the night in New York Harbour, with the lower deck ports left open. A tornado suddenly struck, she heeled over, filled and sank.

After some time she was raised, but the air engine, though economical in fuel, was considered too bulky and expensive to reconstruct. A steam engine was fitted instead, but this was not very successful so it was pulled out and the *Ericsson* carried on as a sailing vessel, until she was wrecked.

Ericsson still carried on making thousands of small air engines, but I find it hard to understand why such a talented engineer did not realise that there was a future for a low pressure engine. The Dundee air engine developed pressure of about 35 p.s.i. by using dense air, and it might have been obvious that this was the line to work on.

Ericsson, too, overestimated the economy to be gained by his regenerator. But it is pleasing to read the remarks of one customer—the New York Central Railroad—that the air engine performed an incredible amount of labour for a small quantity of fuel consumed. Perhaps Ericsson was the first man to formulate the creed that the heat engine of the future will be independent of water vapour. ■

The view from Peak Sixty

This is the Diamond Jubilee year of MODEL ENGINEER. Sixty years ago, when a great century and a great reign were drawing to their close, the young Percival Marshall brought out a magazine which was new in an age of novelty. You are reading it now.

No periodical would allow an anniversary of this kind to pass unmarked. Accordingly, a special Diamond Jubilee Number will be published on the First of May as a fitting souvenir which readers old and new are sure to enjoy in the moment and to treasure for years.

The Diamond Jubilee of "Ours" is also the Diamond Jubilee of a world-wide movement, for it was P.M.'s brave little paper of the Nineties which gave modellers everywhere the meeting-place that they needed, and their first consciousness of belonging to a brotherhood that was spread across the earth.

Few periodicals are so close as MODEL ENGINEER to the lives of their readers. The typical model engineer not only reads these pages: he actually works from them, detail by patient detail, often devoting years to a single model.

Consequently ME is a part of his life whether he works as a lone-hand or as a member of a club which itself, inevitably, has ME for its focus and centre. Most magazines, however eagerly read, are thrown away sooner or later, but nearly every copy of ME meets with a more dignified fate.

The Diamond Jubilee Number will stand proudly with all the others. It has been planned as a handsome issue of 80 pages with the technical and non-technical features nicely balanced so that it will be read both inside and outside the movement. Nothing is likelier to lure a young man into the clubroom, or revive the faith of a backslider, than this bright, packed souvenir number alive with the spirit of the First of May.

The reader who buys a copy for a friend is helping the cause. This is true of the person who will never become a model engineer as well as of the possible recruit, for the issue has the value of a highly attractive advertisement. It will add to the respect in which modelling is held and teach respect where modelling is misunderstood. Give a copy to a professional engineer and he is certain to be impressed; give one to the next-door neighbour and he will no longer associate model engineering with toys and boys !

The Diamond Jubilee Number has, in short, a strong missionary value. It is also interesting and important for its own sake, quite apart from these other considerations. Having climbed to Peak 60, we can look back over a great vista of endeavour and achievement and forward to the hope of tomorrow.

Every anniversary of this kind is an occasion for summing up what has gone before, and so we shall read in these happy pages the story of MODEL ENGINEER itself from January 1898, and the story of the clubs which sprang from ME as from the head of Zeus.

All the familiar contributors are here, each with his own tale to tell like an old salt with memories of the Horn. On the purely constructional side details are given for building the ME Jubilee Clock to a specially commissioned design. Clocks were being made by our readers many years ago, and this first article of a notable series is in effect a recognition of an interest which has always been very close to modelling itself.

Most of the regular features are included, together with an unusual one: a design for a sputnik spotter ! After all, a paper which described a television set in 1898 should not leave its readers behind in the Space Age !

The cover in three colours and the beautiful coloured section inside are a magnificent tribute to the craftsmanship of the model engineer, while scores of other illustrations provide a gallery of models and personalities through the decades.

All in all, this is an issue worthy of what it commemorates; and remember, for your own sakes, that however long MODEL ENGINEER may flourish it will never again be 60 years old !

Checking torque values

WORKSHOP HINTS AND TIPS

By GEOMETER

EMPLOYING only a very elementary rig which can be made up in a few minutes, some weights or spring balances, many of the simpler problems involving torque, can be solved.

By using ordinary spanners, one can get an idea of what particular torque values involve in effort—or one can verify the setting of a torque wrench. Simple torque-testing devices can be set or checked for use, as when pre-loading bearings—and it is also possible, if one is compiling simple design data or checking the twisting-off values of small bolts or screws, to do so with the minimum of trouble.

The basic rig is as at *A*, consisting of a rectangular bar drilled at the centre, so as to balance reasonably, and fitted with a stud or bolt locked with two nuts, and the stud or bolt mounted in a bent-up and drilled bracket which can be held in the vice. The bar can pivot freely in the bracket, and at one end suitable weights or a spring balance can be applied.

The length *X* from the pivot to where the weight or spring balance is attached can vary according to the work undertaken. For a test of torque of a few lb. in., as required when pre-loading bearings, length *X* would be some small dimension in inches.

For example, if the pre-load is 4 lb. in., length *X* could be 4 in., and a 1 lb. weight attached. It would then take a torque of 4 lb. in. on the nut to lift the weight with the bar, or to pull the spring balance to read 1 lb. For higher or lower torques at the same length, weights are merely increased or reduced. If the weight is made $1\frac{1}{2}$ lb., then $4 \times 1\frac{1}{2} = 6$ lb. in.; while if the weight is reduced to $\frac{3}{4}$ lb., then $4 \times \frac{3}{4} = 3$ lb. in.

For much bigger torque values, involving lb. ft., length *X* should not be less than 1 ft, and may well be 2 ft. With length *X* as 1 ft, a weight of 10 lb. will give a torque of 10 lb. ft; while if length *X* is 2 ft, the weight of 10 lb. will give a torque of 20 lb. ft. Thus, length *X* and the weight, multiplied together, always give the torque in lb. in. or lb. ft, as the case may be.

Checking of pre-load on a shaft to a few lb. in. can be done with a device as at *B*, using a spanner on the nut at the end of the shaft, or pushing the mounting rod through the hole in the shaft, there being collars with grubscrews for length *X* to be adjusted as necessary.

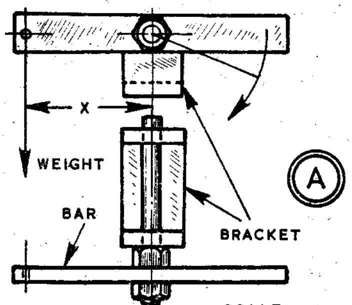
The "measuring head" of the tool is a plunger or rod with a spring and a bent-over strip serving as a pointer. The plunger slides in a boss soldered to the mounting rod, carrying a scale or some reference marks on the outside.

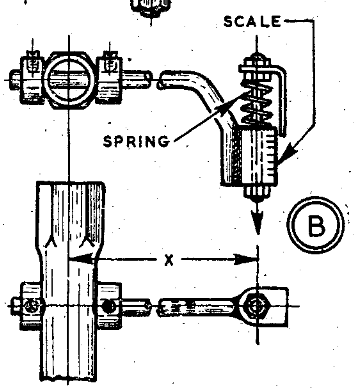
To set the tool for torque—the pointer pushing to a certain position on the scale, preferably about the middle—the rig at *A* is prepared, and the tool and box spanner applied (when the nut is the right size), and the free end of the spanner lightly supported.

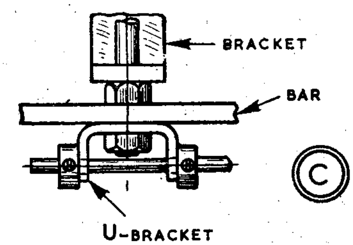
A push on the plunger lifts the weight and gives the torque on the scale. If the spring is weak a stronger one can be fitted, or the mounting rod lengthened; if the spring is strong, the rod can be shortened.

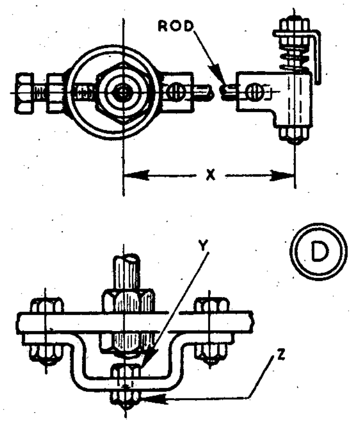
When the box spanner cannot be applied, a simple U-bracket can be fitted to the arm on the rig, and the mounting rod set through that, as at *C*. A modified measuring head, as shown, can be fitted with mounting rods of different lengths, and a clamp for use on nuts and shafts.

Using a stirrup on the bar of the rig, as at *D*, small bolts can be fitted to test the twisting-off values, wedging the head *Y* with a spanner, and applying torque to the nut *Z*. ▣

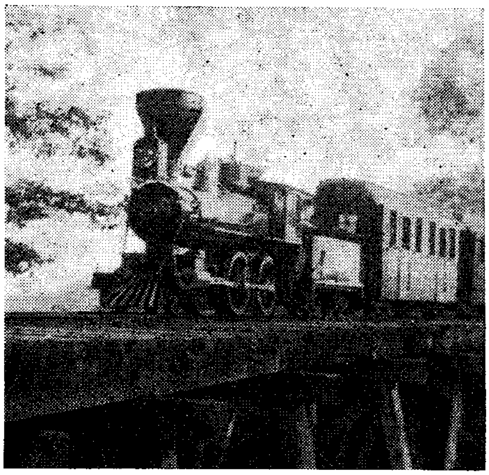








The HOOT, TOOT and WHISTLE



JOSEPH MARTIN describes a railway of the 1860s capturing in miniature the characters of that grand and bustling era

ALTHOUGH you will no longer find in the United States a railroad announcing itself as the Hoosac Tunnel and Wilmington, you can still return from a visit saying with perfect truth that you have ridden on the HT and W. To enjoy this pleasure—and a pleasure it is—head for Illinois and the area of Chicago.

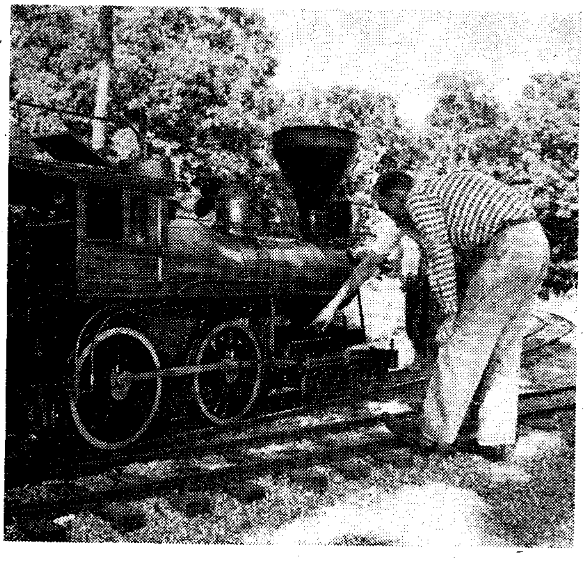
Rather less than 30 miles west and slightly north of the Windy City stands the thriving town of Elgin which makes some of the world's best watches and, for some reason, insists on pronouncing its name to mix with vermouth instead of with the art-loving earl who brought the Parthenon marbles to England. Outside Elgin, three miles to the east and 29 miles from Chicago, you will come upon the HT and W Railroad.

The HT and W of 1958 is the Hoot Toot and Whistle. Local humour, which delights in apt ingenuities, may conceivably have attached this name, in fond disrespect, to the old Hoosac Tunnel and Wilmington; but let it suffice for the present that Hoot, Toot and Whistle admirably suits the railroad near Elgin.

Soon after the last war Bob Buchmann, an Elgin hardware merchant with an enthusiasm for model railroads and for railroad lore, began to think earnestly of turning to something bigger than O-gauge. Like thousands of other enthusiasts, he dreamt of building a live steam track that would be all his own. What he envisaged was not the usual small-gauge construction with driver and passengers travelling astride on bogies, but a railroad large enough to carry people in coaches.

As the years passed, the dream took on the solider shape of an ambition, until, in 1955, Mr and Mrs Buchmann—for Bob's wife had come under the spell by now—were looking for a piece of land where their railroad could be built. Six months of searching rewarded them with their present site, 16 acres of lovely woodland where little animals flicker among the whiteoak and hickory trees.

Every builder of a miniature railroad rejoices in obstacles providing that they are not wildly overdone. Appropriately, Mr and Mrs Buchmann found themselves confronted with problems essentially similar to those which might challenge the engineers of a full-scale line. To be sure of the correct grades and alignment for their proposed one-and-a-quarter mile of track through the woods, they called



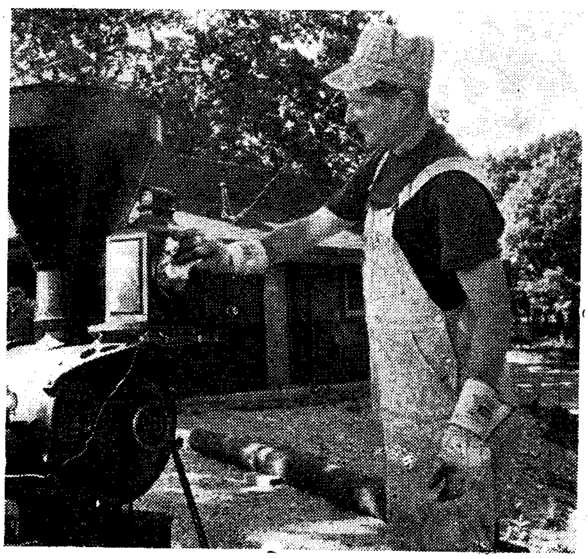
in a professional railroad surveyor—wisely, when one considered the size and special difficulties of the project.

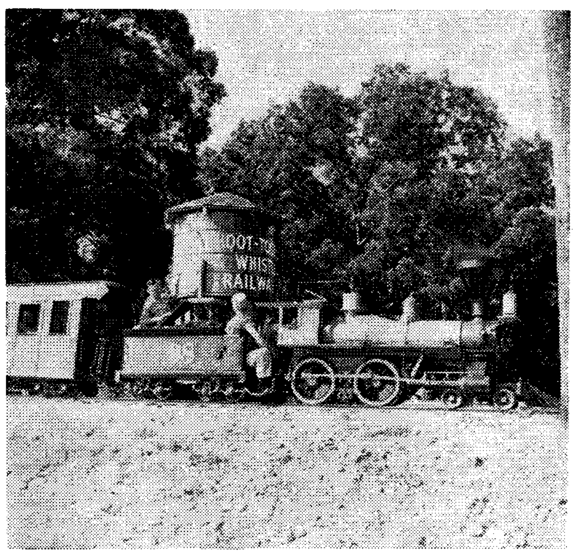
Bob wanted to represent an old-time locomotive in 15 in. gauge. The period that he chose was the 1860s when all sorts of odd and charming things were running on rails in the United States. Luckily, he had an excellent ally in Norman Sandley of the Sandley Light Railway Equipment Works. A contract for a locomotive and four passenger coaches of about 1860 was sure of a keen response from Mr Sandley. With the patience and thoroughness of a first-class model engineer, he built the coaches in correct period detail and produced a vertical-boiler engine whose cylinders and driving mechanism had been taken from an old Stanley Steamer automobile.

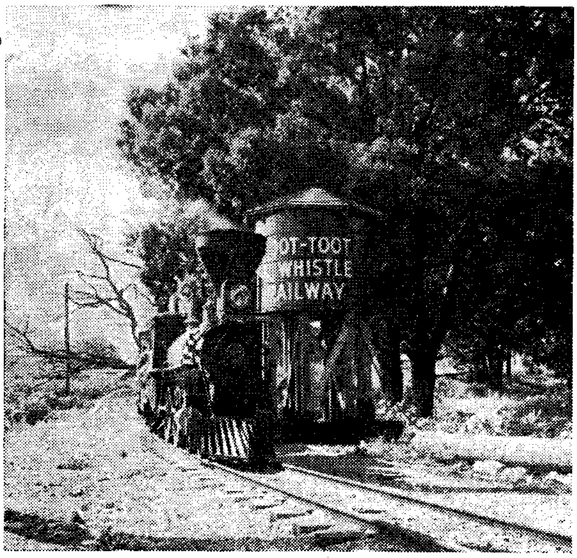
Although this type of rail locomotive had passed its heyday by the end of the 1840s, the HT and W engine is by no means out of tune with the coaches. Old Peppersass, for instance, was built in 1869, and many of her predecessors had such long lives that they were still puffing away in a later era. Anyone who has seen a picture of Old Peppersass—like a tar-boiler in collision with a badly damaged wagonette—braving the slopes of Mount Washington in New Hampshire will understand that the upright-boiler locomotive was far from being a freak experiment on the permanent way. The Baltimore and Ohio had one in service as late as 1893.

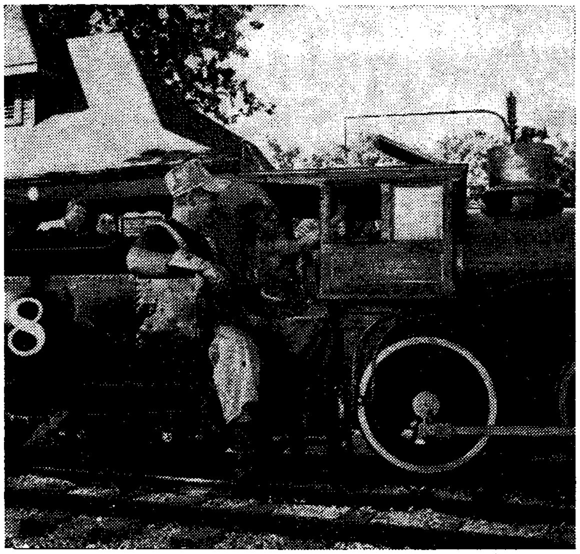
The rolling stock, clean and well preserved, sparkles in the crisp Illinois air

Bob's next order, when the vertical *Old No* 1 had been completed, was for a model of the *General*, the famous Civil War engine. These are the details which he has sent me: " Overall length of engine and tender 17½ ft; 68 in. to top of stack; wood spoked pilot; 21½ in. drive wheels; steel tyres made by Baldwin Locomotive Works; mechanical brakes on engine and tender; lead truck wheels 10 in.; boiler all welded, with 43 1¼ in. flues;









mahogany cab made by a pattern maker. . . ." She carries 150 lb. of steam, is coal-fired, and weighs three tons with the tender. The cylinders are $3\frac{1}{2}$ in. bore × 7 in. stroke.

She is, says Mr Buchmann, a very efficient engine. "We have a three per cent grade and she will walk up from a sharp curve with four loaded coaches at 30 m.p.h. The cylinders have been so designed that they can be bored larger now that we know the boiler is efficient."

For a miniature railroad this is a big engine; and it hauls a big load. The coaches are 14 ft long, 72 in. high and 33 in. wide. Each has two compartments and each compartment holds four adults. Underneath are fully sprung four-wheel trucks with 8 in. steel wheels. Add such picturesque details as link-and-pin couplers, handbrake wheels and clerestory windows; and then try to visualise the coaches in their livery of olive green and red trimming.

With Norman Sandley able and ready to supply anything, the provision of rolling stock was pretty straightforward. The hard work for Bob Buchmann—and the pleasure of it—lay in the construction of the track. At one point, over an entrance to the car park, a trestle 40 ft long was built of 8 in. × 8 in. whiteoak timbers weighing about 500 lb. each. Despite the labour involved, I doubt if we should list this as a difficulty—for who would want a miniature railroad without a bridge somewhere along the way? The sight of Bob's little train on the trestle, with steam and smoke rising against a background of foliage, is one to tempt the camera enthusiast and set the colour film buzzing in the glory of the fall and the snow of deep winter.

Another task, on the lower side of the property, required earth—that useful stuff which Americans call dirt. More than 6,000 yards of it had to be dumped for a 16 ft fill—and then a heavy rainstorm washed about 1,500 yards of it away. But the people of the Prairie State are tough and well used to having water in the wrong place. Bob and his helpers soon had the big fill right again and the work of laying the track continued happily. Altogether it took a year. While at one time as many as 15 people were engaged, the railroad is essentially the creation of Bob and one or two assistants.

The track-laying would have been a stiff project for a club, much less a solitary individual. Along the one-and-a-quarter mile way a limestone ballast was put down, and on it were laid more than 5,000 ties or sleepers to which the 12 lb. rail was fastened by miniature railroad spikes. Two switches and sidings and a high-banked horseshoe curve were further items in the programme, and it may surprise us that the work did not take much longer to complete when we weigh the difficulties of accommodating such a large-scale railroad in a setting thick with obstacles.

Obviously a railroad of 1860 must have an 1860 station. Bob constructed one with rest rooms (I am not sure whether the passengers rest in the English or the special American sense !) and with a refreshment bar and ticket office. He also built a train shed and loading platform, and then—right in the middle of it all—he planted the Buchmann home. The house stands in a clearing with a spur track from the main line running right down to the garage. In bad weather Bob can switch his rolling stock straight to headquarters for storing or repairs.

The HT and W keeps open throughout the year as weather permits, with a seven-day schedule most of the time and Sunday-trains-only in the winter. Every year will see it grow in size or detail; for no enterprise of this kind—none that answers the creative instincts of model engineering—can ever be considered complete. A turntable, a water-tower and a petrol engine (not 1860, but excusable as a practical adjunct) are among the later additions to a railroad whose very name brings out the Casey Jones in every live steamer.

Good luck to the HT and W; and may it hoot, toot and whistle for many years yet among the wood violets of Illinois. ▣

GEAR CUTTING

Gear Wheels and Gear Cutting, by Alfred W. Marshall, explains the principles which govern the formation and numbers of the teeth for a given mechanism and describes the types of gears in general use.

There are numerous illustrations in this 92 page book, price 3s. 9d. post paid, which can be obtained from Percival Marshall and Co. Ltd, 19-20, Noel Street, London, W.1. Rate in U.S.A. and Canada is **$1.00**.

A 10 c.c. TWIN TWO-STROKE ENGINE

In concluding this series EDGAR T. WESTBURY stresses the need for an efficient silencer, with notes on construction, end components and engine cooling

Continued from 27 March 1958, pages 384 to 386

At the time the Cadet engine was first designed, open exhaust pipes were fashionable, and any suggestion that silencers should be fitted was shouted down by the worshippers of high efficiency.

It has now been proved, however, that suppression of noise does not inevitably cause loss of performance, and in model power boats, where silencers are compulsory for MPBA competitions, there has been no halt in the steady progress in attainment of speed. For moderate efficiency, as required for driving prototype boats, there can be no possible excuse for excessively noisy engines.

It was, therefore, decided that the design of the Cherub engine could not be complete without some provision for fitting a properly designed and efficient silencer. Makeshift devices, such as are often "hooked up" to open-port engines as an afterthought, vary widely in their effectiveness, and only too often fall off or disintegrate while the engine is running.

The cylinders of the Cadet are not equipped with flanges or other means of fixing a silencer, but the elongated exhaust trunks enable the silencer inlet pipes to be sleeved over them, and as it is not necessary to provide an airtight joint, this method of fitting has been found quite satisfactory.

In fact, any leakage results in air being drawn into the system, rather than the escape of exhaust gas, due to the injector effect of the gas moving at high velocity at this point.

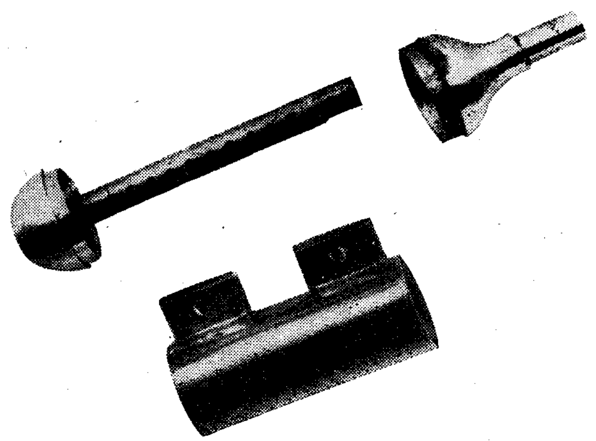
The silencer fitted to the prototype engine was fabricated from copper tube by silver soldering, and this method of construction is quite satisfactory. But many constructors will prefer to use castings, which very much simplify the work involved, and the drawings show this version of the design; for fabricated construction of the body, thinner sections can, of course, be used (down to 20 gauge), and materials most suitable are copper, brass or steel, though it is possible to use aluminium alloy if one is conversant with the technique of welding or brazing this rather difficult material.

The principle on which the silencer operates is similar to that employed on engines previously described, including the Dolphin and the two Bees. It involves no direct baffling of the gases to set up back pressure, as the inlet pipes enter the cylindrical expansion chamber tangentially and are free to flow in a circular path without meeting any solid obstruction.

This rotary flow not only absorbs the kinetic energy of the gases, but also creates a vortex, or zone of low pressure, in the centre, where the perforated exit pipe allows it to escape.

Tests of the engine with and without the silencer fitted show that it makes no perceptible difference to performance at normal working loads and speeds, while the muffling effect is at least as great as that produced by silencers containing baffles or absorbent material.

The construction allows for easy dismantling to remove accumulated oil and carbon, which is not always a feature of the other types. It is possible to place the body either way up, and locate the exit pipe at either end of the engine, to suit the particular installation arrangements.



The silencer components before final assembly

CONSTRUCTION

The body casting requires only to be bored out and faced on the two ends, and as no very close limits of precision are called for, this can be carried out by holding, from each end in turn, in the self-centring chuck.

It will be found that the projecting inlet lugs will just clear between the chuck jaws, with the size and type of chuck normally employed on lathes used by model engineers. A reasonably good finish of the bore will deter the adhesion of carbon, and the end faces should also be smooth and true to make a good metal-to-metal joint.

The inlet pipes are fitted over the exhaust trunks on the engine by milling or filing, and the final fitting must, of course, be done with the latter fully assembled so that the proper distance apart of the pipes can be ensured.

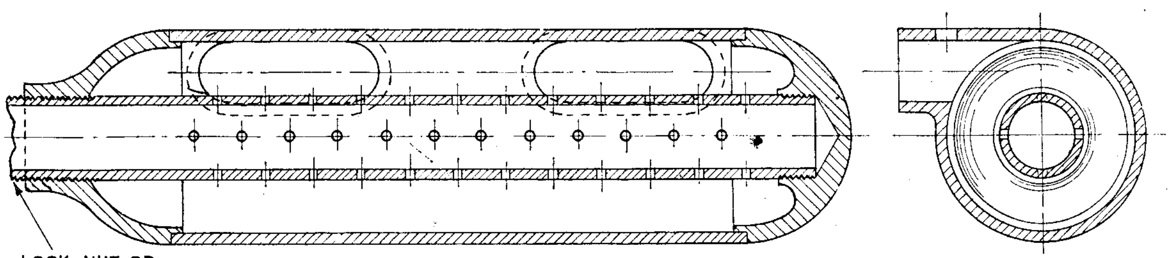
A hole is drilled in the top surface of each inlet lug, and when in position a corresponding hole is drilled and tapped in each exhaust trunk to take a short fixing screw.

With reasonable care in fitting the pipes, this will provide adequate security for the silencer, though in the event of a long tail pipe being fitted to the latter its overhanging weight should, of course, be supported in any convenient manner.

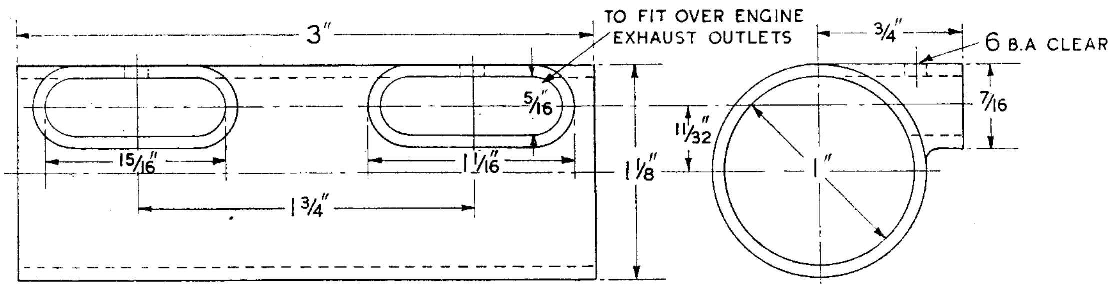
END COMPONENTS

The end components should preferably be machined all over, as a good exterior finish will enhance the appearance; to turn the contours the use of a hand tool, after preliminary roughing to shape, will be found desirable.

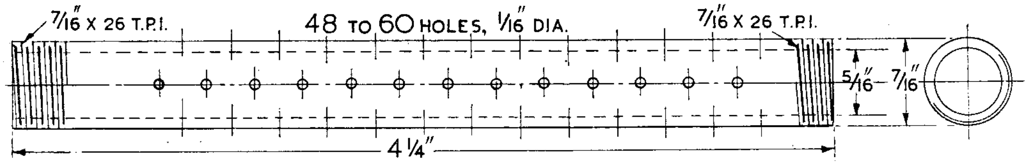
If the alloy does not machine very freely, and tends to tear instead of



SILENCER ASSEMBLY



SILENCER BODY 1 OFF L.A.



EXIT PIPE 1 OFF DURAL OR STEEL

producing a good tool finish, a thin lubricant will help matters.

Paraffin is often recommended, but I have found that well-diluted soluble cutting oil is better. The blank end could be machined outside by means of a spherical generating tool, but this would be applicable only to a part of the contour on the outlet end.

Before tackling the exterior in each case, however, it is advisable to deal with the inside, but here the spherical tool could be used on the outlet end and not on the blank end, as the centre must be left thick enough to provide adequate depth in the tapped hole to secure the exit pipe.

At the outlet end the centre hole may be tapped if desired so that it can be secured by simply screwing it on to the exit pipe. But if so, it will be desirable to provide some means of applying a spanner, tommy bar or other wrench without damaging the finished surface.

In most cases, however, it will be found more convenient to provide a clearance hole in the outlet and hold it in place with a thin nut, or, alternatively, a tapped sleeve into which an extension or tail pipe could be screwed. Both components should have the spigots turned to fit closely in the bore of the body.

EXIT PIPE

The exit pipe is simply a length of $\frac{7}{16}$ in. × 16-gauge tube screwed at each end and drilled with a large number of small holes, the aggregate area of which must be greater than that of the exhaust ports in one (not both) of the cylinder liners.

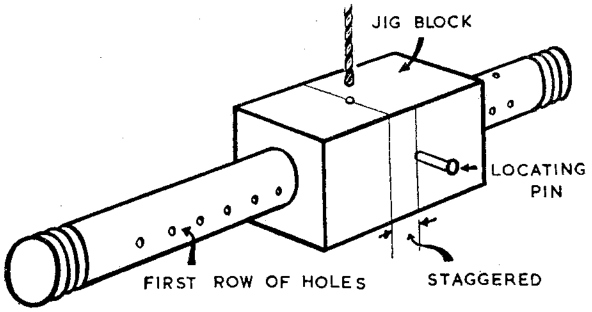
The drilling of so many holes might be regarded as tedious, but will not take long if a good sharp drill is used—even if the only appliance available is a hand brace. In my case, I simplified marking out by making a very simple jig, consisting simply of a piece of $\frac{3}{4}$ in. square steel bar about 1 in. long, with a $\frac{7}{16}$ in. hole drilled axially through it, and $\frac{1}{16}$ in. holes drilled in the centre of two adjacent sides, staggered laterally $\frac{1}{8}$ in.

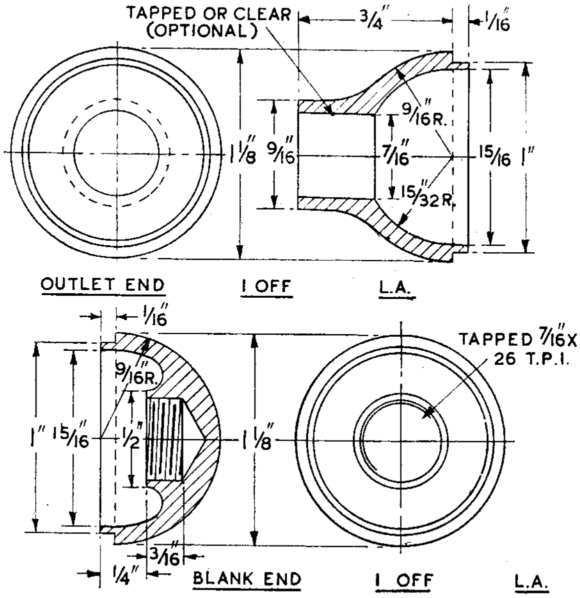
After marking out one row of holes, centre-punching and drilling them in the normal way, the pipe was slipped into the jig and located by a pin pushed through the side hole into one of the holes in the first row. This enabled the second row of holes to be drilled, and the process was repeated for the third and fourth row.

Of course, it does not matter if the holes are irregularly spaced, but a neat job is worth while for its own sake, even if it will never be seen.

As the exit pipe is in tension when the silencer is assembled, it must have sufficient tensile strength to take the strain when heated to a high temperature. It might be thought that steel, owing to the difference in its coefficient of expansion compared to aluminium, would not be suitable. But the fact is that the pipe gets much hotter than the silencer body because the heat is not so readily conducted away from it.

Aluminium alloy or brass, being better heat conductors, will keep somewhat cooler and will thus serve





for the exit pipe, but they lose tensile strength at high temperatures and are less suitable than steel for a hot-running engine.

A simple jig for drilling holes in the exit pipe

ENGINE COOLING

Several readers have asked me whether I propose to design a water-cooled version of the Cherub, as they consider it better suited to marine work.

It is, of course, possible to convert any air-cooled engine to water cooling simply by jacketing the accessible part of the cylinder barrel, and this gives fairly satisfactory results in small engines, as the head is kept sufficiently cool by conduction alone.

In this particular design of engine, however, conversion is rather difficult owing to the unusual depth of the head. As I am not keen on makeshift methods I should prefer, if water cooling is insisted on, to design a different engine better suited to complete water jacketing of the entire cylinder and head—as I have done in the case of four-stroke engines such as the Seal, Seagull and 1831 engines.

I think, however, that many users of marine engines are inclined to jump too readily to the conclusion that water cooling is a necessity for this class of work. It is quite true that many air-cooled engines have not given satisfactory results when installed in boats, but there are several reasons for this.

Apart from the obvious necessity for providing for a good flow of air over the cylinder fins, either by natural or forced draught, it is most essential that the design of the engine should be conducive to efficient cooling, and —more important still—the avoidance of distortion at high temperature, which is the most common cause of actual mechanical trouble. With modern lubricating oils, engines will run merrily at very high temperatures so long as the pistons do not seize or the cylinders distort so as to lose compression.

Many engine failures are due not to high cylinder temperatures as such, but to conduction of heat to the carburettor so that the fuel boils before it gets to the jet, and the engine is thereby starved; this can occur even in water-cooled engines.

Some years ago, in the course of experimental work, I came to the conclusion that with small two-strokes, there was a very strong case for providing fins all over the engine, and the crankcase in particular. My friend Jim Cruickshank went so far as to water-jacket the crankcase, with beneficial results.

One reason why I favour air-cooled engines in experimental work is that it is rather a nuisance to have to connect up water service to engines which have to be frequently dismantled and reassembled during the course of bench tests.

Water cooling can only be employed within a relatively narrow temperature range—between freezing and boiling points—unless special coolants or pressure systems are employed, and exploration of higher temperature ranges is useful in design investigation. I often run engines deliberately without cooling draught to find out if any trouble is likely to develop and, if so, to find its nature and possible remedy.

It is, I think, easier to make and fit an engine-driven fan than a water circulating pump, even if this also entails the making of a sheet metal cowling to direct air where it is most wanted; and the power likely to be absorbed in driving the former is certainly not greater than for the pump. Moreover, a boat engine can be run on the bank for tuning up, without any qualms as to risk of overheating, if it is independent of water supply.

My advice on this matter, therefore, is to water cool engines if you prefer it that way, but do not imagine that this confers any outstanding practical advantages over air cooling for boat engines, or any other types within the size range employed for models.

CASTINGS FOR THE CHERUB

I am now able to announce that sets of castings for this engine are now available from Craftsmanship Models Ltd, 27 Circle Gardens, Merton Park, London SW19. They include excellent die castings for the pistons and connecting-rods, thus eliminating much of the machining work which I described for making these components from the solid.

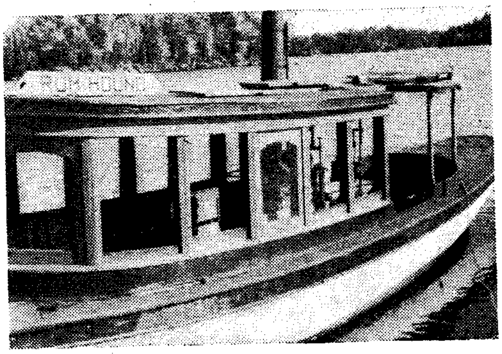
A special type of carburettor to suit the Cherub is under development and I hope to describe it in due course, but in the meanwhile I can assure readers that the Seal carburettor is quite suitable if properly made and adjusted.

It is difficult to improve on this type for simplicity, if a good range of throttle control is to be obtained. But in common with any tiny device of this kind, the best results demand a good deal of patience and delicacy in obtaining correct adjustments. ■

Steam boats in the USA

Lake Winnipesaukee, in a lovely New Hampshire setting, is a steamboat paradise

By N. J. CHAPMAN



The steam launch RUM-HOUND

LAKE Winnipesaukee, in New England, has all the attractions pleasure seekers could ask for: clear sparkling water, sandy beaches, good fishing, bathing beauties, boat rides, and all the rest. But the unusual feature is steamboats—it is the last stronghold of such craft.

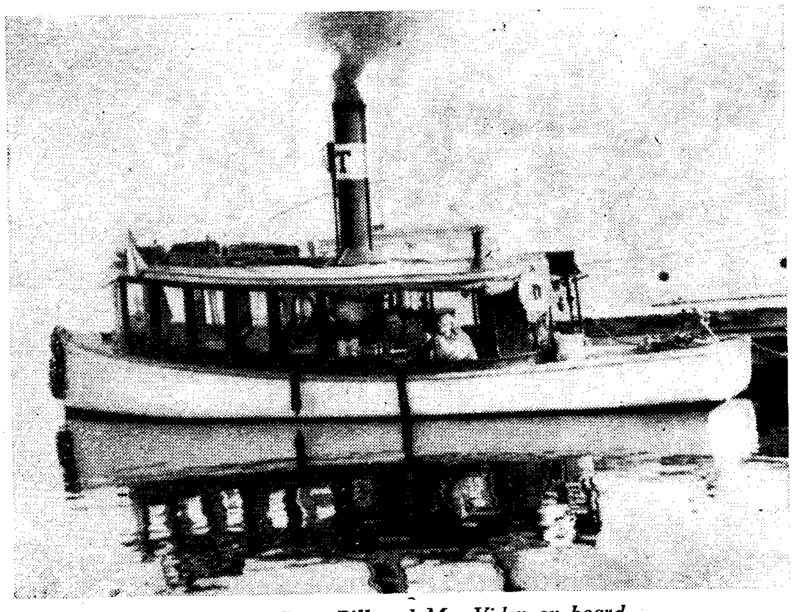
Thanks to another enthusiast, Richard Mitchell of Hinsdale, New Hampshire, I learned of several boats and their owners to visit. The first was Capt. Bill Viden and the SL *Staurus.* This was a locally built boat 33 ft long with a 9 ft beam. The power plant consists of a Ward water tube boiler, coal fired and feeding a compound engine $3\frac{1}{2}$ in. × 5 in. × 6 in. exhausting to a keel condenser. Capt. Viden had fired on a tug boat in New York harbour and has rigged up engine room telegraph and signals for the helmsman—in this case Mrs Viden.

The *Staurus* is well equipped for cruising, having sleeping bunks on the side and a galley at the stern. I arrived at dockside early in the morning when the aroma of bacon and eggs frying was most appetising. Capt. Viden suggested a short cruise of about five miles to a point where another steam man would drive me around the lake to see the other boats. The black smoke poured out the funnel as we weighed anchor and steamed east.

The silence and absence of vibration were restful and relaxing. Occasionally Mrs Viden would toot the whistle at friends who liked the rich chime tone. I asked if residents ever complained about the smoke. Normally the smoke stack is quite clear, Capt. Viden said. One citizen had complained to the lake commission but they replied that steamboats had been on this lake for 100 years so it was a little late to act now.

A quiet, leisurely cruise is the ideal way to enjoy the beauties of this New Hampshire landscape. Our five mile trip was over all too soon and we tied up to a dock. Here I met Bob Fuhr who hails from Long Island but spends his spare time at Lake Winnipesaukee visiting steam men of all kinds. Waving goodbye to Capt. and Mrs Viden we started for a bay nearly half way around the lake.

Here we found a beautiful spot, thickly wooded with trees right down to the water's edge—a Sylvan setting for the steam launch *Slo-Mo-Shun.* Dick Mason, the owner, greeted us warmly; he was firing her up for a ride so we were just in time. He also introduced us to a charming young man, Fred Semple, who produces small steam power plants for marine and stationary use.



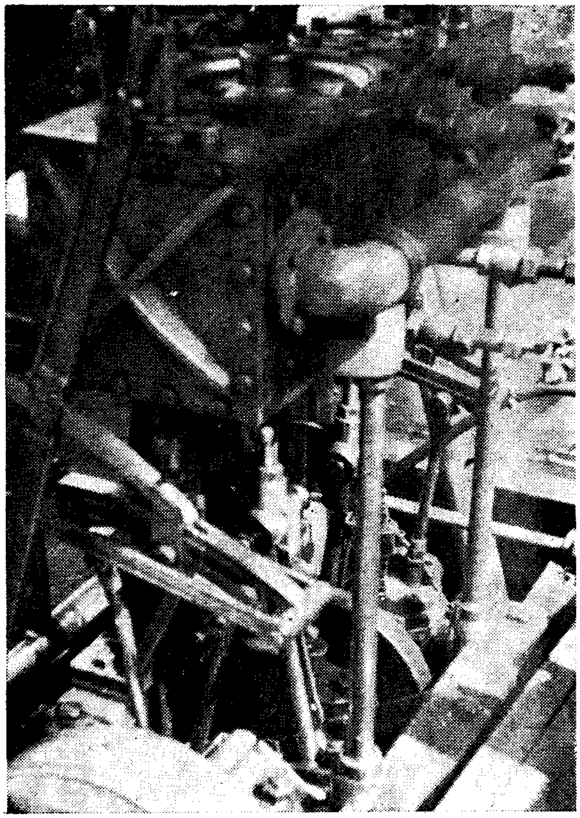
STAURUS—*Capt. Bill and Mrs Viden on board*

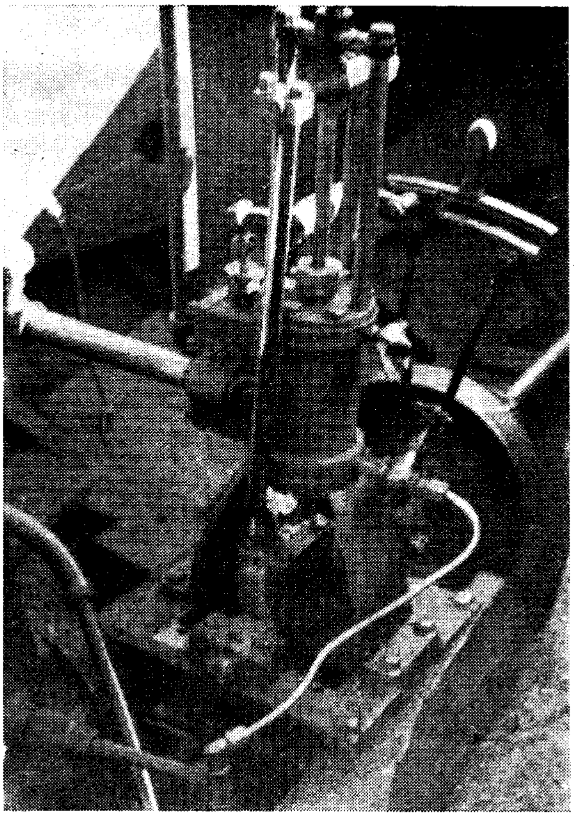
Counterweighted crankshaft

There was time for a few pictures before departure and then two blasts of the whistle called all hands on board. Like her sister ship the *Staurus,* the machinery is quite old but has been reworked along more modern lines. The boiler is the Roberts design with upper central drum and water legs of iron pipe. It is usually coal fired although wood may be used. The hull is 40 ft long × 9 ft beam.

The engine is a compound type built by George Whitney—a man who was a contemporary of, and competed with, the Stanley brothers at the turn of the century. Later he began building steam launches of many and varied designs. This engine ran very smoothly even at high speed, being fitted with counterweights on the crankshaft.

Cruising like this is a good way to entertain friends. One man can





toss in a couple of shovels of coal every 10 or 15 minutes, another can man the helm, another can work the injector, and another can stop the engine occasionally to lubricate a cross head pin or some other part. Meanwhile all hands enjoy light refreshments, liquid or otherwise, and take in the scenery and fresh air. More than two hours passed quickly on this delightful cruise.

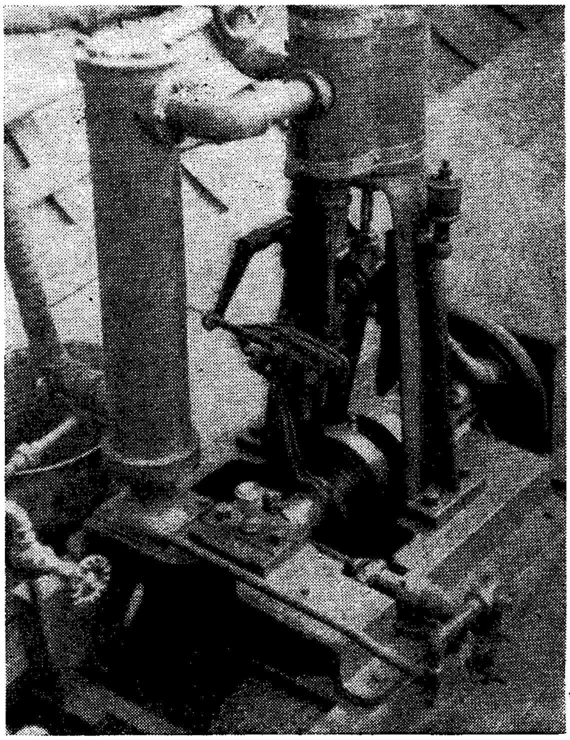
Reluctantly we bade goodbye to Mason and Semple—there were other boats to see but time would not permit visiting them all. Hurriedly we drove to another bay where my host recognised the owner of a steamboat coming down the road. After exchanging greetings with us, he told us to go aboard his craft and feel at home.

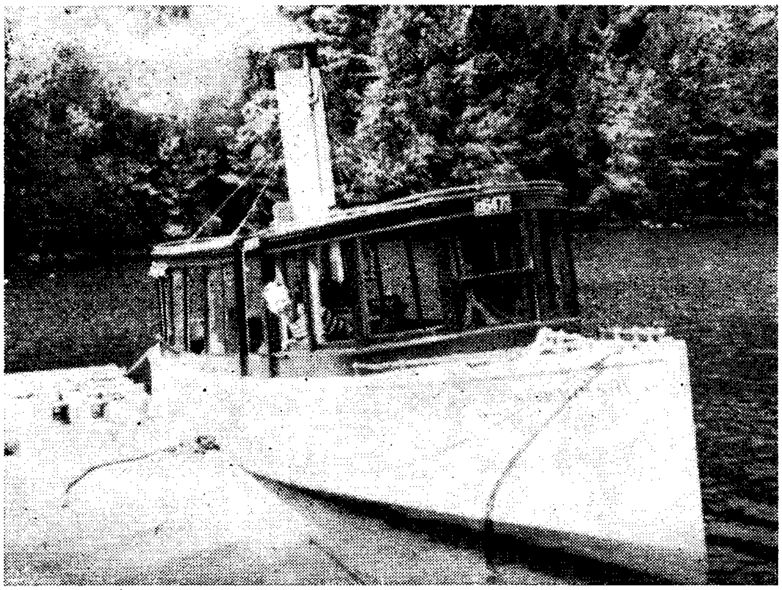
We found the launch *Rum-Hound* tied up to a dock. It is a 28 ft glass cabined boat somewhat smaller than the other two we had just visited. Her powerplant is interesting, having a watertube boiler of Derr design which consists of vertical sections of tube joined to headers at top and bottom. This boiler was first built for use in steam cars needing quick steaming and some steam men favour

Above left: *The Whitney engine of* SLO-MO-SHUN, *probably fifty years old*

Above Right: RUM-HOUND *engine is an inverted Payne*

Right: *The Shipman engine of* RIVER QUEEN





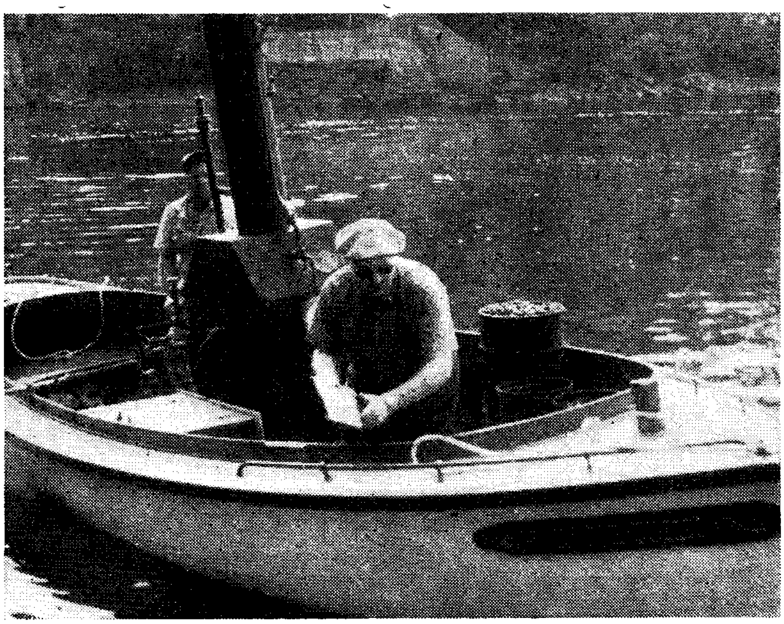
SLO-MO-SHUN *has handsome lines*

its design while others do not.

The engine is a very old Payne inverted type. Bob Fuhr said he thought it was at least 100 years old. It is of vertical design with piston rod and guides on the top cylinder head. A pair of very long connecting rods go down to the crank pin bearing which is also quite long.

It would be interesting to hear the philosophy behind such a design. It must have been good to last so many years.

By this time, the sun was going down and I knew the other steamboats on Winnipesaukee would have to wait till next year. Bob Fuhr promised to be on hand for my next visit.



The RIVER QUEEN *on the Connecticut River, Vermont*

Some time later, I got the chance to see some distance from the lake two more boats whose owners go up there occasionally. Don Beckner of South Lancaster, Massachusetts, has a charming little 20 ft launch with a canopy on top. The boiler is neatly housed in with all fittings of polished chrome plate. The engine is a twin-cylinder job taken from a steam car and connected to the propeller shaft by chain and sprockets. This drive permits the changing of ratios to get the best economy and speed.

Don had just finished painting and polishing his boat so I did not get to ride in her—that too will come later.

Connecticut Queen

Then, at long last, I met the man, Dick Mitchell, who had directed me to all the others. Dick had just completed building his 23 ft *River Queen* and launched her last summer on the Connecticut River. She is of generous beam and solidly built of oak throughout so she should last Dick and his son all their lives. The power plant is a Derr watertube boiler, coal fired, steaming a one-cylinder 3 in. × 4 in. Shipman engine. It was built 50 years ago and drives a 24 in. dia. × 24 in. pitch propeller. The engine exhausts are passed to a cast iron feedwater heater before going out to the open air. The feed pump drives from a crankshaft eccentric, with hand pump and injector added. A large chime whistle which can be heard far and wide surmounts the boiler.

Shovelled 27 tons a day!

Dick Mitchell had another visitor, Oakman Mullen, a locomotive fireman from Wisconsin. We all decided to cruise down river on this beautiful fall day. I got the job of steering while Mullen tended the fire, using a tiny fire shovel as his scoop. I wondered he wasn't overworked, using this small shovel every ten minutes or so.

In his day he had shovelled 27 tons of coal a trip on a freight locomotive.

Cruising along we noticed a diesel locomotive and freight train approaching on the tracks skirting our river bank, whereupon Dick gave a long blast of his whistle. Immediately the engineer responded with several toots as his train rolled by. Finally, not to be outdone, the brakeman tooted his little whistle as the caboose appeared. I'm sure everyone had his fill of whistle tooting!

It all goes to show that steam men are brothers of a great fraternity. Can we who love steam power be blamed for returning to this steamboat paradise? ▣

Cylinders for $1\frac{3}{4}$ in. gauge locomotives

LBSC describes a pair of cylinders suitable for any $1\frac{3}{4}$ in. gauge engine with steam chests inside the frames, and adds a few general observations

HAVING recently received requests for details of outside cylinders for $1\frac{3}{4}$ in. gauge locomotives having their steam chests inside the frames, here are some drawings of a type which can be fitted to any engine from a Brighton Baltic tank down to a six-coupled dock shunter. I fitted a similar pair to a commercially-made 4-4-0 for a friend in Yorkshire, and they did the job in great style.

Steam chests inside the frames have their advantages and disadvantages. The principal advantage is that the valve gear is directly connected to the valve spindles. The principal disadvantage is that the passages between steam ports and cylinder bores are far too long for high efficiency, and for that reason I don't love them a little bit.

Even when the port faces are nearly flush with the insides of the frames, the steam still has a far longer journey from port to bore than it has in a cylinder with valves on top or underneath, and as the passages have to be filled with steam at boiler pressure when the port opens, and the steam is blown to waste when the exhaust port opens, it doesn't need a Sherlock Holmes to deduce that the shorter the passage, the less the waste.

I found out a lot about causes of steam wastage by accident, when a small child. My tin *Ajax* had stamped brass cups for the pistons of its oscillating cylinders. The cups faced toward the steam inlet, so they had to be filled with steam at each stroke, and this was naturally blown away on the exhaust stroke, the cylinders being single-acting. When the cups wore in the bores, and steam began to blow past so much that the engine had no power and the pressure fell rapidly, it was obvious that they needed packing, and it was also very obvious that I couldn't file a packing groove in a cup.

I reckoned that the easiest way out of the difficulty was to fill the cups with solder. I could then file my packing-grooves (this was long before I had a lathe) right through the brass cup into the solder, and the piston would still be in one piece. This was done, and the pistons packed with wick taken from a halfpenny tallow dip. When I got steam up again, the difference was amazing, the engine ran far better than ever it did before, and kept pressure easily with a much smaller spirit flame.

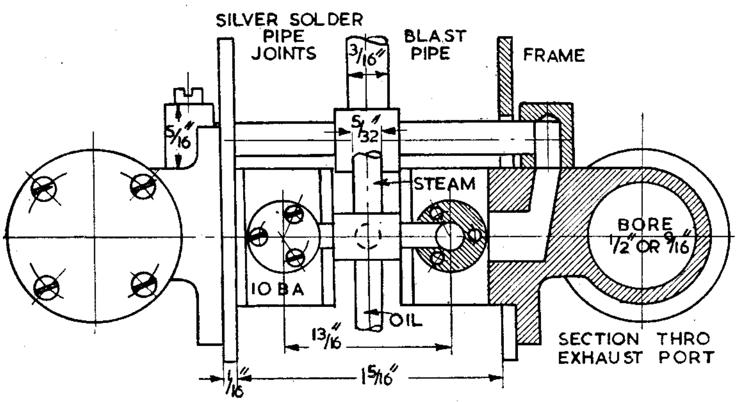
If ever there was a Nosey Parker in the "why-and-wherefore" department, it was young Curly. I just couldn't rest until I discovered the reason for every happening, and when investigating this one, it soon dawned on me that as the cups were now filled with solder, there was only a little gap, less than $\frac{1}{16}$ in., between the filled-up cup and the end of the cylinder when the crank was on dead centre. As the cups were about $\frac{3}{8}$ in. long, the waste of steam in filling them was now abolished. That object lesson taught me always to cut clearances to the minimum, which I have done to this day.

The way I cut loss to the minimum in cylinders of the type illustrated, is to cut the area of the passages to the amount necessary to pass just sufficient steam to keep the engine running at high speed with normal load. This area will pass the extra steam needed at starting, or running slowly with a heavy load, simply because it has more time to get through the passageway. I have proved this by actual test.

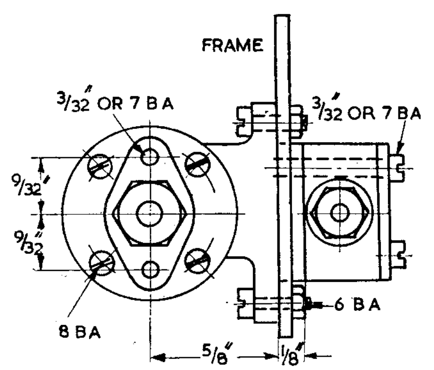
In the present instance two No 48 holes will do the trick, and the waste is negligible. With the valves set to cut off at 75 per cent in full gear with link motion, or 60 per cent with the fixed cut-off of loose eccentrics, the small amount of steam in the passageways only helps the expansion, and keeps the exhaust pressure low.

A mistaken notion

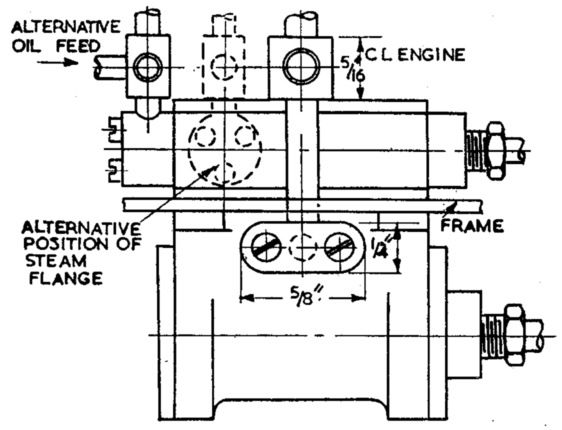
A correspondent some years ago built one of my earlier designs, a simple $2\frac{1}{2}$ in. gauge 4-4-0 which I called *Annie Boddie* because anybody could easily build it. He wrote me that the engine worked all right, but burnt away the coal almost as fast as he could shovel it into the firebox, and the $\frac{5}{16}$ in. × $\frac{3}{8}$ in. feed pump that

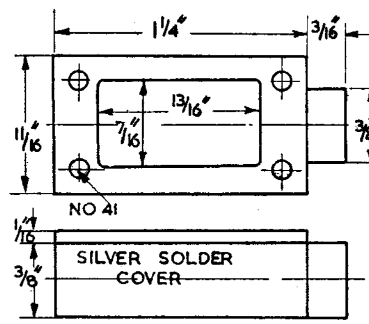


CYLINDER ERECTED



REAR OF LH CYLINDER





STEAM CHEST

I specified wouldn't maintain water level. The blast was so fierce that the return bend of the superheater had burnt out. I suspected that the valve setting was late and that she was taking steam full stroke, but he said no; he had carefully followed the instructions and the setting was correct.

I asked whether any other variation had been made in the job, and he said only one; he didn't think the passages between ports and bores were adequate, so he had milled them out to the same cross-section as the steam ports.

That explained how the milk got into the coconut ! He had introduced a huge cavern at each end of each cylinder which not only had to be filled with steam at each stroke and blown to waste, but it was so big that after the valve had closed the steam port, the combined volume of steam in the cylinder and cavernous passage was such that the pressure drop at the point where the exhaust port opened was almost negligible. Hence the excessive steam consumption and the heavy blast.

I told the builder to forget all his notions, block up the milled-out passages, and drill the holes according to specification. He hm'd and ha'd about it, but eventually did so, and was surprised at the difference. The engine used very little coal, the blast was just a purr when running fast, and the pump fed in far more water than needed unless the bypass was opened a little. The proof of the pudding is always in the eating !

Critics have asked, why big ports if not-so-big passages are provided ? The answer is simply that the port must open wide enough and quick enough to get steam to the piston at full pressure as the crank reaches dead centre. If the ports were small, the steam would be wiredrawn before it got into the passages—*which are full open all the time*, whereas the ports are not; nuff sed !

SPECIFICATION OF CYLINDERS

The cylinders illustrated can be bored to 9/16 in. if required, but should be not less than ½ in. The stroke is ⅞ in. but could be used when rebuilding a ¾ in. stroke job by fitting thicker pistons, so that the clearance remains the same. The boring and facing can be done by the method illustrated in the recent "Ways and Means" article, so repetition is superfluous. The bolting flanges above and below the portface can be endmilled, or simply cleaned up with a file, but they must be parallel to the portface. The ports can be cut by endmilling, in which case the ends will be rounded, but that doesn't matter. They can also be cut by drilling holes close together in the marked-out space, and chipping into rectangular slots with a little chisel made from silver steel.

Chuck the back covers by the spigot on the gland boss, face the back (says Pat) and take care to turn the register to an exact fit in the cylinder bore. Centre and drill No 30 to about ⅜ in. depth, to ensure that the hole for the piston-rod is exactly in the middle. Reverse and rechuck either by gripping the edge, or holding in a stepped ring. Saw or part off the spigot, face the gland boss, open out the hole to 3/16 in. depth with a 7/32 in. pin-drill, and tap ¼ in. × 40. It is always advisable to use a pin-drill when opening up holes in which to fit screwed glands, as this ensures that the hole in the gland lines up with the hole in the cover, and there is no risk of the rod or spindle binding.

The front covers are just plain turning jobs, and the screwholes in all are drilled No 43 for 8 BA screws.

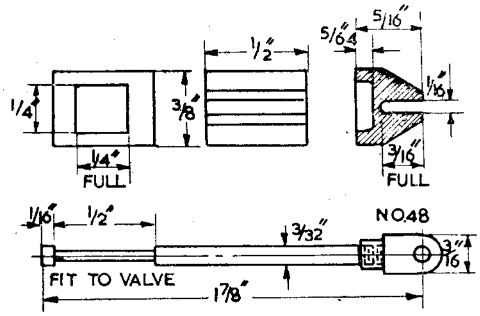
The two No 48 holes at each end which connect ports and bores should be drilled with the casting held at the appropriate angle, in a machine vice on the drilling machine-table.

I have described several times how to sight the drill from outside the casting, but a tip for beginners is worth repeating, viz. use a drill ground slightly off-centre (beginners usually grind them that way !) so that the hole will be slightly larger than the drill. Should the drill break—it shouldn't if it is withdrawn every ⅛ in. to clear the chips—the broken pieces can be shaken out. Wee drills cost muckle bawbees the noo, ye ken, but they're nae sae expensive as a fresh casting.

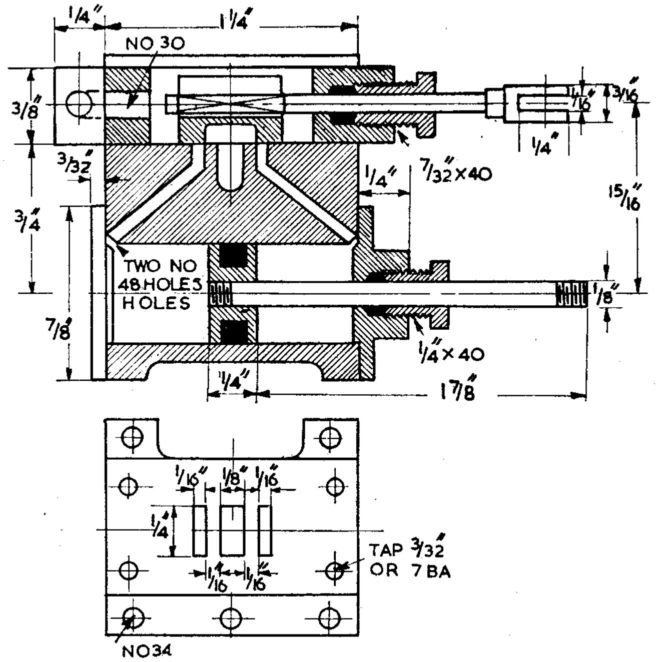
The piston-rods are 1⅞ in. lengths of ⅛ in. rustless steel with a few threads on each end. Turn the piston blanks 1/64 in. oversize, chuck one, centre and drill through No 40, open out to half thickness with No 31 drill and tap the remainder to suit the rod. Put the rod in the tailstock chuck, run it up to the piston, enter it in the hole and pull the lathe belt by hand until the rod seats home. Turn the piston to an exact sliding fit in the bore, with the piston rod gripped either in a collet or in a split bush held in the three-jaw.

The steam chest casting can be held in the four-jaw to face both sides, and with a little careful setting to get the boss to run truly, same can be turned on the outside (bring up the tailstock to support the boss while doing this) and drilled, counterbored and tapped for the gland. Both piston and spindle glands are turned from hexagon rod, bronze or gunmetal for preference.

Four 3/32 in. or 7 BA screws will be sufficient to attach the steam chest to the cylinder, as the depth of the walls will prevent any springing which would allow the jointing gasket to



SLIDE VALVE & SPINDLE



SECTION OF CYLINDER WITH PORTFACE

blow out, but it is advisable to silver solder the $\frac{1}{16}$ in. cover. If this isn't done, put an extra screw, $\frac{1}{16}$ in. or 10 BA, through the cover into the wall of the steam chest halfway along each side.

The slide valves can be made from $\frac{1}{2}$ in. lengths of $\frac{3}{8}$ in. square bronze or gunmetal rod, the ends being squared off in the four-jaw. The easiest way to form the cavity, if a milling machine isn't available, is to make a countersink in the middle with a 7/32 in. drill, and chip it to dimensions shown with a little chisel made from $\frac{1}{4}$ in. silver steel. The groove in the back can either be cut with a $\frac{1}{16}$ in. saw-type milling-cutter, or cut with a hacksaw and finished with a thin flat file. Bevel the sides as shown, either by milling or filing.

The spindle is made from 3/32 in. rustless steel or bronze rod, screwed at one end for a fork or clevis as shown. At the other end file or mill a flat at each side, so that the spindle will enter the slot in the valve easily, but without endplay. The whole bag of tricks is assembled in the way I have so often described for various other cylinders in this series of notes.

ERECTION TIPS

The holes in the frame should be cut to the same size as the steam chests, the exact location depending on the type of locomotive for which the cylinders are required. The frames should be cut deep enough at the leading end to allow for the attachment of the bottom flange. Clearances should be filed for the gland boss on the steam chest, and for the exhaust pipe, the flanges for which are outside the frames.

The plumbing job for these cylinders is just a piece of cake. The exhaust assembly just consists of a block of brass $\frac{5}{16}$ in. square with a No 23 hole drilled right through it, and a $\frac{3}{16}$ in. hole drilled in one of the other facets to meet it. The blastpipe is fitted into this, and a $\frac{3}{4}$ in. length of 5/32 in. pipe is fitted into each end of the cross-hole; the outer ends of these carry oval flanges as shown in the plan and sectional views.

Assemble the lot temporarily and put it in the gaps filed over the steam chest openings in the frames, then put the cylinders in place, and adjust the flanges on the ends of the pipes until they are exactly over the exhaust holes in the cylinder castings. Remove the lot and silver solder the joints. When the cylinders are permanently erected, the flanges are attached to the cylinders by two screws in each, with a jointing gasket between the contact faces.

The steam connection can be arranged either at the front end of the steam chests or on top, the latter being shown by dotted lines in the plan view. In either case the assembly is the same, the centre-piece being a piece of $\frac{1}{4}$ in. square brass rod $\frac{5}{16}$ in. long. The flanges are two $\frac{1}{8}$ in. slices of $\frac{3}{8}$ in. brass rod drilled as shown, and attached to the centre-piece by short lengths of $\frac{1}{8}$ in. copper pipe, the centres of the two flanges being $1\frac{3}{16}$ in. apart. The 5/32 in. steam pipe is fitted into a No 23 hole in the top of the centre-piece, and the oil pipe ($\frac{1}{8}$ in. or 3/32 in. according to type of lubricator) either underneath, front or back, whichever is most convenient for the type of engine.

Each flange is held to the steam chest by three $\frac{1}{16}$ in. or 10 BA screws. For the front fitting, simply attach them over the clearance holes for the valve-spindles at the front end of the steam chest. For the top fitting, plug the ends of the clearance holes with short hexagon-headed plugs, tapping the holes 5/32 in. × 40 and making the plugs to suit. Drill $\frac{1}{8}$ in. holes in the tops of the steam chests in whatever position is found most convenient for the type of engine, and attach the flanges by three screws as mentioned above, putting a 1/64 in. Hallite or similar gasket between flange and steam chest.

TIPS FOR VALVE SETTING

The valves can be set either by sight or by pressure. When setting the valves on the job mentioned in the first paragraph I laid the chassis on its side, holding it clear of the bench by gripping one end of the buffer-beam in a machine-vice, and propping up the other end with a block of wood. The steam chest was removed and the valve laid on the portface, with the spindle and eccentric-rod connected up. A small rectangular handbag mirror was laid under the main crankpin; this showed the exact position of the pin at a glance—and I'm open to bet that the makers of the mirror never dreamed it would ever be used for *that* purpose!

● *Continued on page 468*

An auxiliary woodturning spindle . . .

for a metal-working lathe

By ROLAND V. HUTCHINSON

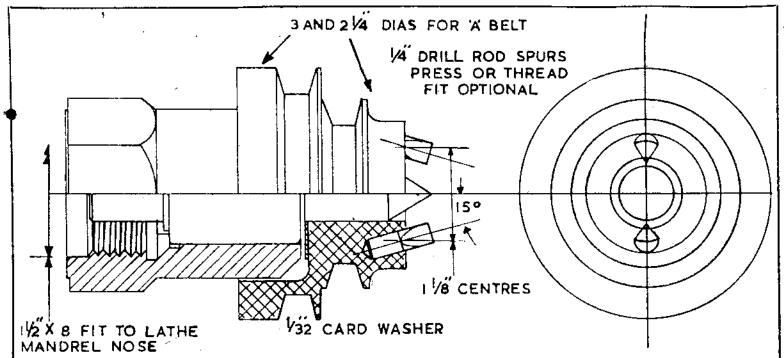
THE highest spindle-speed of my 4½ in. centre South Bend lathe is less than 600 r.p.m., which, while fairly satisfactory when turning patterns and the like approaching full swing of the lathe in size, is pretty slow for small work.

My picture shows a high speed woodturning spindle and a short hand-tool rest in place on the lathe. The spindle is a new departure cartridge-type water pump bearing, one shaft end of which was ground to a 60 deg. centre and the whole pressed lightly (about 0.0005 in. allowance) into a cast-iron hub screwed on to the nose of the lathe mandrel.

Shrunk on to the bearing shaft is a two step aluminium pulley which includes screwed-in spurs for driving workpieces. Thus the torque to be transmitted by the shrink-fit is only the resisting torque of the bearing assembly—the forces to do useful work are transmitted directly to the workpiece.

For the ⅝ in. nominal dia. shrink fit, an allowance of 0.001 is ample interference at room temperature.

The cast-iron hub is bored in place on the lathe mandrel, and counterbored about 0.0002 (two ten thou) larger than the bearing outside diameter for a depth of about ¼ in. Thus the bearing may be entered in place, and aligned and pressed home with a 60 deg. female tail centre, using the tailstock screw as a screw-jack.



Details of the internal construction of the spindle

Next the assembly may be set point-up on the bench or table, and a 1/32 in. thick cardboard washer fitted over the spindle to position the drive pulley.

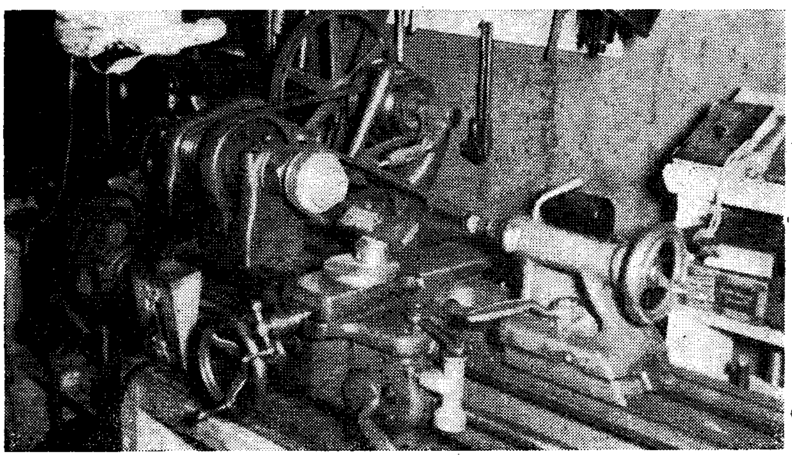
This latter may be placed on a hotplate suitably heated. Since it is aluminium, there is no colour-change to indicate its approximate temperature, but one simple way to avoid *overheating* the pulley is to heat it until a little ordinary bacon grease put on the pulley starts to smoke.

Then the pulley may be slipped in place on to the bearing spindle, and just as soon as it grips the shaft, it should be quenched in water.

The cardboard washer not only positions the pulley but also acts as a heat insulator, preventing loss of the lubricant with which cartridge-type bearings are pre-packed for life, so long as the quenching be done promptly. The cardboard washer is left in place; it does no harm.

The drive, via the A-section belt, is by a separate 1,725 r.p.m. electric motor.

The assembly drawing shows internal construction of the spindle. Some makers offer cartridge bearings assembled with optional amounts of built-in clearance or preload. But the preloaded type is to be preferred. ▣



A high-speed woodturning spindle and a short hand-tool rest in place on the author's lathe

IN THE ME WORKSHOP

Fine feed drive for a small lathe

First article in a short series in which EXACTUS advocates a split nut for the leadscrew, a rack feed for the saddle, and eccentric drive for a fine feed, with a description of a four-tool turret

ARTICLES on improvements and modifications to lathes seem never ending, but what a pity this would be if it were not so. Model engineers are always striving to get the best from their machines and the progress they make enriches our hobby.

Most articles of this nature are nearly always intended for the lads with a 3½ in. lathe, although there was an exception to this a few months ago, when a very useful and interesting series of articles was written by Martin Cleeve entitled, " Modifications to the EW Lathe."

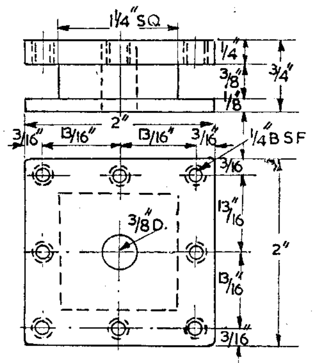
The EW lathe is without doubt a fine machine and increasingly popular with model engineers. I can write with plenty of practical experience of these lathes because not only is there one in the ME workshop but at home I have one of the first to be built. From time to time I have carried out a few ideas to improve it, and one of the best I have found was the fitting of a quick release split nut to the leadscrew and a rack and pinion for quick traverse of the saddle.

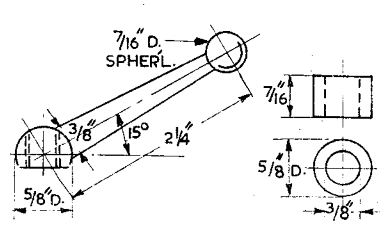
For the benefit of readers who are not familiar with the EW lathe I will briefly describe the layout.

The leadscrew has 8 t.p.i. and is constantly in mesh with the solid cast-iron leadscrew nut. The nut itself is positioned central with the saddle and is held in its place by a piece of fork shaped mild steel plate ⅛ in. thick. This plate is secured to the saddle by two ¼ in. setscrews and thereby transmits the drive from the leadscrew to the saddle.

To traverse the saddle by hand the leadscrew is fitted with a ball handle at the tailstock end. The main inconvenience with this arrangement arises when screwcutting or using a fine feed. To return the saddle to begin another cut in either instance meant either running the lathe in reverse or disengaging the train of gears. The latter only applied in my case when screwcutting as I have devised my own method for a fine feed arrangement. I will come to that in a minute. To eliminate this fault Martin Cleeve built a dog clutch into the leadscrew just below the headstock. When the drive is disengaged by this clutch the saddle can then be returned as before by turning the leadscrew by hand.

The good point about this system is that the disengagement, etc., can be carried out without stopping the lathe. My idea is more in line with general lathe practice because I can travel my saddle without using the leadscrew. By disengaging my leadscrew using the split nut, or perhaps I should say half nut, I can traverse the saddle more quickly and smoothly with the rack and pinion.





This is a great time saver when screwcutting, or when a fine feed is in operation. Also I find that the less effort required makes the lathe much more pleasant to handle.

These two modifications are carried on a small apron attached to the saddle in place of the bent mild steel plate that held the leadscrew nut. A very clear view of the layout can be seen in Fig. 1. There is nothing difficult in making it, the only ready made commercial articles required being the rack and pinion.

The knurled knob to engage the split nut and the ball handle for traversing the saddle were to suit my own particular fancy. If something different is desired there's no reason why you shouldn't have the fitting of your choice.

There is one other important point; the whole job can be done on the EW, so don't get the erroneous impression that you will need a larger machine. As I mentioned previously, any additions to my lathe have arisen from practical experience and at one time I wanted a fine feed for boring out some cylinders. There have been numerous articles on ideas for fine feeds and nearly always they involve a train of gears and/or pulleys.

Ratchet feed

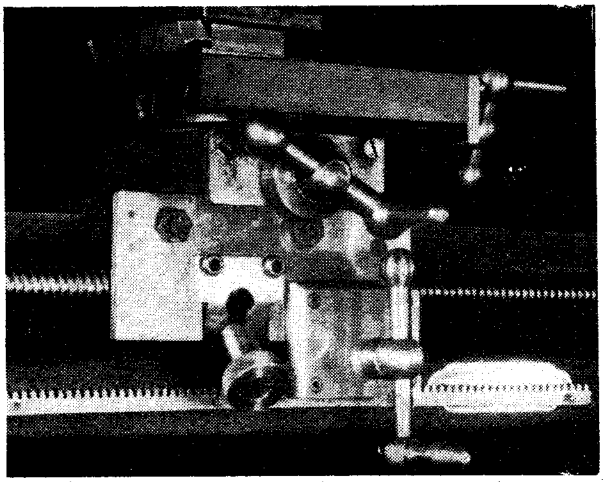
I wanted something simple, easy to build, and not too involved, yet efficient. I finally settled for a ratchet feed driven by an eccentric on the lathe mandrel. Fig. 2 shows clearly how simple the whole set-up is.

To change the direction of the feed, all that is required is to turn the knurled knob of the pawl 180 deg. It is as simple as that, and what is more there is no need to stop the lathe.

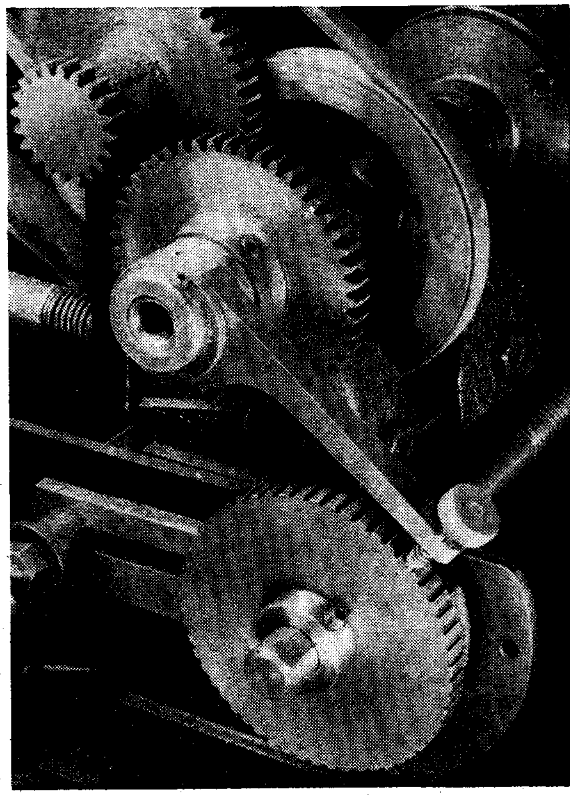
I never use fast speeds for boring operations and in these instances the feed works perfectly, but when I was turning at high speeds it had a tendency to bounce. This was soon overcome by adding a little more weight to the arm. I experimented by clamping small pieces by the knurled knob. In making one from scratch I would advise making the arm a little thicker and this would give it that extra weight.

The ratchet wheel seen in the illustration is an odd change wheel I had with the teeth partly turned away. It is a 55 t. wheel and gives me a feed of slightly over 0.002 in. per rev. Any odd change wheel will do, not necessarily one from an EW. The Myford change wheels have a ⅝ in. dia. hole and will do just as well. Of course, any change in the number of teeth will alter the rate of feed, those with the greater number of teeth giving the finer feed.

In Fig. 3 is a view of the four-tool



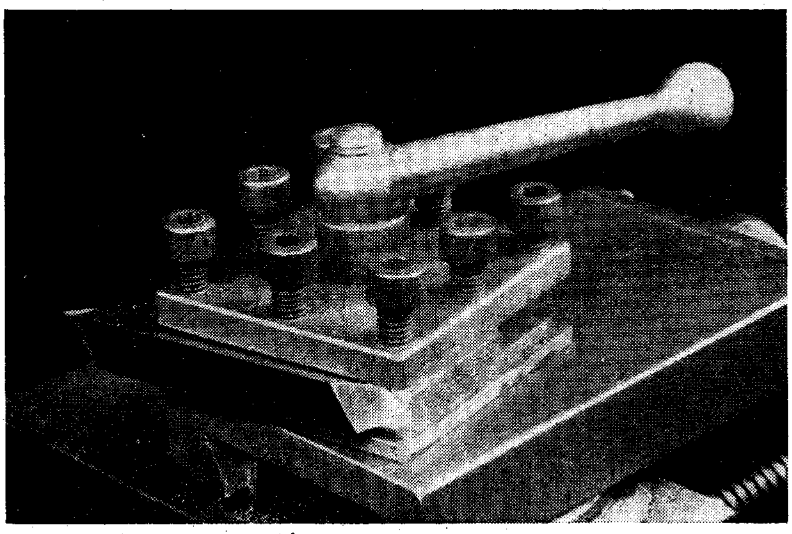
Above, Fig. 1: View of the apron with self-act and rapid traverse controls



Right, Fig. 2: Fine feed to leadscrew operated by eccentric

turret mounted on the topslide of my EW. I consider this as one of the most useful things I have made; it is practically a permanent part of the lathe as I very rarely take it off. As can be seen, I hold high speed tool bits direct in the turret. Having four tool bits sharpened and set for different jobs is a great time saver.

I know there is nothing new in describing one of these turrets as they have been done before but for the benefit of those who are not acquainted I will finish this first article with a brief description.



The four-tool turret

I made mine from a solid piece of mild steel 2 in. square and $\frac{3}{4}$ in. thick. There is an alternative to this by fabricating it from either two or three pieces of material. In the instance of the two pieces, one piece would have to be $\frac{1}{2}$ in. thick and the other, the top plate, $\frac{1}{4}$ in. thick. By adopting this method I think it has the advantage of being easier to build.

In my solid piece I milled the slot for the tool bits, and it was quite easy, but those not so fortunate may consider this a problem. By using two pieces of material this problem is overcome because the slots can be cut in the large piece of mild steel with a hacksaw and finished with a file. The top plate for the clamping screws is secured to the body by countersunk screws.

In the alternative method, using three pieces of material, very little cutting may be required as the sizes are all readily obtainable. Here again the three pieces can be assembled by countersunk screws or by silver soldering it all together.

I have not adopted any method for indexing the turret at each station as I can set it correctly through experience. But indexing could be done without too much difficulty and the advantage gained would be when screwcutting was included in the operations.

The size of screws used for clamping the tool bits is $\frac{1}{4}$ in. BSF Allen screws $\frac{1}{2}$ in. long. To clamp the holder to the topslide I made a ball handle with a spacing collar in between to clear the Allen screws.

If there is an EW owner without a turret toolholder I can assure him it is really worth the time making one. Next week I will begin to describe the eccentric feed for the leadscrew.

● *To be continued*

A $\frac{1}{16}$ in. SCALE MODEL

OF THE

ARCHIBALD RUSSELL

... built by J. S. Kamp, of Chester, Pennsylvania, with comments by our nautical adviser, Edward Bowness

I have recently received a letter from Mr J. S. Kamp, of Chester, Pennsylvania. In it, he says:

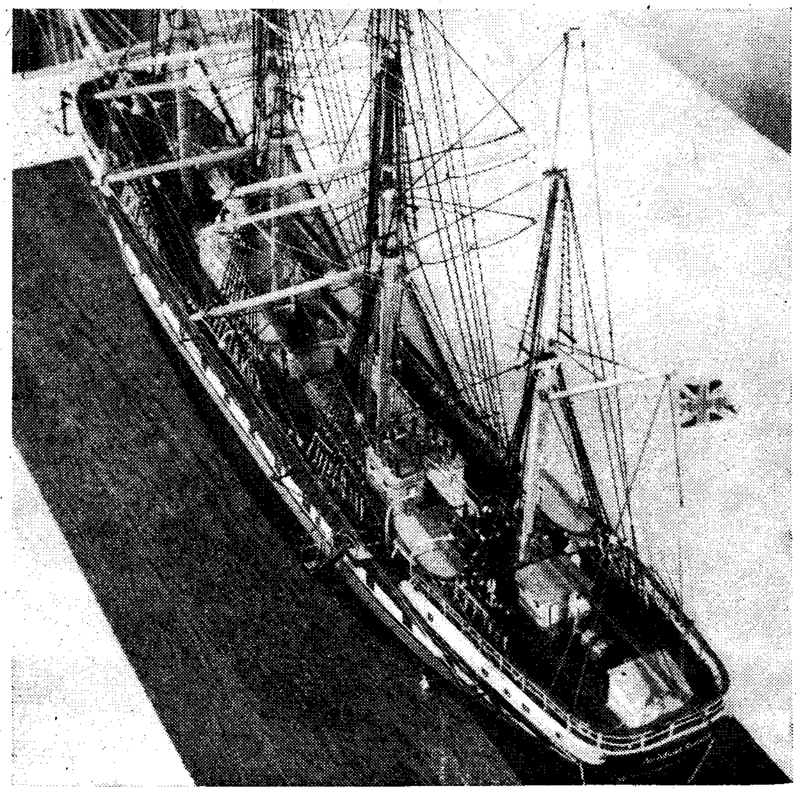
"I HAVE taken the liberty of sending you under separate cover a couple of photographs of a model of *Archibald Russell* built from the plans and information published in your book "Modelling the Archibald Russell." I would much appreciate your comment.

I have made one change in the model—i.e. added a carved "lady" figurehead. Everything else is according to your plans.

The taffrail is mahogany and the stanchions of turned brass with wire threaded through, as are also the stanchions around the fo'c'sle and along the catwalk. The stanchions at the break of the poop and around the half-deck and at the break of the fo'c'sle, are of turned walnut, with a mahogany rail.

The ratlines are all hitched, and the shrouds have rigging screws. These are secured to the deck with an ordinary pin with the head flattened and drilled to form a small eye to take the rigging screw; this is driven through a hole drilled in the pin rail, being forced in until the head touches the pin rail. It looks very neat and proportionate.

The bowsprit shrouds are small chain, also the brace bumpkin stays, and a gangway has been added."



* * *

THIS is a very fine model and the proportions and general effect are extremely good. The hull lines are smooth and graceful, and these have been enhanced by careful painting, the ports being especially neat and clean.

I sympathise with the builder in his preference for a female figurehead, as against a scroll or fiddle head, but accuracy is important in a named model and one should be content to model a ship as she is. Similarly, with the gangway or accommodation ladder.

True, these were used in the more spacious days, as witness the well-known photograph of *Cutty Sark* in Sydney Harbour, but so far as I am aware the later sailing ships made do with a rope ladder slung over the side. However, as it is shown in the model, the ladder should, I think, slope aft.

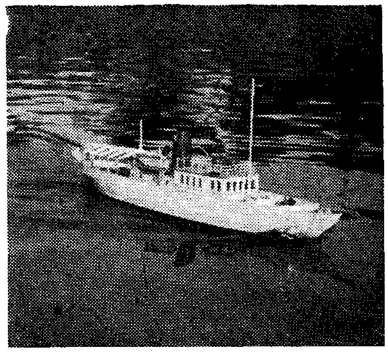
The name should have been in block letters, and on the counter it should be arched, with the port of registry—Glasgow—in smaller capitals underneath, and the Union flag at the peak should, of course, have been the Red Ensign.

The forestays on the lower masts were usually seized together a few feet (to scale) above the deck. This could still be done without much trouble. In this the builder was probably misled by a picture of a model of *Cutty Sark* (on page 56 in the book) where the forestay was left open.

The rigging screws are an improvement on those described in the book and look most effective. The deck details and fittings generally are well carried out and add greatly to the general effect.

Altogether Mr Kamp is to be congratulated on a very successful and pleasing model; I look forward to seeing more of his work. But when will our American friends follow the lead given by the Russians and send over a selection of their models to the Model Engineer Exhibition? ▣

Live steam models in Japan



The author's 4 ft steam yacht running at speed

The trials and problems of a model engineer in the Far East

By SEIICHI WATANABE

It is my pleasure to report about my live steam models and to receive the comments and criticisms of my model engineer friends all over the world.

When I was a fairly new reader of ME about 20 years ago, a $1\frac{1}{16}$ in. scale locomotive was being constructed by me to LBSC's specifications. When the boiler and the chassis were almost assembled, the war broke out and brought a stop to my hobby for a long period.

Moreover a part of my model was damaged during bombing. I finally completed the model in 1950 after 13 years of spare time work !

The subject type for the model was Ivatt's Atlantic compound, of which the attractive photograph was shown at the top page of *The World's Locomotives* published by Percival Marshall and Co. at the beginning of this century. But, I designed the model as a single expansion two-cylinder locomotive.

There were no parts for live steam models available in Japan at that time, and I had to design and construct all of them; for instance, 1 in. dia. pressure gauges could be easily obtained in England, but I had to make mine.

The boiler, with a total heating surface of 640 sq. in., has a barrel 6 in. dia. and $18\frac{1}{2}$ in. long, a superheater of 58 sq. in. and a grate area of 27 sq. in. It contains seven tubes, $\frac{3}{4}$ in. external dia. and two superheater tubes, $1\frac{1}{2}$ in. external dia. The working pressure is 60 p.s.i. The model has two cast-iron cylinders, $1\frac{5}{8}$ in. dia. × $2\frac{1}{2}$ in. stroke, and four coupled driving wheels, 7 in. dia.

The engine and tender weigh 1/10 ton in working order. The tender runs on six wheels fitted with ball-races and footbrake shoes, 4 in. dia., and carries 2.5 gallons of water and 5 lb. of coal. The overall length of engine and tender is 5 ft $5\frac{7}{8}$ in.

The Vic type injector and feed pump are installed in the tender tank and there is a mechanical lubricator, 5/32 in. dia. × $\frac{1}{4}$ in. stroke, and a Roscoe lubricator for oiling the cylinders.

The test running of the model showed a satisfactory performance. The tractive effort was 22 lb. at starting and $15\frac{1}{2}$ lb. at the speed of 3 m.p.h. The maximum load (without slip) on the trailer, which was fitted with ball-races, was about 0.6 ton (equivalent to ten adults) at 50 m.p.h. scale speed.

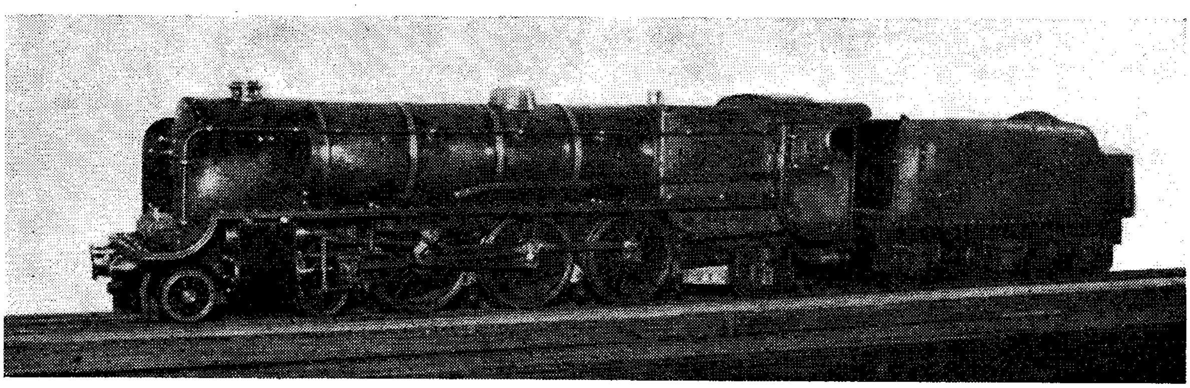
It takes about 25 minutes to raise steam by operating a hand blower, and 12 minutes by the suction fan described by LBSC in the ME on 4 April 1957. This blower was constructed by Mr K. Motoki, who is a reader of ME and has completed a $2\frac{1}{2}$ in. gauge 4-6-2 American engine recently.

Japanese coal has approximately only 6,500 calories, there being no comparison between it and the famous Welsh coal. The model needs about 30 oz. of coal and 1.2 gallons of water per mile with 0.3 tons load in cold weather.

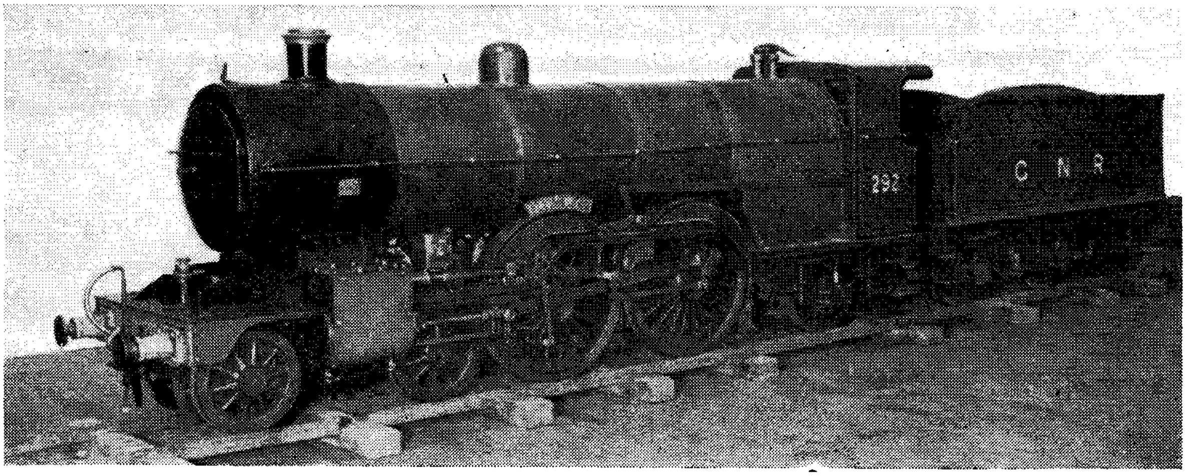
A cast brass nameplate bearing the legend *Flying Jiro* is fitted on the front splashers. This is after my younger brother Jiro, who was also a model engineer and who died at the time I was making the 7 in. dia. driving wheels for the model.

I am very fond of steam driven model boats, too. Though a millionaire can enjoy a de luxe motor or steam yacht, I think a poor model engineer of Japan, who constructs a model steam yacht by himself and sails it, may be happier than a millionaire. I planned a 4 ft long steam yacht about 20 years ago, and completed a marine engine and a hull. But, I was forced to stop the job owing to the war.

In Japan May 5 is known as the Boy Festival. Large flags float in the sky on tall posts, and dolls of brave



A freelance 4-6-2 gauge 1 locomotive nearing completion



The author's Atlantic FLYING JIRO *which is based on Ivatt's compound*

samurai, or warriors, are exhibited in the alcove of parlours.

In 1949, I determined to complete a model steam yacht as a present to my youngest son for the Boy Festival. A marine boiler was designed, constructed and installed in the hull. The power plant, superstructure and deck fittings were completed within three months. The upper part of the hull and the superstructure were painted white, below the waterline in red, and the funnel in red and green.

The model was named *Yatsuno-Maru*, incorporating the capitals of the names of my three sons—Yasuo, Tsuguo, Norio.

The hull was made of tin plates soldered on the frame which was constructed from 3/32 in. iron wire, according to the hull lines drawn by myself. The length of the vessel is 4 ft, width 8 in. and depth 6 in.

The front deck, the cabin and the engine room were made of Japanese cypress and can be lifted from the model separately in a few seconds, so that firing, oiling and inspection may be done easily. The stop valve can be adjusted with the bakelite handle projecting from the upper deck of the cabin.

The engine installed in the hull has a cast gunmetal cylinder, ⅝ in. bore × ¾ in. stroke, with a displacement lubricator and is connected by means of loose coupling to the propeller shaft which is fitted to a 2⅝ in. dia., 4½ in. pitch three-blade propeller.

The boiler has a barrel 6 in. dia., 11½ in. long and a grate area of 20 sq. in. It contains seven tubes, 1 in. external diameter, 4⅝ in. long. Its dimension seems too large for the small engine, but it runs successfully although no water feed geared pump is fitted.

As soon as the engine starts, charcoal is fed fully into the furnace, and the steam yacht is released towards the centre of the pond so that a circular course is taken. Several minutes later, steam pressure rises, a safety valve blows off, and she runs fast with a broken bow wave and long wake.

The third report of my live steam models is about a gauge 1 Pacific locomotive which was constructed in 1953.

My garden is not big enough for an endless track of 2½ in. gauge, but I found a ground on which an elevated track of 2.6 meters radius could be laid. I determined to construct a ⅜ in. scale locomotive which could haul an adult on a 1¾ in. gauge elevated track. My engine is a free-lance design; for instance, the smokebox and the front deck are LNER style, the cab and the tender being LMS. As much as possible the designs of LBSC for his 2½ in. gaugers were adopted.

Particulars of the model are: gauge of track 45 mm.; total length over buffers 745 mm.; cylinders 15 mm. bore × 19 mm. stroke made of cast gunmetal; driving wheels 60 mm. dia.; leading and trailing wheels 30 mm. dia.; tender wheels 39 mm. dia.; diameter of boiler barrel 60 mm.; small tubes 9.5 mm. × 5 mm.; superheater flue 12.5 mm. dia. with 5 mm. superheater tube; grate area 68 mm. × 50 mm.; total heating surface 561 sq. cm.; working pressure 4 kg. per sq. cm.

The model gave a good performance. The engine could haul an adult non-stop for 25 circuits of the track (about 400 metres) at the speed of 1.2 metres per second using very hard charcoal. ■

Steam raising by LBSC's suction fan, built by K. Motoki

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

FOUR-YEAR INTERVAL

SIR,—I enclose some photographs of the 2½ in. gauge 2-10-0 *Austere Ada* which I am building. Since these photographs were taken the mechanical lubricator has been made up and fitted, and the engine has been given a run on air from a small electrically driven compressor. The boiler is about finished and I hope to fit it to the chassis in the near future.

Since the notes for this locomotive appeared in MODEL ENGINEER during the war years, some readers may wonder why I have taken such a long time to reach this stage. I started in 1952, using back numbers of ME, and built up the frames, wheels and coupling rods, but progress was stopped when my job took me to South Africa in February 1953.

After four and a half years of yearning I decided to have my lathe and tools along with the unfinished chassis sent out. The great day dawned with a 5 ft × 2 ft 6 in. × 2 ft 6 in. crate dumped in front of the house and like a long lost friend I greeted my 3⅜ in. Exe lathe. Work has now been proceeding for five months with the results shown.

I hope soon to build a small garden railway but I have not yet decided on the type of construction. At the moment all flanges have been left on the coupled wheels, and in this respect I feel the centre three coupled wheels must have the flanges turned off in order to use a rail radius of say 15 ft.

When resuming the construction of this model in SA I experienced difficulty in procuring the necessary materials, but a commercial friend made inquiries and uncovered sources of brass, copper sheet, screws, spring wire, etc., at reasonable prices. Copper tubing was located but on one occasion the supplier insisted that I purchase a 25 ft coil. It would seem that a flash type boiler is indicated with the remaining 20-odd feet.

BDMS is unknown here and, therefore, most of the valve motion had to be roughed out from scrap structural plate with a hack-saw before milling in the lathe. This can be very hot work in the summer with the temperature in the shade around the plus eighty mark, the usual dress on these occasions being shorts and sandals.

I would like to thank LBSC for his very excellent drawings and notes; the present locomotive promises to perform in the way expected of these designs. The Lobby Chats which appear from time to time are gems which I greatly appreciate. The photographs were produced by my colleague Mr K. Daems.

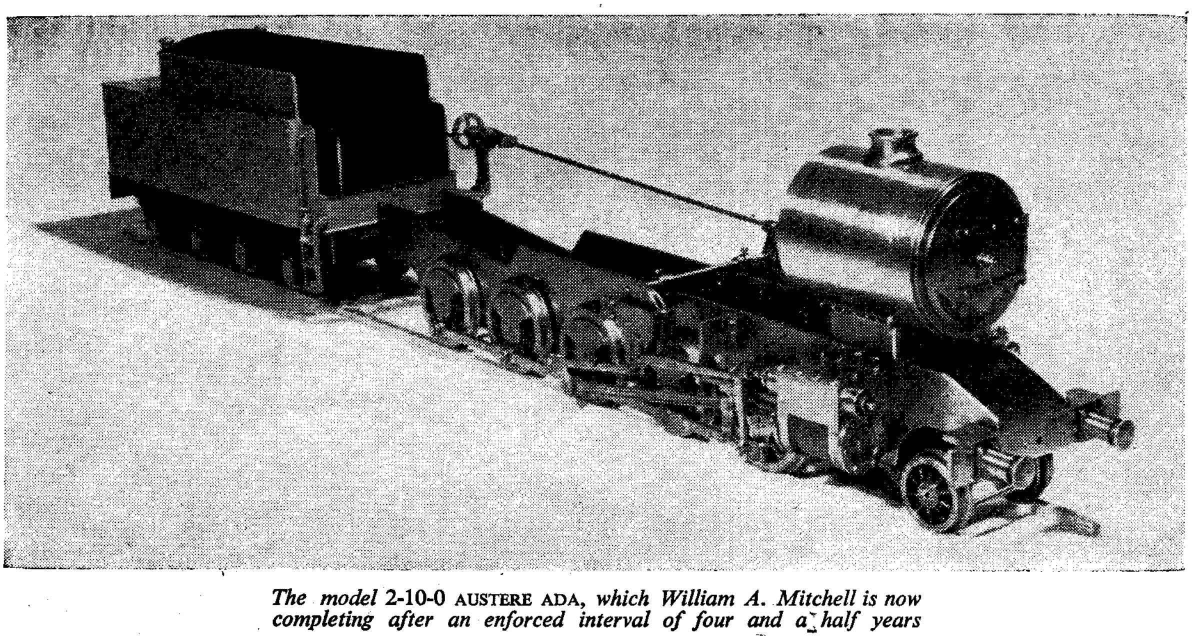
Vereeniging, Transvaal. WILLIAM A. MITCHELL.

MISCELLANEA

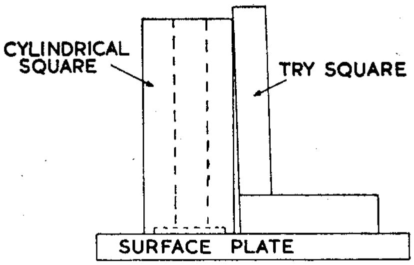
SIR,—Vulcan's recent remarks regarding the difficulty of getting certain materials in small quantities, sometimes an essential to the completion of an important piece of work, strikes me as being most opportune.

My suggestion is that when a reader has exhausted the likely sources of supply without result, a note to Postbag would very likely elicit some assistance. I have in the past been enabled to render some service to one or two people in this way and recently a reader was supplied with material for a clock pendulum suspension spring. What about a "Readers' SOS" weekly half-column?

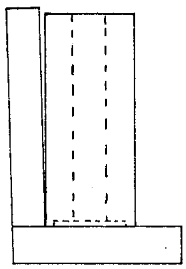
In answer to a querist regarding the melting of brass your technician recommended the use of old water taps from the scrap metal merchant. While I have never attempted the



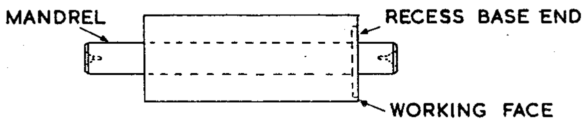
The model 2-10-0 AUSTERE ADA, *which William A. Mitchell is now completing after an enforced interval of four and a half years*



CHECKING OUTSIDE OF BLADE



CHECKING INSIDE OF BLADE



casting of brass, I do know that these items should be 30 or more years old, as most items of plumbers' brassware are now hot-stamped in dies from an alloy which is not suitable for casting. Generally speaking it is quite easy to tell by visual inspection when articles have been sand-cast by the appearance of the unmachined surfaces.

I was interested in Mr H. E. White's article on "Making and Finishing Piston Valves" [ME, March 13] but like numerous contributors he tells the story of routine operations in great detail but gives no wrinkles for doing the tricky part.

His drawing, Fig 5, shows, by scaling, a rectangular hole $\frac{11}{16}$ in. × $\frac{1}{8}$ in. through the centre of a $\frac{1}{2}$ in. dia. bar and he says this hole should be a tight fit for the cutter. Obviously the fit should, if anything, be better at the edges of the hole than at the centre; no mean task for a skilled fitter.

Perhaps, Mr White (or some other reader skilled in the art) could suggest a method of achieving this which would be applicable to the not-so-skilled.

Harrow Weald, Middx. — W. H. RIDER.

WATER BUBBLES

SIR,—I was interested in Vulcan's remarks [Smoke Rings, March 13] about experiments in the use of compressed air for wave control. I have read an account of air being used as a baffle to prevent shock from an explosion being carried to work already completed (I think it was a dam) during blasting in a river wall.

I cannot remember the amount of air used but several pipes were laid and the height of the water was raised a number of feet. A thought here is that as the water must be much "thinner" in this area will a boat sink or will it be lifted?

Warter, York. — E. RUDD.

THE SQUARE

SIR,—I have always considered that to produce a piece of work and have the utmost confidence that it is perfectly square is, perhaps, one of the most difficult of all statements to make in the engineering world. You can keep on trying the work with that nice new square until the cows come home but the underlying question remains, how do you know it is square?

Unless one is prepared to pay a lot of money for a guaranteed precision square, the chances of processing something that is reasonably accurate are very slight.

In these days, of course, the tool and gauge making industry have all kinds of wonderful electronic and optical devices for checking, and yet for all that one can check one's square with a reasonable amount of accuracy in quite a simple manner.

You will require a piece of mild steel about 2 in. dia. and from 4 in. to 6 in. length. Should you require something longer, then the diameter will have to be increased for obvious reasons.

Face off each end and recess one end leaving about a $\frac{3}{16}$ in. wall. Drill right through and ream $\frac{1}{2}$ in. dia. This must be a good fit on $\frac{1}{2}$ in. dia. mandrel. Next see that the lathe centres are in good condition and then place the work between them and drive with a carrier in the usual way. Lightly skim the outside until it is perfectly parallel, then without removing the work take a light cut across the face (the recessed end).

Upon removal from the lathe you will now have what is known as a cylindrical square, the accuracy of which will depend entirely upon the care you have exercised in this simple operation.

To make one better still I would suggest lapping the outside to ensure roundness and parallelism. This is important. If you require the square to be hardened, then, of course, it would have to be ground, but I feel it is not all that necessary. The main difference is that unhardened it will have to be treated with a good deal of respect.

Having gone to all this bother I would suggest making a box and lining with some material for safe keeping and storage. The only other important point is that the checking must take place on a surface that is known to be reasonably flat and for this purpose I can think of nothing other than my old favourite, a piece of plate glass.

The sketch shows an exaggerated view of a square being tested. Place the cylinder carefully on the surface plate, and slide the try-square up to it. It will now be possible to check with (feelers) the amount of error. Another way is to apply some blue to the blade of the try-square and slide up to the cylindrical square and note where the blue marks. By lapping and scraping it will be possible to correct the try-square, repeating the blueing and scraping until a thin blue line appears the whole length of the cylinder. Angle plates can be treated in the same manner.

The cylindrical square, as a master, is very simple but it can be very efficient. It only needs patience.

Tolworth, Surrey. — H. R. JAMES.

WORTHWHILE ENGINE

SIR,—Thank you for sending me a copy of *The Live Steam Book*, as requested. There is no doubt of the value of this book—it fills in some of the blank spaces in notes and must add confidence to any new constructors. Please convey my congratulations to LBSC for his efforts. Percival Marshall should be commended for printing this worthwhile volume and selling it at such an attractive price.

Bardwell Park, NSW. — JOHN TUNBRIDGE.

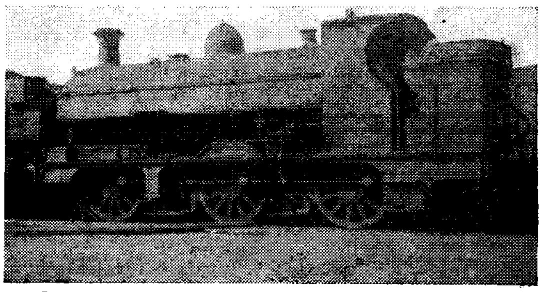
END OF KATIE

SIR,—Regarding "Methanides'" letter [Postbag, March 6], interested readers are advised to visit the narrow gauge museum of the Talyllyn Railway at Towyn, Merioneth, where they will find preserved not only a magnificent specimen of a Guinness engine, but also cast iron sleepers

POSTBAG . . .

from both Duffield Bank and Eaton Hall Railways.

Furthermore, only a few miles to the north there are other relevant and important remains ! LBSC left *Katie* with the Ravenglass and Eskdale, but from there she went to Southport, and finally to the Fairbourne Railway near Barmouth, where the marine type boiler blew up. The frames still lie in the sand.



GWR 0-6-0 No 1925 awaiting the breaker

Incidentally, a journey over Talyllyn and Fairbourne Railways would surely delight any reader of MODEL ENGINEER.
Lymm, Cheshire. G. H. NAYLOR.

SIR,—The issue of March 6 brings together some items in what is something of a coincidence. There is my letter and that of Mr E. A. Steel on the subject of *Katie's* boiler; also Mr Westbury describes the superb model of M. Reine Rabier.

This model incorporates the type of boiler which Mr Steel and myself discussed. Furthermore M. Rabier's boiler has the most unusual feature of being "demountable." The firebox, tubes and tubeplate assembly can be completely removed from the barrel for cleaning.

As M. Rabier does not claim it to be a replica of any particular prototype, both he and Mr Westbury and all interested parties will be surprised to know that Messrs Richard Garratt Engineering Works, Leiston, Suffolk, (of traction engine fame, and incidentally a subsidiary of the famous Beyer Peacock) used to build an overtype semi-portable engine similar to Mr Rabier's model.

The Garratt engines had the demountable firebox and tube assembly which was, I believe, their patent. The smokebox tubeplate and firebox tubeplate had the additional feature of a roller "castor" to facilitate removal. This, I am told, promptly seized up with scale. The joints at firebox doorplate and smokebox tubeplate were made tight by an asbestos gasket, which (according to R. Garratt's catalogue): "if carefully fitted and removed could be re-used several times."

METHANIDES.

IN A SAD STATE

SIR,—I read with interest the article on the GWR 0-6-0 No 1925 [ME, February 6]. I enclose a photograph taken of it by my father when we visited Swindon on 29 August 1951.

The engine was standing on a siding in the scrap yard; also on that siding were Dean goods No 2322 (minus middle driving wheels), Saint No 2947 and some South Wales Railways tanks—all unfortunately waiting to be broken up. No 1925 was in a very sad state as you can see.
Brimpton, Berks. K. W. GILBERT.

GAUGE O

SIR,—What has come over the maestro LBSC ? Except as a three-year-old's toy, that "Beyer-Garratt" [ME March 6] just isn't worthy of him. Granted it is for a tinplate outfit but gauge O Hornby, pre-1939, ran to near scale locomotives up to Princess class LMS Pacifics on 20 v. a.c. It is only since 1945 that Meccano Ltd have restricted their gauge O output to the nursery floor.

Furthermore gauge O nowadays is moving on a very different level to the old tinplate stuff where real miniature locomotives are concerned and live steam is becoming a very live topic. Moreover, electric control and even electric firing of live steamers in this size has been shown to be practicable.

Please, could the maestro give us —even briefly—the words and music for a real miniature Beyer-Garratt, possibly taking the LMS type as a prototype, and with proper locomotive type firetube boiler and the alternatives of solid fuel firing and his own simplified oil firing for such a boiler ?
Edinburgh 3 W. LOCH KIDSTON.

CYLINDERS FOR 1¾ in. GAUGE LOCOMOTIVES

Continued from page 459

The valve gear was of the loose-eccentric type, which incidentally cannot be beaten for a 1¾ in. gauge engine with inside-frame steam chests, as there is only one pin joint for each valve. Also on "scenic" railways of this gauge there is no need for cab reversing or notching-up. The procedure was as usual; with the crank on front dead centre, the stop collar was turned until the front port just cracked, and the setting then checked on the back centre.

This proving O.K. the wheels were then turned backwards, the setting checked on both dead centres, and this also was found correct, so the stop collar setscrew was permanently tightened, the chassis turned over and the performance ditto-repeatoed on the other valve. No adjustment was necessary; had it been, it could have easily been made by turning the fork on the spindle.

All that remained was to take out the pins connecting the eccentrics to the forks, replace the steam chests with the valves and spindles, re-erect the cylinders and put in the pins. On air test the engine ran perfectly in either direction.

Setting the valves under pressure

I fitted a similar pair of cylinders to a 1¾ in. gauge Atlantic-type locomotive originally built by the long-defunct "junk merchants," and on that job I set the valves under pressure. The chassis was assembled complete with cylinders, but the connecting-rods were left off. A soldered-up tin can was connected to the steam pipe union by a piece of tube with a union nut to fit, and a tyre pump connected to the can by an adapter.

With the crank on front dead centre, and a little air pumped into the can, the stop collar was slowly turned until the piston-rod shot out to its full extent. The setscrew in the stop collar was then tightened, and the wheels slowly turned in a forward direction until the piston-rod shot back again. As this happened exactly on back dead centre, the setting was correct for forward gear.

The wheels were then turned backward, and it was found that the shoot-in-and-out movements occurred slightly after dead centres. A thin bit of brass soldered to the back-gear shoulder of each stop collar put that right in a jiffy. ▣

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

Glow plug ignition

I have a model diesel engine which I want to adapt for driving a model. I encountered starting difficulties, but have since discovered that I can convert the engine to glow plug ignition. Therefore, I should be grateful if you would answer the following points:

1 Is a glow plug engine easier to start than a diesel?

2 How do I set about conversion to glow plug?

3 Does it require as much compression as a diesel?—E.D., Saltburn-by-Sea, Yorks.

▲ 1 *Either type of engine should start readily if it is in good working order but a diesel engine—having no external means of ignition—must necessarily be turned fast enough to generate heat in the cylinder sufficient to produce ignition. A glow plug engine will also work on a lower compression than a diesel engine.*

2 *Conversion to glow plug entails essentially the fitting of a glow plug to the head, but the details will vary according to the type of engine.*

3 *A good compression is essential to the success of any type of internal combustion engine. But there is a distinction between "good" compression, which means a good fit of the piston in the cylinder, and a "high" compression, which depends on the amount of space left in the cylinder at the top of the stroke. In this respect the diesel requires higher compression than any other type.*

Welder efficiency

I have a Mox-Arc 150 amp welder and my power is single phase; the voltage is very low as I am far from the transformer.

If I obtain another 150 amp welder, and connected the two in parallel and set each at 100 amps, will I get 200 amps and would it work as efficiently as a big welder?—R.P., Shercock, Co. Cavan.

▲ *The idea you have in mind is impracticable. The paralleling of the transformers would not increase the voltage, only the current. To attain what you require it is necessary for the voltage to be raised.*

It is not clear as to what you mean by being a long way from the transformer: if you are referring to the actual welder leads being a great distance from the welding transformer itself, the loss of volts is due to these leads being of too small a cross section. Possibly these leads may need to be twice their present current-carrying capacity.

If the transformer cannot be moved nearer the site of operations, the only thing you can do is to increase the welder cables in size. It is, of course, possible for two welding transformers to be connected in series, but if this were done, the resultant voltage would be much higher than a single transformer; this voltage might be quite unsuitable for welding.

If you wish to experiment on these lines, it will be necessary for the two transformers to be matched and correctly connected for series working. The higher voltage obtained with this arrangement could be dealt with by arranging a suitable resistance in the primary circuit of the transformers, but this would be a very wasteful and inefficient method of adjusting the voltage at the point of welding.

Backplate difficulty

Having just acquired a S/U ML7, I find that the backplate of the three-jaw chuck is a tight fit on the nose of the mandrel—so tight, in fact, that it will not screw right up to the shoulder. If I tighten it as far as possible with hand power it leaves a gap of $\frac{1}{8}$ in.

What method would you suggest for easing the thread in the backplate?—A.G., Middlesbrough.

▲ *This trouble could be corrected by lapping. It is necessary to ascertain just where the tightness occurs. If it is on the register—that is to say, the bored out portion at the back of the thread—it might be possible to ease it by the use of emerycloth or careful scraping all round the surface.*

If, however, the thread is tight, a tap which fits the contour of the thread is advised. Lapping it on the mandrel nose is not recommended as wear would take place, and both parts and the mandrel nose thread might then be slack for other fittings.

The lap could be made of copper, aluminium or similar metal which must be softer than the backplate. If it is not convenient to screwcut the lap, an alternative would be to cast a plug of white metal in the backplate itself, having first blackleaded the surface so that the white metal will not adhere.

The lap can be charged with an abrasive material such as carborundum paste and worked in and out of the backplate, taking care not to use side pressure which might result in the thread becoming out of truth.

Early springs

I have recently been shown an old clock—over 200 years old—by a local watch repairer. The workmanship is superb, the ornamentation of the brasswork exquisite. It is driven by a mainspring about $1\frac{3}{4}$ in. wide enclosed in a brass cylinder.

Could you give me any idea how these old craftsmen made these steel springs, as steel as we know it was an invention of the last 100 years? There were no ready made springs in those days, and hardening and tempering was no small matter.

Could you also enlighten me how wrought iron was made two centuries ago?—S.L.H., Hexham, Northumberland.

▲ *It is rather difficult to obtain accurate information on this matter, but carbon steel was generally produced by repeated folding and hammering of hot metal, the heat being obtained by a charcoal or similar fuel which would introduce a certain percentage of carbon into the metal.*

The repeated hammering produced a laminated and "puff pastry" structure which was welded into a homogenous mass.

It is believed that quite early on in the industry strip material was produced by rolling; the springs would then be cut to the required width and rolled up in a metal box for hardening and tempering.

Wrought iron was usually produced by hammering out ingots of pig iron—usually straight from the cupola—and the old tilt hammers, which are still to be seen in some of the older iron works, were extensively used for this purpose.