# Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

## TIMEKEEPER OF THE SEA

1/3 19 APRIL 1962 VOL. 126 NO 3171

19 April 1962 Vol. 126 No 3171

# Model Engineer

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

19-20 Noel Street, London W1

## Contents



Published every Thursday

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



## Cover picture

*Harrison timepiece of* 1715. *James Forsyte, inspired by a recent Smoke Rings, adds some interesting facts on this historical machine. See page* 488 (*Crown copyright reserved, Science Museum*)

## Next week

*Good news for tram modellers. In the issue for April* 26 *Terry Russell, well known for his model tram layout, starts a short serial on the construction of a class E3 London Transport tramcar*



# Smoke Rings A weekly commentary by VULCAN

WE hold the view—and we are prepared to demonstrate it at any time—that model engineering is much more valuable as an educational subject than many of the handicraft techniques taught in schools.

Too often the projects chosen in handicraft classes are limiting in their scope; moreover, they fail to arouse much enthusiasm in the trainee.

Although many schools have well-equipped workshops and better equipment is going into technical colleges almost every week, there is still a ridiculous reluctance among education authorities to break away from a method of teaching that was becoming old-fashioned in the period between the wars.

Every kind of handicraft deserves encouragement—and these remarks are no censure on the age-old crafts that one sees to perfection at such national competitions as the Eisteddfod; but modern industry demands a variety of modern skills and in this respect model engineering has a special appeal for it embodies a valuable selection of crafts.

## End products

It gives scope for all kinds of metal work, including fitting, turning, coppersmithing and brazing, and in addition it may embrace drawing and design, patternmaking and foundry work. Above all it creates an absorbing end product.

Few schoolboys have any enthusiasm for making a toasting fork, but hardly one of them could fail to be thrilled at the prospect of making a working model locomotive, or a tool or appliance that he could put to use.

In some progressive technical schools, models made by pupils are subsequently employed for demonstrations, thereby making a valuable contribution to the school equipment and helping to bridge the gap, often unnecessarily wide, between academic and practical education.

Members of MODEL ENGINEER staff who have studied the training of boys and young people have always found that youngsters take readily to model work and invariably benefit from the training it can provide.

Without any doubt, model engineering merits much more serious consideration by education authorities than it has received.

## Mr H. S. F. Denford

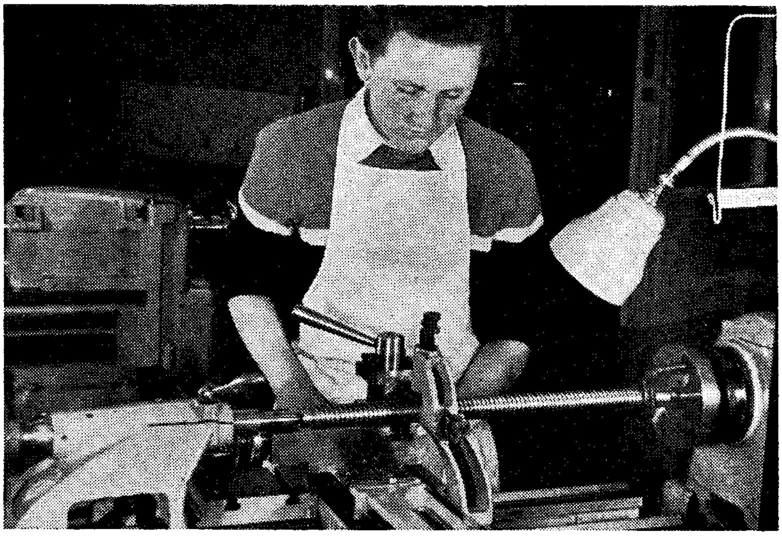
WE were very sorry to learn of the death of Mr H. S. F. Denford, who was the founder of Denford's Engineering Co. Ltd, of Box Tree Mills, Halifax, Yorks.

This is the company which developed and produced the well-known Box-Ford lathes and other equipment. Mr Denford also, at a later date, founded Denford Small Tools (Brighouse) Limited primarily for the production of tool holders and other small appliances.

The products of this firm have now been extended to embrace Viceroy and Educator lathes, and grinders for wood and metal working tools.

On several occasions, when demonstrating Box-Ford equipment at ME Exhibitions, Mr Denford exhibited a keen interest in the problems of model engineers and made many friends among them.

The business of Denford Small Tools, at Victoria Works, Birds Royd, Brighouse, Yorks, is carried on by his son Mr G. H. R. Denford.

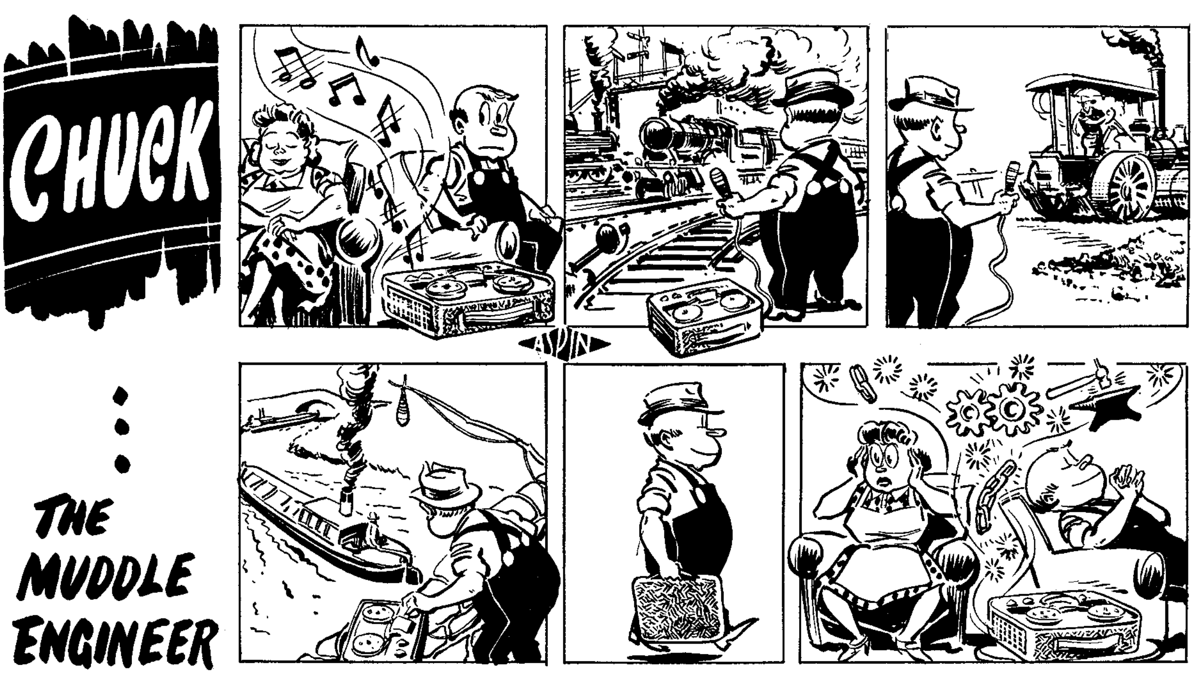


*Screwcutting, here being learnt by a pupil, is a common operation in the modern machine shop, and it is one of the essential skills incorporated in model engineering*

## Firefly

THIS issue would normally have carried another instalment by Martin Evans in the *Firefly* serial. Unfortunately, Mr Evans is still in hospital as we go to press and the article has had to be held over.

Latest bulletin is that he is making a good recovery and should be back at the workbench and drawing board very soon.



# Introducing the WALLABY

WALLABY

EDGAR T. WESTBURY redesigns the 30 c.c. petrol engine which he made for locomotive *1831*. It can be used to power a model boat

More than twenty years ago I set out to design a model locomotive propelled by an internal combustion engine, in response to many requests from readers who were interested in this form of motive power. That was in the dark days of the war when I had time for contemplation while I was carrying out fire-watching and other necessary duties.

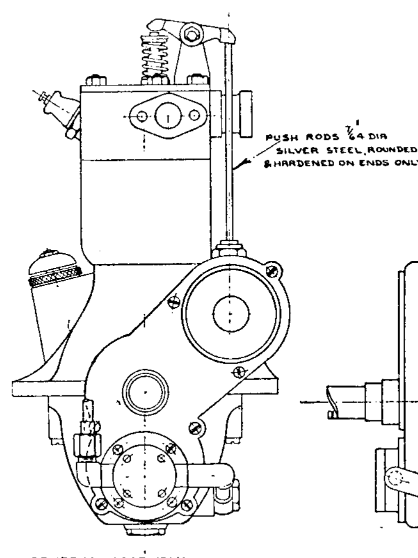
So far as I am aware, no very serious attempt had been made to design a model locomotive of this type before. It involved special problems which called for very careful consideration. The original engine which I selected for the design—dictated to a great extent by the information obtainable—was the LMS diesel shunting locomotive *1831*, which began its working life as a steam-driven 0-6-0 tank and had been experimentally converted by the fitting of a diesel engine and a hydraulic torque converter.

I do not propose to discuss the model locomotive as such, beyond saying that while it proved itself capable of carrying out the task for which it was designed, it did not, because of its unorthodoxy, make any great impression on model locomotive builders—nor was it expected to do so. But the engine incorporated in the unit attracted the attention of many model engineers who were not particularly interested in putting it into a locomotive, and it proved to be very well suited to other duties, including model power boat propulsion.

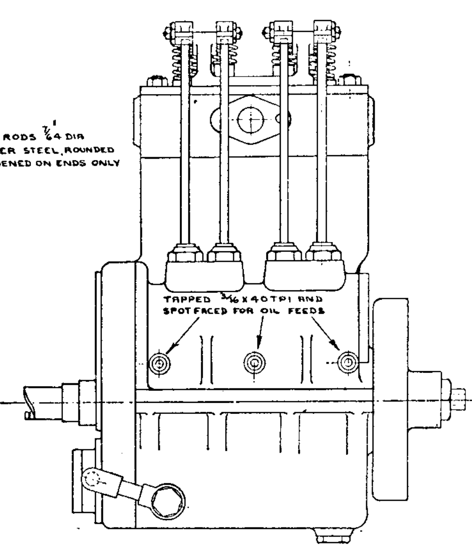
In the years following the war, interest in the construction of model petrol engines tended to decline, mainly because ready-made i.c. engines could be bought. Power boat builders who needed engines simply as a means of propulsion generally found that these engines were more or less satisfactory for their purpose and saved the time and effort of producing engines themselves. There has, however, been a revival of interest in engine construction in recent years, particularly in the larger sizes of engine, which are suited to heavy duty at moderate speed, and are more readily controllable than most of the small high-revving ones; moreover, their ability to run on normal motor fuels, instead of expensive diesel or glow plug fuels, gives them an economic advantage.

The engine of the *1831* locomotive has features of design which have proved very successful in modern power boats, particularly those equipped for radio control. There has been a widespread demand for the revival of the design. The castings and parts were originally supplied by Mr W. H. Haselgrove of Petts Wood, Kent, but, unfortunately, Mr Haselgrove has now retired from business and there has been some difficulty in arranging for another source of supply. It has, of course, been necessary to make entirely new patterns, and to provide for other special raw materials. After many delays, I am able to announce that Woking Precision Models of 32 Mount Hermon Road, Woking, Surrey, have undertaken to supply castings and parts.

Though the engine design has achieved maturity in age, it is by no means archaic or out of date. The essentials of design do not change as rapidly as some people think, and many "advanced" features in full-size practice are little more than old ones improved in detail, and perhaps made of better material, or more accurately. On careful investigation of the *1831* engine design, I found little which called for drastic alteration




GENERAL ASSEMBLY:
TIMING END ELEVATION



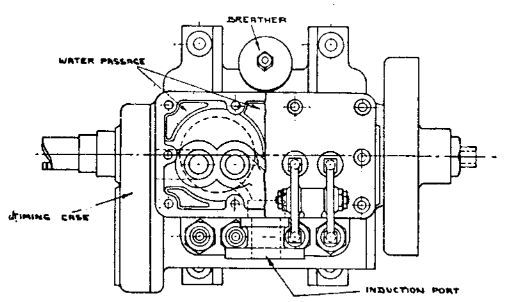

SIDE ELEVATION

in any of the major components, to bring them fully into line with modern practice, and only a few details have been modified and improved.

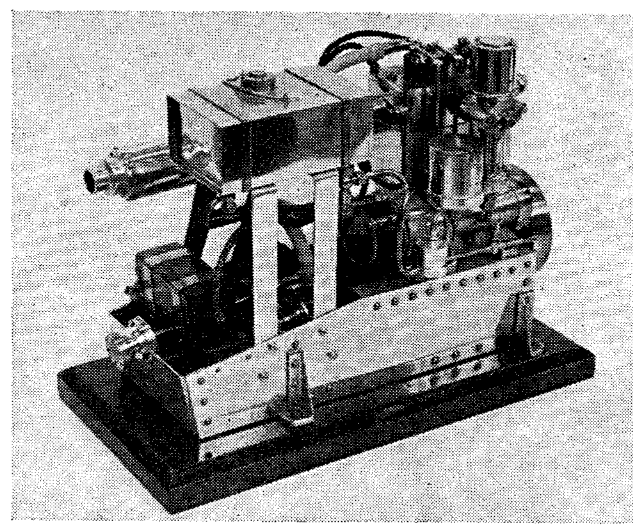
The characteristics of the engine design are, I think, worthy of a brief review for the benefit of readers not already acquainted with it. First, I may mention that the choice of a twin-cylinder engine for the *1831* was determined by the installation space. More than one cylinder was desirable, to ensure even torque, but the longitudinal space in a short wheelbase 0-6-0 chassis made it difficult to accommodate four cylinders. At the time when I designed the engine, the vertical twin was not very popular; it has since proved one of the most successful engines for motorcycles, and has been produced by various manufacturers for this purpose.

In a small engine, the twin has some advantages over an engine with a larger number of cylinders, because the fewer and more robust working parts permit running friction to be reduced, with an improvement in mechanical efficiency. Even torque is attainable by locating the two crankpins in the same plane, so that the cylinders fire on alternate revolutions; though this would appear to be bad from the aspect of balancing reciprocating masses, the effect is less serious than might be expected. In twin cylinder engines with equal firing intervals, mixture distribution is less likely to be troublesome than in irregular-timed engines such as V-twins, or even flat twins, in which long induction pipes introduce complications. Four-cylinder engines have their own induction troubles, too, and in the very small sizes I have found that the best palliative—I will not say *cure*—for these is to use a hot-spotted induction-exhaust manifold.

Altogether, it may be said that a vertical twin represents a good compromise between the single and the four-cylinder, with some of the virtues of both and the worst vices of neither. The result, assuming sound detail design and construction, is an engine capable of packing a good punch for its size, yet docile and flexible withal, and not too difficult to construct. Some of its features have been introduced to make it suitable for running continuously for longer periods than are usual in model practice. Among them are the heavy split main bearings, with provision for forced lubrication, and the robust valve operating mechanism which includes unusually broad timing gears. Vertical overhead valves, conducive to high performance, were preferred to side valves, which tend to limit combustion efficiency. To avoid mechanical complication, they are operated through plain rockers, push rods and flat-based tappets.




PLAN EXPOSING CYLINDER HEAD



*Here is an* 1831 *engine adapted as a marine power unit by G. L. Jones of the Victoria MSC*

In any small engine with more than one cylinder, there is some difficulty in finding room for all the ports and passages in a single cylinder head casting, and at the same time providing an adequate number of securing studs or screws, evenly spaced to ensure that the joint faces are not liable to distortion. The problem is further complicated by the need to provide space and communicating passages for the flow of cooling water. I know that many engines have been built in which only the cylinder barrels are water-jacketed, and the heads are left to look after themselves, with the dubious aid of one or two rudimentary fins. While such engines may be moderately successful, the difference of temperature between the head and the barrel must inevitably introduce a liability to distortion and also limit the power output, especially on long runs.

The porting of the cylinder head casting is somewhat unusual, as it has the exhaust outlets at the two ends, with a single inlet port, leading to siamesed passages, in the middle of one side. In order to keep the push rods transversely in line with the valves, and thereby avoid offsetting the rockers, no adequate space for exhaust outlets could be found on the same side as the inlet, and it was undesirable to locate them on the same side as the sparking plugs. Some coppersmithing is, therefore, called for in the exhaust pipe system, but this does not appear to have given constructors any particular trouble so far. Pipes with nice sweeping bends are certainly no disadvantage; if anything, they enhance the appearance of the engine as a whole.

As the two pistons of the engine move in unison, they create a displacement of air in the crankcase. The air must be released to prevent mechanical pumping losses. A breather, combined with an oil-filler cap, is provided for this purpose, and fitting it with a light disc valve keeps the mean crankcase pressure slightly below atmospheric. The suction could be used to feed oil to the crankcase when it is not convenient to fit an oil pump, but in any event it helps to keep the engine clean externally, by preventing leakage of oil from bearings and tappets. In a small engine, however, it is very difficult to prevent the escape of some oil mist from the breather; extending it to the highest possible level will help to some extent, but the most effective method would be to connect the breather to a pipe discharging into the carburettor intake.

In the original version of this engine, the structural castings were made in gunmetal, whose weight was an advantage in a locomotive from the aspect of adhesion. But boat work nearly always calls for some economy in weight and, therefore, aluminium alloy is specified in the revised design. Another feature of the locomotive engine, which is optional when the engine is employed for other duties, is the centrifugal clutch. This enables it to take up tractive drive more gradually than with a positive coupling. It also serves as an anti-stalling device, for the clutch would slip if the engine speed was slowed down by overload. In boat work there is less risk of stalling, unless an oversize or otherwise unsuitable propeller is fitted, but a " free engine " may be an advantage when it is throttled down to idling speed. If the clutch is not fitted, you can well increase the size of the flywheel so that its momentum is sufficient to cope with the slowest speed of the engine. Apart from the actual weight, a large flywheel is only a disadvantage when an engine is required to change its speed very rapidly; not a common condition in model practice, except possibly for racing engines. But most boat builders these days wish to keep the weight of the power plant as low as possible, and are reluctant to use larger flywheels than are absolutely necessary.

A special carburettor was designed for the *1831* engine, to cope with the conditions encountered in traction duties. Its main features were flexibility of control over a wide speed range, and a prompt pick-up, or response to control, after a slowing down by throttling or overload. After some experimental work, it was found that these conditions were met by a somewhat similar carburettor to the one employed successfully in the ME Aveling road roller, but with the addition of float-feed. This employs a needle-adjusted jet in a small primary choke tube, a barrel throttle, and an air valve with a spring-loaded piston and ported sleeve.

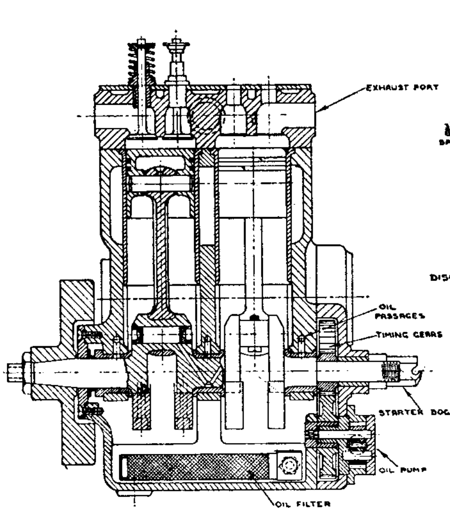
At idling speed, the air valve remains closed, and the small choke tube supplies all the air required; but as the throttle is opened and suction increases, this acts on the piston of the air valve and opens the ports to a greater or less extent, to restore the balance of pressure and keep the strength of the mixture fairly constant. This principle, with infinite variations, has been applied to many carburettors in the past, including the early Longuemare and Krebbs, which were among the first really automatic carburettors to be used on motor cars.

Some constructors have considered the carburettor too complicated, and bulky, and have asked about the possibilities of designing a simpler one. It is, of course, quite practicable to use some of the carburettors designed for other engines, such as the *Kiwi* or the *Atom Type R*, which are smaller and have fewer parts. The *Kiwi* has been tried, and gives fairly satisfactory results, but as its compensation is purely mechanical (by throttle action), its anti-stalling properties, and acceleration under full load, are not quite so good. This may not be very important in marine work, where the load is always more or less in proportion to the engine speed.

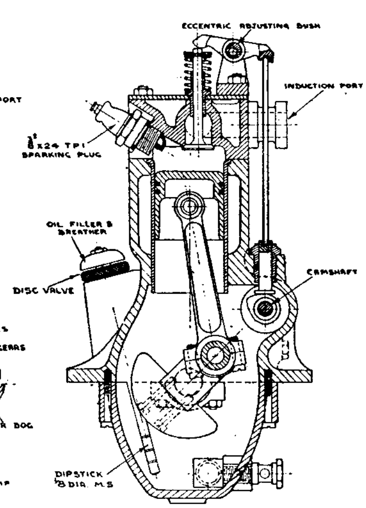
Three optional systems of coil ignition were specified for the original: normal single-pole coil, contact-breaker and h.t. distributor; by double-pole coil and single contact-breaker only; and by twin coils and double contact-breaker. With the first two, the contact-breaker is fitted on the engine shaft, but could be fitted to the camshaft with a double-break cam, as is required for the third. Magneto ignition can also be applied, with the Atomag Minor, direct-coupled to the engine shaft or gear-driven from it at the same speed. The h.t. lead of the magneto is connected to the input terminal of the distributor, and no other wiring is needed. Yet another course is to substitute the Atomax four-pole system for the standard flywheel, in which event the first arrangement is employed. All this may sound a little confusing, but in actual practice either system is extremely simple, and involves only elementary electric principles.

The locomotive from which the design of the model was adapted never had a name, so far as I am aware (though it might have had quite a few names bestowed upon it at various times by its running and maintenance crew!) and was distinguished only by its number, " 1831." This is not a very appropriate appelation for identification, as many readers, in referring to it, have mixed or misquoted the number, and I have even been asked if it applies to the date of construction! I have, therefore, decided to give the improved engine a new name, which should be more distinctive and easier to remember than a number. As with many of my earlier designs, I have borrowed the name from the animal kingdom, and for the benefit of those not well versed in zoology, I will explain that a Wallaby is " a marsupial of the genus or sub-genus *Halmaturus*, indigenous to Australasia." In later articles I shall describe the construction of the Wallaby which will, I trust, be found as lively and energetic as its original. ■

More information on small i.c. engines can be had from Edgar T. Westbury's book *Model Petrol Engines*, price 8s. 6d., or 9s. 2d. by post, from these offices. The book deals fully with the design, construction and application of the miniature i.c. engine.



SECTIONAL SIDE ELEVATION



SECTIONAL END ELEVATION
TIMING END VIEW

# Sun-and-planet gear

*IAN BRADLEY writes the second instalment of a short serial on a small power tool with an integral speed-reduction unit*

*Continued from March 29, page 392*

I MADE the front half of the gearbox from duralumin to the dimensions given in Fig. 11. The material mounted in the four-jaw chuck and the $\frac{15}{16}$ in. dia. bore was formed first, before the machining of the $1\frac{1}{8}$ in. dia. seat for the outer ball race. Then I made the external profile, leaving enough material, after parting off, to produce the 2 in. dia. spigot which registers with the rear half of the box.

To machine the spigot and the rear ball race seating so that they were both in axial alignment with the front seating, I mounted the work on a specially made mandrel and made it a firm fit. Its nose projected into the $\frac{15}{16}$ in. dia. bore with an allowance of $\frac{1}{16}$ in. clearance between the bottom of the ball race housing and the end of the mandrel itself. To provide ample hold, I also stepped the mandrel to embrace the outer ball race seating. I could machine the spigot, the inside of the gearbox, and the inner ball race seating at one setting.

The seatings for the screws holding the two halves of the gearbox together were formed by milling. I mounted the work on a small face-plate—a lathe driver plate—secured to a Myford dividing head; the milling cutter itself was driven from the lathe headstock. Fig. 13 shows the arrangement.

I used the same setting for drilling the screw holes in the seatings. A centre drill, held in the special extension holder, centred the seatings and was followed by a No 34 drill as clearance for the 6 BA screws which keep the halves of the gearbox together.

The special extension holder (Fig. 14) was made originally to be fitted direct to the end of the motor shaft. But the speed of the motor was found too great to be of any practical use; and so, by the simple expedient of fitting an extension shaft to the original chuck portion, I made this small piece of equipment of use in holding centre drills for spotting as well as end-mills from $\frac{1}{4}$ in. dia. downwards. As the smaller cutters usually have $\frac{1}{4}$ in. dia. shanks, the $\frac{1}{4}$ in. collet fitted to the extension holder serves to accommodate them. Details of the complete fitment are given in Fig. 15.

The machining of the main shelf *C* (Fig. 16) from a good quality mild steel is, for the most part, a simple turning operation. I made the major part at one setting. The $\frac{1}{2}$ in. dia. part, after having been turned to size plus 0.001 in., was lapped so that the two ball races were a light push fit on it, and the seating for the taper collet securing the drill chuck was machined to drawing size, 27/64 in. dia.

When I had finished this task, together with the drilling and tapping of the 4 BA hole for the axial screw holding the chuck itself, I transferred the work to a Myford dividing head, so that the three $\frac{3}{16}$ in. dia. holes for the planetary wheels might be positioned. To carry out the positioning accurately I had first to bore a $\frac{1}{4}$ in. dia. hole axially to take a well-fitting pin. This $\frac{1}{4}$ in. pin is used as a reference piece for measuring the offset.

The work was gripped in a $\frac{1}{2}$ in. collet held in the dividing head. To position the work I placed a $\frac{1}{4}$ in. collet in the lathe headstock and caught a true-running pin $\frac{1}{4}$ in. dia. in it. With a dial test indicator, I checked both pins to make sure that they were in axial alignment in the horizontal plane. Then I set the work over to the required distance with the lathe cross slide. This distance, obtained by the method shown in Fig. 17, I measured with a micrometer placed over the two pins. When the correct position had been established, I centre-drilled and pilot-drilled the component and reamed it to size, indexing it by the dividing head.

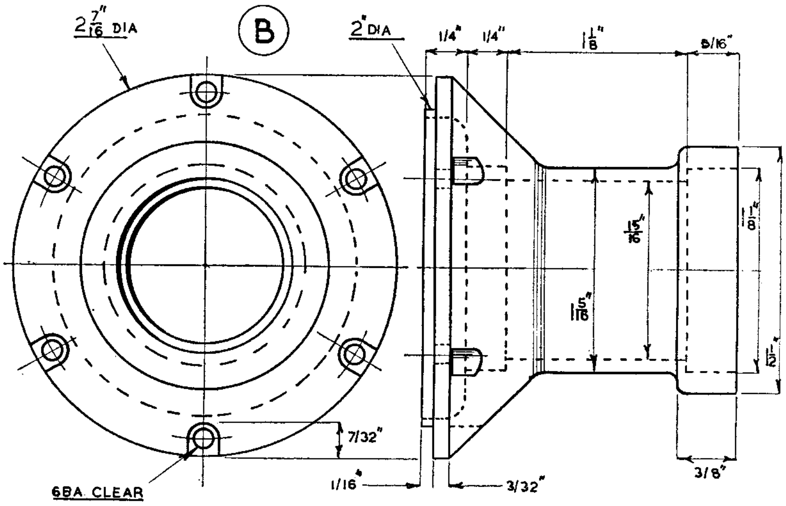
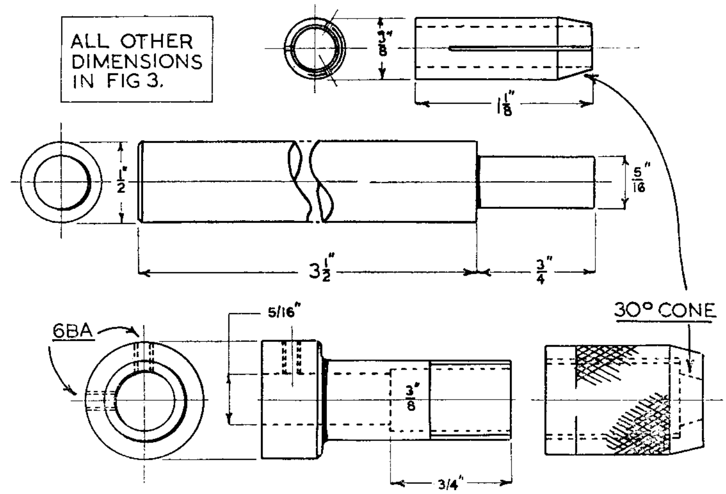
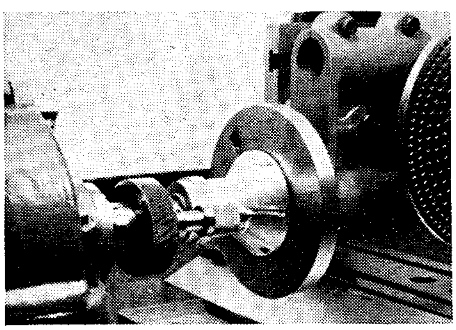


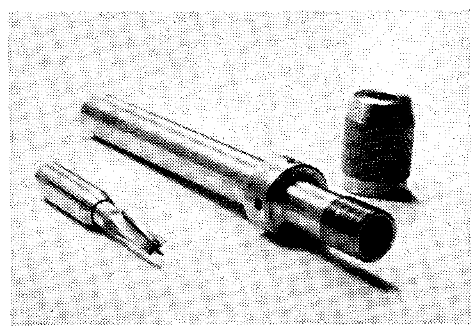

*Fig. 11: Gearbox; front half*

Little need be said of the making of the three shoulder pins which engage the ball races fitted to the planetary gears. You will see that the $\frac{3}{16}$ in. part of the pin is heavily centre-drilled and that the component is 1/32 in. longer than the width of the triangular disc on the driving spindle. This is to enable the pins to be riveted in place.

Riveting with a hammer might well cause damage. Instead, you place a $\frac{1}{4}$ in. dia. steel ball in the countersink formed by the centre drill, using a little motor grease to hold it. A brass protecting cap is put over the $\frac{1}{8}$ in. dia. pin, with its open end resting on the pin's shoulder, and the whole assembly is tightened between the jaws of a vice, forcing the ball into the countersink and thus expanding the $\frac{3}{16}$ in. dia. spigot. With this method the pins are adequately secured. Fig. 18 explains the set-up.





*Above, Fig. 15: This is the completed extension holder*

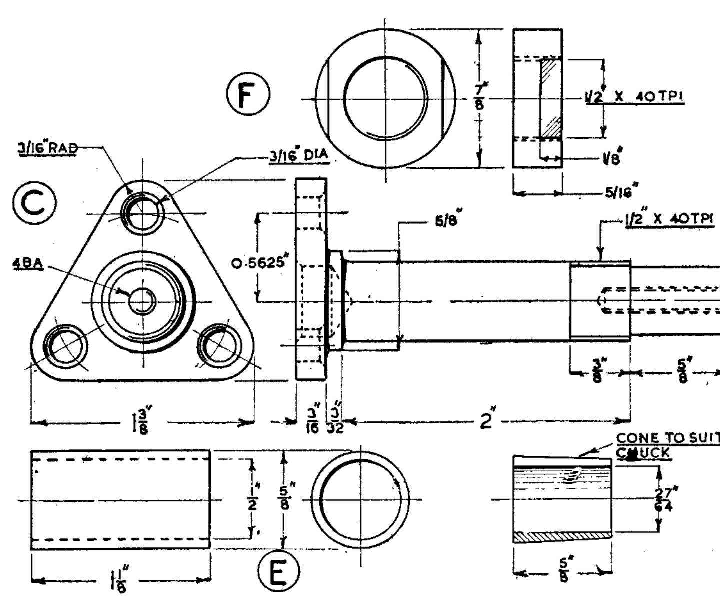
*Left: Here are seen the holder (Fig. 14) and the milling of the seatings (Fig. 13)*

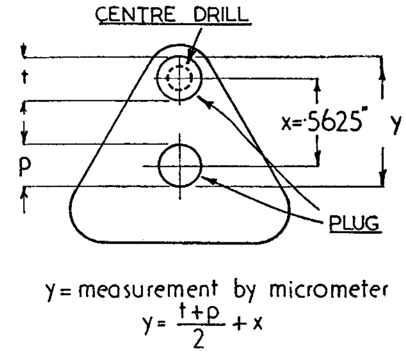
*Below, Fig. 16: This is the main shaft C*

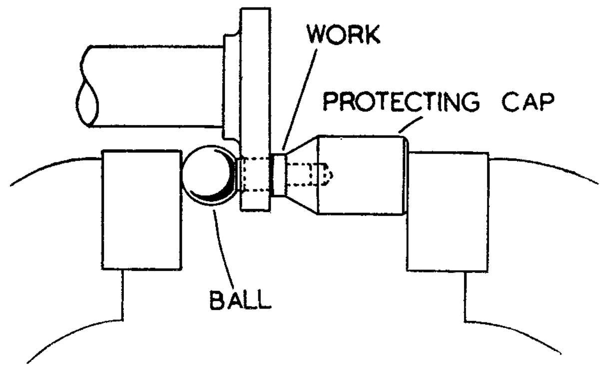
I fashioned the planetary gears from nylon rod machined to the dimensions in Fig. 19. The $\frac{3}{8}$ in. dia. bore for the ball races which support the gears was made 0.001 in. smaller than the races to ensure that they were a firm fit. To protect the ball races and hold them in position I fixed a pair of spigoted caps to each side of the gears with specially-made rivets. A section of one gear showing this arrangement is given in Fig. 20.

The gears themselves were held by 10 BA screws passing axially through the pins upon which the wheel races were mounted. Nuts were placed over the screws on the reverse side of the spider and were secured firmly. The screws were then cut off with some 0.030 in. projecting and were lightly peened over the nut.

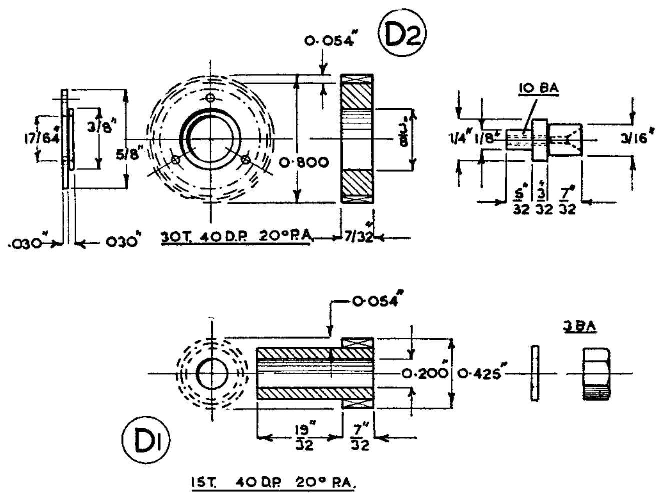
The sun gear (Fig. 19, *D1*) was made from mild steel. I lapped it to a good push fit on the motor shaft. Owing to the small size of the shaft,

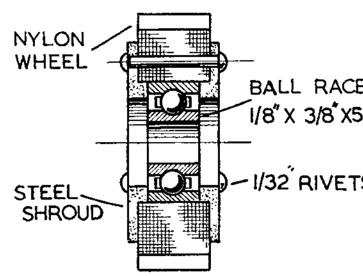





*Setting the centres of the planetary gears (Fig. 17, left) and riveting the shoulder pins (Fig. 18)*



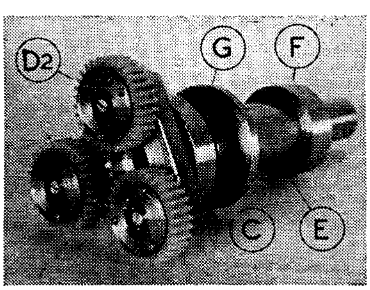



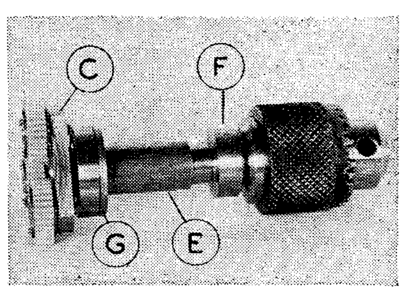

*Planet gears* D1 *and ring gear* D2 *(Fig.* 19, *left) and section of planet gear and bearing (Fig.* 20)

it was not possible to key the pinion to it positively. But in practice I have found that the frictional hold between the back of the pinion and the collar formed on the shaft is quite sufficient and that no slip takes place.

The methods which I use for cutting gears have been described many times.

★ *To be concluded on May* 3




*Left, Fig.* 21*A: Front of main spindle. Right, Fig.* 21*B: Side view, with chuck and sleeve*

## RULING ENGINE

I was interested to read the query about a suitable material for a ruling engine leadscrew.

A few years ago I constructed a small ruling engine myself and although it has ruled some good gratings with a resolution of about 0.1 Angstrom unit, I am still trying to find the reason for some of its faults.

A good description of the making of the screw and other parts of a ruling engine is given in *Glazebrooks Dictionary of Applied Physics*, Vol. 4, p. 30. This is an old book, but the article in it which was written by G. A. Anderson of Mount Wilson Observatory gives a good idea of the precision required and the methods for obtaining it.

It is important that the leadscrew is strain free, otherwise as metal is removed in lapping, it will bend and distort, therefore I suggest the use of ordinary m.s. or s.s. well-annealed before screwcutting.

I used m.s. for the screw in my own machine, which does not rely on the screw's being extremely accurate as it is interferometrically controlled.

B. Manning.

WORKSHOP HINTS AND TIPS

# Ways of applying pressure

THERE are several ways of applying pressure. We employ some of them in the workshop without giving much thought to them. The spindle of a drilling machine may be pressed down by a lever, by a pinion and rack, or by a screw. A toggle linkage may be used for the ram of a small press—or a screw again; a large press is usually operated by a crank and connecting rod. A flat wedge is used to free taper-shank drills and sets of sockets. For gripping components in jigs, plungers may be operated by air pressure or hydraulically.

The use of screw threads is the commonest way of applying pressure through bolts, studs, nuts, and so forth. A screw is the means of closing

**By GEOMETER**

the jaws of a vice and of operating many clamps and pullers. Its force can be increased with two threads of different pitch, on a differential principle; sometimes the screw of a puller has a hydraulic plunger by which final maximum pressure is applied.

A bolt can be the means of applying pressure to extract a bush from a connecting rod, as at *A*, when the job cannot be done in the vice. The sleeve which is used should be as long as the bush to be extracted, with a bore slightly larger than the outside diameter of the bush. The material can be steel or brass. The collars or washers at each end of the bolt must be stiff enough not to distort under pressure; the one to the bush can be stepped so that its outside diameter clears the bore of the connecting rod.

Many pressing operations, such as the fitting of bushes, can be done in a bench vice with accurate jaws—though it is usually advisable to place smooth-faced packing to the surface of work which must be kept free from dents and burrs, as at *O-P*. Hollow packing or a washer, *O*, allows a bush to be pressed beyond the end of its bore or housing. Care should be taken to start a bush or bearing squarely in its housing. Then it will press home smoothly with minimum force. Oil or other lubricant also helps at times to reduce the pressure needed.

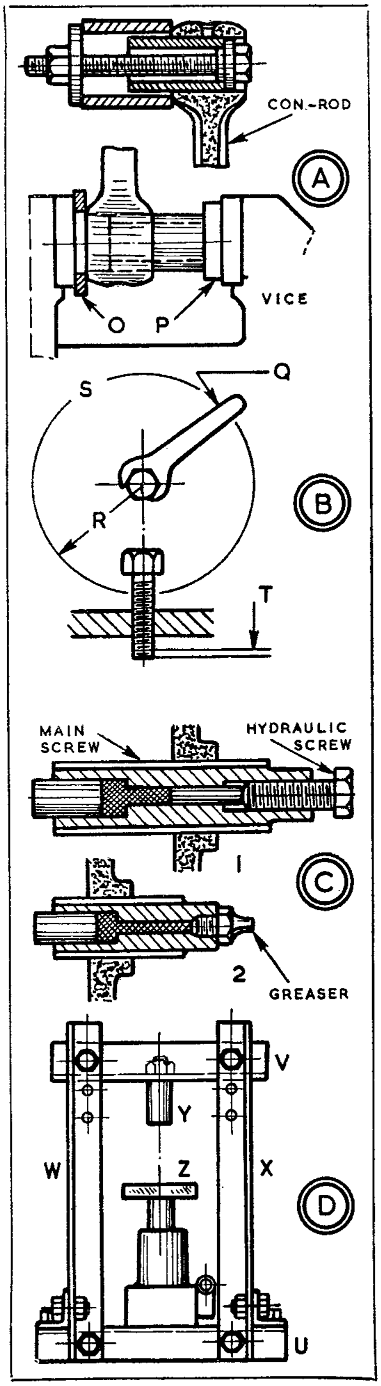
When necessary, the force exerted by a screw can be calculated in reference to diamgram *B*. Here, a force *Q* is applied at a radius *R* for the full circle *S* to move the screw one pitch *T*. Circle *S* and pitch *T* represent the ratio of leverage. *S* in inches = *R* in inches × 2 × 3.14; and *T* = 1 in. divided by t.p.i. Thus, if *R* is 3 in., *S* will be 18.8 in.; and if the screw has 20 t.p.i., *T* will be 0.050 in. By dividing 0.050 into 18.8, the ratio of leverage of 376 to 1 is obtained (or 18.8 can be multiplied by 20, the t.p.i.). If the force *Q* is 5 lb., the pressure exerted by the screw will be 375 × 5, or 1,880 lb. In practice, this would be reduced by friction; a reasonable average would be 80 per cent of it.

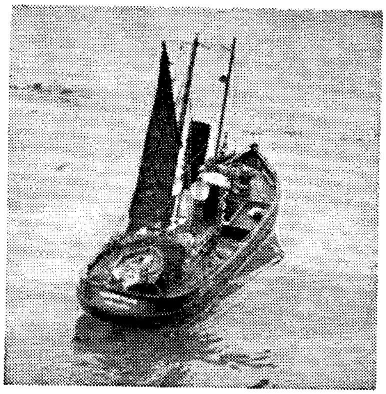
The screw of a puller may be provided with hydraulic plungers, as at *C*1, to increase pressure without the need for a fine pitch thread which would be mechanically weak. A large plunger at the end of the main screw is forced out by a smaller plunger operated by the hydraulic screw. The space between the plungers is filled with oil or grease.

Another way of applying pressure to a plunger in a screw is as at *C*2. Here the screw is shown fitted with a greaser on which a high pressure gun can be used after the screw has been fully tightened. A plain screw can sometimes be altered like this.

A standard hydraulic jack has ample power for many jobs. By providing a frame, it can be used as a press in the workshop. The easiest way of making the frame, as at *D*, is to bolt together standard angle and channel sections.

Two channel sections *U-V* are needed and four angle sections, *W-X*, with two extra angle sections to bolt crosswise at the bottom. An anvil *Y* is mounted by a stud and nut to the upper channel section, and a platform *Z* is fitted by a spigot into the ram of the jack. These may be made, of course, to suit the particular work. ▣





YOUNG CLIFF

# Smoke on the skyline . . . and so farewell

**Only a few weeks after the 1961 Model Engineer Exhibition, where this model by D. S. PATERSON of Maidstone received a medal, the last English-built wooden steam drifter sailed away for ever**

*Continued from March 29, page 404*

THE mizen sail has ten cloths sewn in and a soft land cotton bolt rope sewn on through the lay on the port side. Nine reef eyelet holes are worked in at each seam, as drifters do not have reef points. The sail is dressed with a drop of the real stuff brushed on in two coats on each side. This not only gives the correct colour; it creates that heavy greasy appearance as well. Surprisingly enough, the sail remains quite pliable. In practice, the colour of a steam drifter's mizen did not last very long and soon became almost black.

There are four mast hoops, made from a thin piece of $\frac{1}{16}$ in. resin-bonded plywood steamed and bent in a continuous coil round a dowel. On being cut off, they are cramped, glued and sized at the joints.

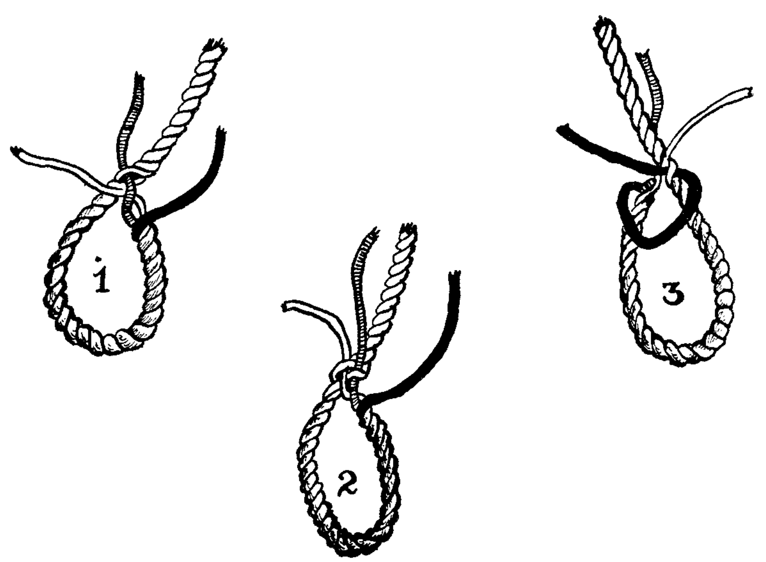
The head of the sail is made fast to the gaff with separate ties formed by passing a light line through the sail and through itself, and then taking up the two ends and tying off on top of the gaff. The lifelines on the boat are fitted similarly.

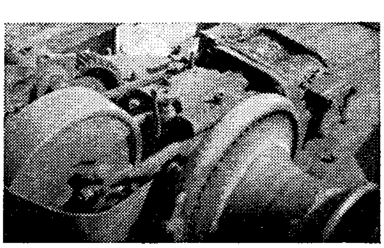
At present I am making the baskets out of wire, using a method outlined to me by Mr P. A. Rumbelow; I hope to pass it on later, with his kind permission. I have yet to make the scutchels for scooping up the fish for unloading. They are usually to be found in the top basket of the stack, or stuck into the space between the rail and fore side of the wheelhouse. The buffs, pallets or pellets are another detail always to be seen aboard drifters. They are the floats attached by strops to the ends of each net and usually painted white, except for the quarter, half, three-quarter and end ones, which are painted red with the appropriate segments. They indicate how many nets of the fleet have to be brought in. There are from 80 to 100 nets in a fleet, and to fit out a drifter with fishing gear today would cost about £6,000!

Engine and boiler are all very basic. The boiler is 6 in. long × $2\frac{1}{4}$ in. dia. and was made out of an old fire extinguisher with the addition of a dome, six cross tubes and a centre stay. It is contained in an asbestos-lined sheet metal casing and is fired by methylated spirit on the drip feed principle. A clack valve and water gauge are provided at the engine room end, and a hand pump is connected to a three-way cock so that water can be pumped into the boiler, or the bilge can be pumped out with the discharge taken out through the port side of the hull where the condenser pump discharge is situated on the actual vessels.

The engine is a single-cylinder slide valve double-acting unit of $\frac{1}{2}$ in. bore × $\frac{3}{4}$ in. stroke, with a displacement lubricator and the exhaust taken up to the funnel. The propeller is four-bladed and is built up with blades cut from $\frac{1}{16}$ in. brass. It is painted white in order that any fouled rope and so forth could be more easily cleared. In the old sailing days it was common practice for the Scotsmen to paint their rudders white so that the plankton upon which the herring feeds could be seen against the white background—thereby giving an indication of where fish were to be found before the echo-sounder was ever thought of.

My colour scheme follows the original. To make sure that the colours were correct I got a small quantity of the actual paint in the more important shades. Black is black and white is white in any tin of paint, but it is awfully difficult to remember the exact shade of the





*Steam capstan*

green, blue and casing paint used.

The general colour scheme of the East Anglian wooden steam drifter was almost traditional, except for minor individual variations. Funnels were highly individual, of course, and were often embellished with flags, shields and elaborate heraldic devices. Even scenes and landscapes were carefully depicted—especially in Scotland. *Young Cliff* had her funnel letters and numbers painted on, but often they were cut out of sheet metal and mounted directly on spacers to the funnel or on a metal band which was fixed to the funnel in turn.

I include a schedule of the colours of the *Young Cliff* which will serve as a general guide, although the wheelhouse, casing and galley were frequently grained and lined out in panels. The *Young Cliff* was painted in this way until quite soon before she went to the breakers. You can quite easily reproduced the colours on a small scale with scumble stain, a small stippling brush, and a cherry stick—working on a small area at a time.

*Schedule of Colours*

**OXFORD BLUE**
Covering board.
Deck bollards.
Capstan base and barrel.
Pound boards.
Hatches and coamings.
Boat chocks and top strake of boat.
Mast crutch.
Derrick.

**GREEN**
Inside bulwarks.
Sides of stanchions.
Top of capstan—including gear train cover and whipping pulley.

**RED**
Capstan cylinder and crankcase cover.
Hawse pipes.
Bollards on rail.
Deck lights.
Compass.

**GRAINED**
Window frames of wheelhouse.
Fore companion.
Faces of bulwark stanchions.
Bulwark pin and bankboard rails.

**BLACK**
Bulwark externally and hull above waterline.
Mizen mast to hounds board, boom and gaff.
Rail, galley and stove funnels, warp hatch.

**WHITE**
Base of funnel.
Rail round boiler casing.
Top of wheelhouse.
Port and starboard light screens, except insides
Inside of ventilator cowls.
External planking of boat except top strake.

**RED OXIDE COLOUR**
Deck except covering board.

**GOLD LEAF**
Name and scroll on bow and wheelhouse.
Mizen mast truck.

**YELLOW**
Line round hull on bottom plank of bulwark.

**RED CASING PAINT, (red-brown)**
Casing.
Galley.
Foremast and tabernacle.
Ventilators.
Mizen mast between hounds bands and truck.
Cabin skylight.

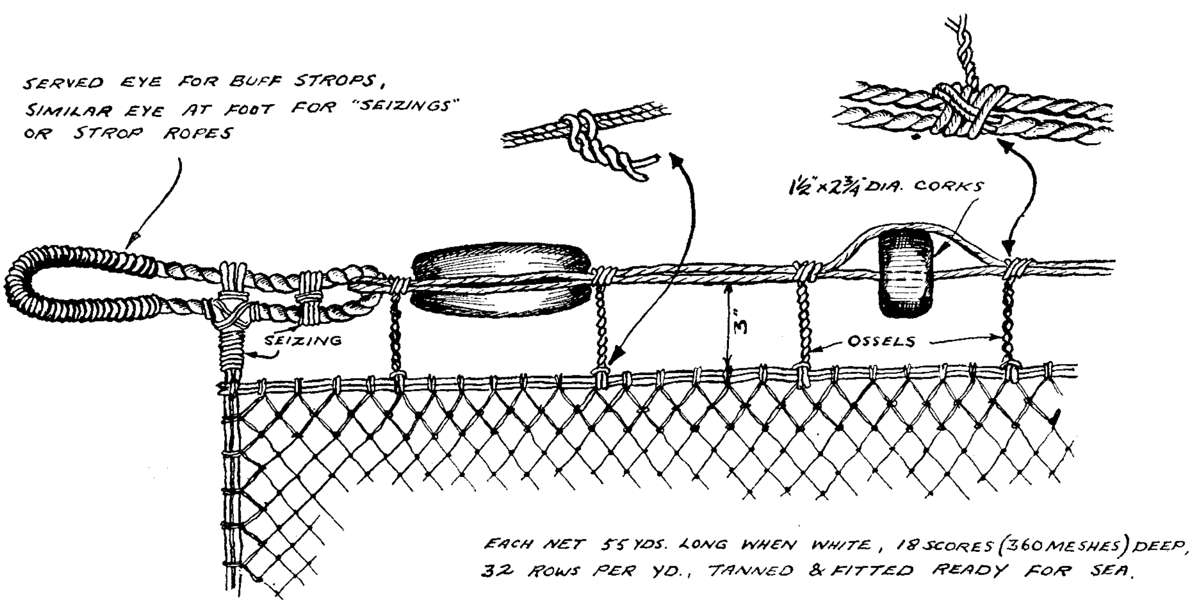
I must tell you something about the old craft herself. The *Young Cliff* was built in 1925 as the *Plankton* by John Chambers of Lowestoft, and was broken up at Peterhead in 1959. She was 875 ft × 19 ft 6 in. × 9 ft 8 in., 96 g.t. 45 n.t.

Her engines were supplied by Messrs Elliott and Garrood and were of a special type which bore the nickname of "Monkey Triples." The cylinders were $9\frac{3}{4}$ in., 15 in. and 22 in. bore × 16 in. stroke, with the h.p. and i.p. cylinders superimposed to reduce the length of engine room; the whole engine was only 7 ft 1 in. in overall length.

These engines gave 297 i.h.p. at 160 r.p.m. and were highly esteemed in the fishing fleets. If coal had remained at a reasonable price they would have been very economical.

There was a massive flywheel of about $1\frac{1}{4}$ tons in weight, with a number of recessed slots in its surface so that the engine could be turned off centre by a pinch bar. Owing to the short overall length of the engine there were 365 tubes in the condenser, compared with the 250 or so on the more usual engines of similar size.

*Continued on page* 492



# These new engines are better-looking

Diesel-hydraulics of the Western class, styled to the recommendations of the BTC design panel, please the eye more than the first electro-diesels, says ROBIN ORCHARD

IN 1958 the first of the Swindon-built B-B diesel hydraulics, the Type 4 Warships, entered service. Since then their number has steadily increased until today over 60 are at work.

They are built by Swindon and the North British Locomotive Company. Apart from the first three and one experimental unit, the whole class is rated at 2,200 h.p. A medium-power class of hydraulics was introduced in the middle of last year, the Type 3 Beyer Peacock Hymeks. But there was a need for a unit more powerful than the Warship, yet not so high that it would enter the Type 5 category. For over two years it has been common knowledge that, as soon as the construction of the Warships was far enough advanced, work would begin on the new C-C unit. Just before Christmas the first pair was released for trials, but the details have been kept secret until now.

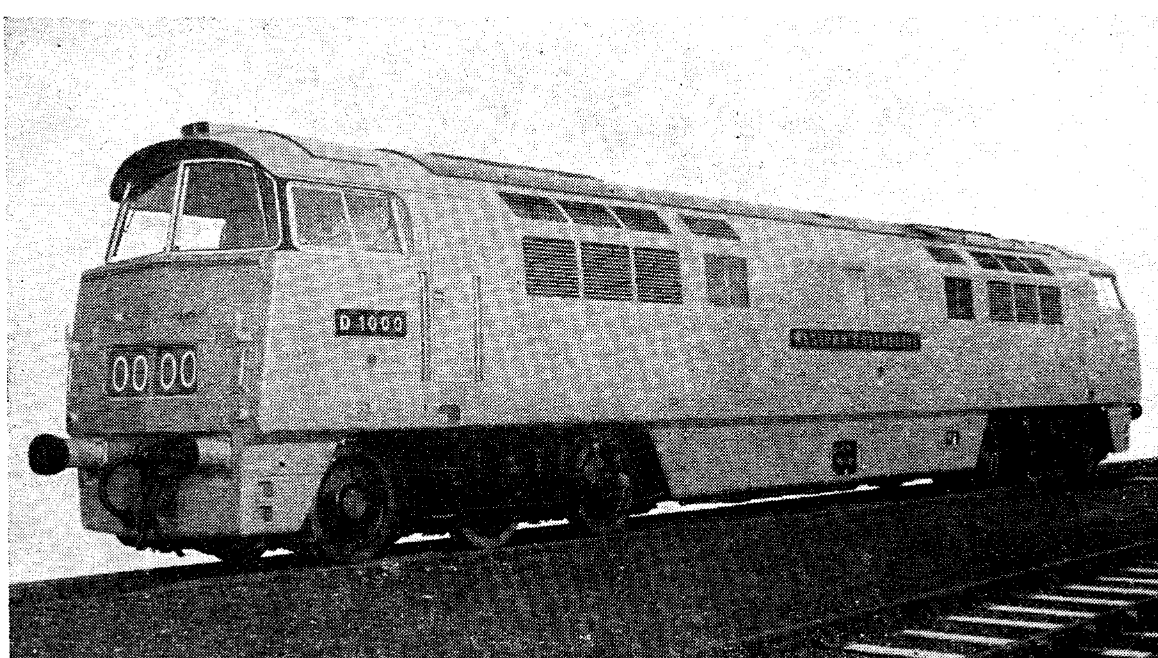
The new units, known as the "Western" class are striking to the eye and are undoubtedly one of the handsomest designs to be seen on Britain's railways. The design panel of the BTC played a considerable part in their exterior styling, and there is little doubt that their neat and attractive lines are mainly attributable to this. I had thought that the omission of the central glazing bar would have improved their looks still further, but a sketch by our artist of a unit with plain screen proved me wrong.

A pair of V-12 Bristol Siddeley-Maybach MD 655 tunnel engines provides the 2,700 h.p. These engines are generally similar to the MD 650 used in the Warships but they develop 1,350 h.p. at 1,500 r.p.m. instead of 1,100 h.p. They are also capable of uprating to 1,440 h.p.

Single-stage exhaust gas turbo-chargers provide the pressure charging; the chargers are inter-cooled. There is a speed control like the one on the Hymeks, pneumatic and infinitely variable. The maximum tractive effort at 30 per cent adhesion is 72,600 lb. and the continuous tractive effort at 14.5 m.p.h. is 45,200 lb.

The unit is the first British-built hydraulic to have six-wheeled bogies with all axles driven. The drive comes from the engine through a cardan shaft to an L6-30rV Voith-North British hydraulic transmission unit, as used on the Type 4 North British A1A-A1A Warships. From there it goes by another cardan shaft to the Stone-Maybach gearbox, and then finally by three separate cardan shafts to the three final-drive mechanisms on each axle.

To take the traction and braking



forces, the bogies are provided with manganese steel rubbing plates, and to take the longitudinal forces there is a special linkage with rubber bearings. Roller bearings are, of course, used in all axleboxes.

The framing is similar to the one on the Warships—two tubes of large diameter from one buffer beam to the other. To these are welded longitudinal and transverse plates; the whole is finally covered by a stressed steel skin.

While the driver is able to brake the train and the locomotive simultaneously with the Laycock-Knorr vacuum-controlled straight air brake, he can also switch it to brake the unit only. Western Region AWS, which gives a bell ring for clear and a hoot and partial brake application for danger, is, of course, a standard fitting. Should the driver fail to acknowledge a warning by cancelling the brake application and re-setting the apparatus, the brakes after a short time will automatically be put into full action. This is an entirely automatic device and cannot be released by the driver. The pulling of the communication cord will achieve the same effect.

**Fire precautions**

Another automatic device is the fire detector—particularly important in diesel locomotives as a fire can start without the crews realising it. In this system, fusible links are fixed at strategic points. If the heat is sufficient to melt them, a bell automatically sounds in the cab. All the crew then have to do is to pull any of the four emergency handles positioned in the most accessible places, and 150 lb. of $CO_2$ is sprayed on the equipment by nozzles fixed at various points.

Altogether 74 of the units have been ordered. Thirty-five are to be built at Swindon under the direction of Mr R. A. Smeddle, the Western CME, and the other 39 at Crewe, under Mr A. E. Robson, CME of the London Midland Region.

The first of the units is D1000 *Western Enterprise.* This engine has been painted experimentally in desert sand colour. The second engine, D1001 *Western Pathfinder* is decked experimentally in maroon. As yet there is no news of which colour will eventually be chosen. Let us hope that it will not be green.

A break-away from tradition on the new units is the cast numberplates, and crests, like those on the a.c. electric locomotives. The numbers are fixed only to the left-hand cab doors and the crests only to the right-hand.


The most versatile diesel locomotive to be built for British Railways has begun tests on the Southern Region—the electro-diesel, a locomotive equally at home on electrified or non-electrified sections. It is not a high powered unit in either form, because it is primarily intended for the lighter-medium weight duties and as a supplementary unit to the main-line diesel or electric locomotives. In straight electric form it develops 1,600 h.p., comparable to the Type 3 diesel-electrics on the region, or the three Southern Railway Co-Co electrics, 20001-3. When it is running as a diesel-electric, it develops 1,000 h.p., equal to the power of an English Electric-Vulcan Foundry Type 1 Bo-Bo.

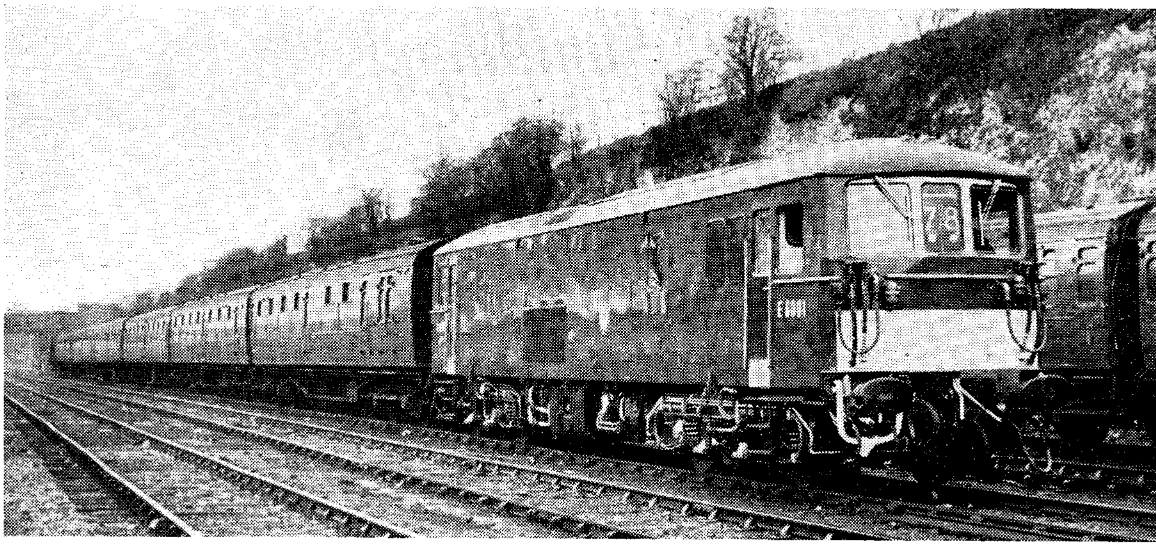
Its versatility is further increased by its ability to be coupled to any of the region's diesel or electric units as well as to multiple-unit trains and Continental rolling stock—the Southern Region moves considerable numbers of wagons brought over from the Continent on the Channel ferries.

Diesel power is supplied by the excellent English Electric 4 SRKT engine, as used in the Hastings and Hampshire multiple units. The four axle-mounted motors are of standard design.

So that the unit can work all over the region, and particularly in the South Eastern Section with its very tight loading gauge, the width is only 8 ft and the weight only 73 tons, with a maximum axle-loading of 18¼ tons. It can, therefore, be used easily as a supplement to the Type 3 diesel-electrics on the line.

Some of you may wonder why the diesel-engine does not produce so much power as the electric. The main reason is that it is meant for working only the lighter trains, or for shunting, and, therefore, does not need the extra power. Another reason is that to put the larger engine in would have raised the construction and running costs to a level at which it would have taken the unit a long, long time to pay for itself.

When the unit is switched from electric power to diesel, the collecting shoes are automatically raised, although it is possible for the driver to lower them for a brief period while the train is diesel-hauled to discover if the section is carrying current.



Two sets of controls are fitted, one for each form of power. Both controllers have an additional lock-off position. It is impossible to start one unit unless the other is switched off. If the unit, for example, is running diesel and the driver wants to change to electric, he moves the diesel lever to lock off and then releases the electric lever from the lock-off position. It is impossible to unlock a lever until the other lever is locked. Besides the normal control positions and the lock-off, the electric controller has other positions including run-up series, parallel and weak-field for working multiple-unit stock.

The unit is a joint product of the region's two works, Eastleigh and Ashford. While the Ashford Works built the underframe, the Eastleigh Works made the body and fitted the equipment. The design of the body is rather box-like but neat. It is undoubtedly more pleasing to the eye than the E5000 class Bo-Bos. The rather drab livery would be greatly improved by a heavy grey band at the base of the body as on certain diesel units and by the white-red-white waist band of the E5000 class.

I suspect that the BTC design panel was not consulted very much about the unit. The sooner the panel is consulted about *new locomotives* the better they will look. The Beyer Peacock Hymek Type 3s, a.c. electric locomotives and the new Swindon C-Cs are examples of what the advisers on design can do to make the units look far more pleasing. I hope that somebody will change that awful livery soon. Why can't the electro-diesels be painted blue like the a.c. electrics ? ▣

## LOCOMOTIVE NEWS

ANOTHER three of the original batch of Castle class 4-6-0s have been scrapped: 4075 *Cardiff Castle*, 4083 *Abbotsbury Castle* and 4092 *Dunraven Castle*. Three Halls have also gone, 4945 *Milligan Hall*, 5907 *Marble Hall* and 5950 *Wardley Hall*.

Of the many quaint little Pug tanks which came into the hands of the Great Western Railway only three now remain, the two Powlesland and Mason 0-4-0STs 1151 and 1152, and the unique Cardiff Railway 0-4-0ST 1338. These three have outlived the other engines by many months, but the news that 1152 has been cut must point to an early end for the other two. Let us hope that the charming little Cardiff engine does not end up as scrap.

The latest Western locomotive to be preserved is 9400, the first of the Hawksworth powerful 0-6-0PTs introduced from 1946. Had the diesel shunter not happened along so soon afterwards, these engines would have been the mainstay of shunting for a great many years.

On the Southern, the scrapping of Maunsell's fine Nelson and Schools class main-line engines continues steadily. We have now lost six Nelsons and fifteen Schools. The latest to go are 30851 *Sir Francis Drake* and 30854 *Lord Hood* from the LN class, and 30905 *Tonbridge*, 30910 *Merchant Taylors*, 30920 *Rugby*, 30922 *Marlborough* and 30933 *King's Canterbury* of class V.

Rumour has it that the original of the class, 30900 *Eton*, which had lain in a terrible condition at Brighton for a long time, has gone to Ashford for scrapping. Up till now it had been generally thought that this was the representative of the class which would be preserved. It now seems likely that 30915 *Brighton* may be the chosen one.

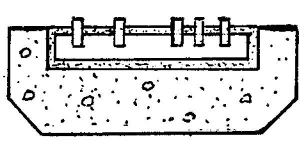
A few months ago, five classes of inside cylindered 4-4-0s remained in service on the Southern Region. I predicted that it would not be long before they all became extinct. Last year the T9s went, and now three of the others have officially gone and it is generally believed that the fourth is also scrapped The withdrawal of 31749 marked the passing of the D1 class 4-4-0s, the 1921 Maunsell rebuild of H. S. Wainwright's D class 4-4-0s. These engines were fitted with a larger superheated boiler, a Belpaire firebox, and long-travel piston valves. They were distinguishable from the D class by the larger boiler with extended smokebox and the stepped-up footplating over the coupled wheels. The scrapping of 31067 was the end of the E1 class, a similar rebuild of Wainwright's E class 4-4-0s. They were introduced from 1919 for the SECR.

The L class were Wainwright's last and largest 4-4-0s. They were introduced in 1914 and became famous when a number of them were built in Germany by the Borsig Company of Berlin and were brought over to Britain at the eleventh hour. No 31768, the last of the class, has been scrapped.

In 1926 Maunsell rebuilt some of the L class with long travel valves, a side window cab and detail alterations. The last of them is 31786, which rumour says has also been scrapped, leaving the Schools as the only Southern 4-4-0s in service. R.O.

# TROUBLE ON THE TRACK

**Under the pseudonym of Observer, a member of a North Country club offers a few hints to those who are building a layout**



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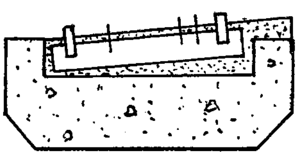

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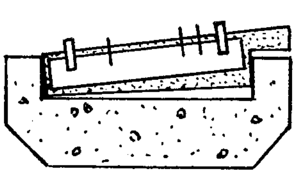

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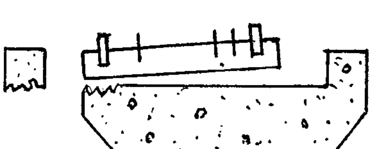


4

My club track is 240 yd in perimeter and is multi-gauge. Rails are 1 in. × $\frac{1}{4}$ in. steel, welded into slotted 1 in. × $\frac{1}{2}$ in. steel sleepers, the whole being cemented solid into concrete troughing (sketch 1).

The troughing is in 6 ft lengths supported by concrete columns 15 in. high on concrete bases.

After ten seasons of summer operation the track has shown up many faults associated with amateur construction. The greater part is perfectly sound and it is to be recorded that no derailments have occurred due to faulty track.

The commonest troubles have arisen from incorrect mixing of cement, and concrete which weathered badly, and also because some of the mixes were laid when there was frost in the air, resulting in surface flaking.

We laid some cement work in doubtful weather because progress was being stepped up owing to imminence of the opening date. Nevertheless, a temporary covering might have saved much work later.

The above faults were dealt with by digging out the faulty material and replacing it with a mixture of three parts sand to one of cement. Senior club members (in retirement) found this a congenial occupation.

Another trouble which developed was a crack between the troughing and the cement filling. Rain entered this hole, froze and burst pieces from the trough sides and also lifted the track and filling from the bed of the troughing.

This trouble was corrected by brushing cement grout into the cracks. There was no guarantee that the whole was filled throughout, but with perseverance an unbroken surface could be produced which prevented moisture creeping in. Crack filling was done prior to the painting of the steel rails before the winter.

The origin of the crack is uncertain: it may have been due to temperature changes or to dirty troughing when the track was laid originally, or possibly both.

Two seasons ago a different kind of fault cropped up when, at the crown of one curved section, the super elevated outer rail (sketch 2) together with the cement filling lifted a further $\frac{1}{8}$ in., as indicated by the gap between the troughing and the filling (sketch 3).

Running was not noticeably affected but as the lift tended to increase it was considered advisable to break out the 25 ft of track involved and relieve what appeared to be tension in the rails.

The tension must have been high, for when cement was removed and the rails freed, the sleeper ends bore so hard against the inner lip of the troughing that it broke away (sketch 4).

The troughing in turn must have been in compression because when the lip gave way the exposed joints cracked and the two middle sections were pushed well to the outside of the original line. Four sections had to be taken down and shortened to line up with the lie of the rails. The latter were undamaged and the whole was recemented and has given no further trouble to date.

At another point, the whole track at the crown of a curve of larger radius than that above moved 1 in. across the tops of the supporting columns. This occurred at the height of the summer. It returned to normal as the season advanced, and was probably due to expansion. The rails were not affected, and minor cracks in the troughing were pointed up before the winter.

**Turntable trouble**

During hot summers the turntable to the lighting-up sidings sometimes jammed due to expansion, but a bucket or two of cold water proved to be more effective and less damaging than a sledge hammer plus pinch bars. The treatment depended on the people present.

Bubbles in the cement filling have shown up during the last few seasons. They were caused by rust where sleepers and such things as iron washers used as packing had been insufficiently covered with cement.

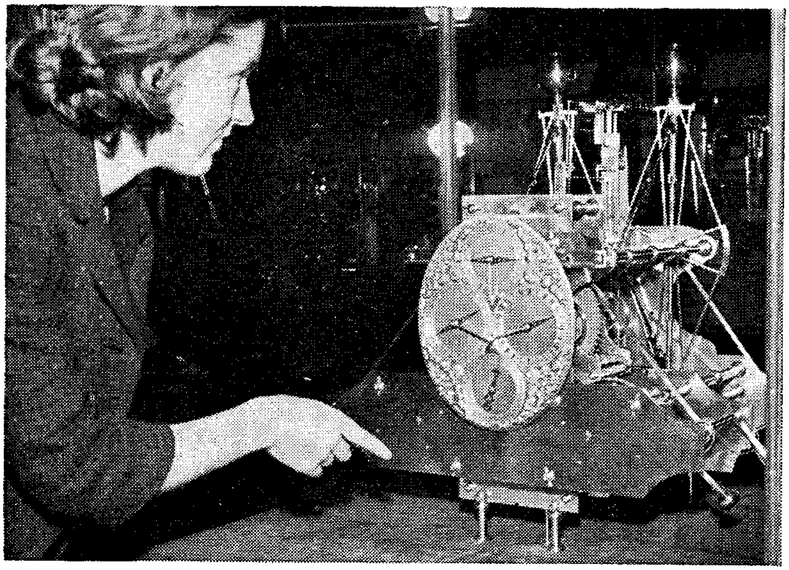
The worst case occurred at the abutment to the turntable when the rail ends lifted nearly $\frac{3}{16}$ in. above the turntable level. The lift ran out in about a foot and it was a relief to see the rails return to normal level after a mass of rusted iron washers had been knocked out. They were replaced with non-ferrous material and well covered with cement.

It is my experience that cement covered steel track work should be properly done otherwise there is bound to be trouble sooner or later with blows. This is especially the case at super-elevated points where sleeper ends come above trough level.

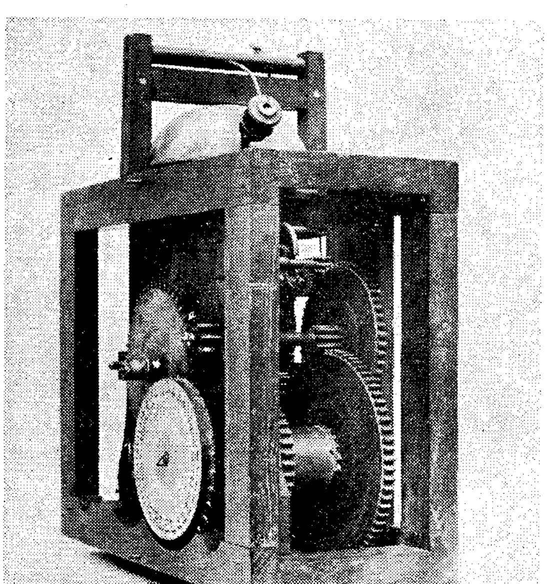
Common practice has been to slope the cement from the rail to the trough edge, leaving corners of the sleepers exposed or only lightly covered. A much better plan is that shown in sketch 2, where cement is banked up to rail level right out to trough width.

● *Continued on page 498*

# TIMEKEEPER OF THE SEA



When John Harrison developed his instrument for finding longitude, he met with opposition from Nevil Maskelyne, the Astronomer Royal. The story is told by James Forsyte



*Miss Fisher of the National Maritime Museum, Greenwich, admires Harrison's marine timekeeper of* 1735. *The Museum held an exhibition earlier this year to mark the trial of No* 4 *Watch in* 1762. *From* 1920, *No* 2 *and No* 3 *were restored by Lt Cmdr Gould, RN. All five clocks still exist. On the left is the* 1715 *movement at the Science Museum*



I WAS interested to read Vulcan's reference in Smoke Rings to John Harrison and Nevil Maskelyne. John Harrison did not receive the full £20,000 offered by Act of Parliament for a successful method of finding longitude at sea. Though he was not considered an eminent horologist, he was without doubt the man whose skill, ingenuity and tenacity made the fixing of longitude possible by mechanical means.

In offering a graduated scale of awards, the Act of 1714 set up a permanent body of Commissioners, charged with supervising all the claims. The Board of Longitude, as it was known, operated from 1714 to 1828. Dr Maskelyne became a member of the Board in his capacity as Astronomer-Royal, a post which he held from 1762 to 1811.

In pursuit of the prize John Harrison constructed three timekeeping machines. The first took him six years and the second only two; but the third, which was extremely complex, took him seventeen, probably because he also constructed a conventional pendulum machine for use as a standard by which he could check and adjust his sea-going instruments.

In 1757, when No 3 Instrument, as it is still known, was almost to his satisfaction, he notified the Board of Longitude that he proposed to compete for the £20,000. At the same time he suggested that he should build a much smaller portable machine as an auxiliary to the cumbersome No 3. This step was approved—the Board had for some years been advancing him small sums, in accordance with their charter—and with the help of his son William he produced the most famous timekeeper which has ever been made—his No 4 watch.

On 18 November 1761 William embarked with No 4 in HMS *Deptford* at Portsmouth, bound for the Indies to prove the claim. When he arrived at Jamaica on January 21 he found that No 4 was only five seconds slow, producing an error in that latitude of less than one geographical mile. This alone was sufficient practical proof that Harrison's mechanical means was well within the terms of the award. But the Board of Longitude was, for some reason, disinclined to recognise the fact. The members were divided in opinion and Dr Maskelyne was quite openly a disbeliever.

Dr Maskelyne was the person responsible for bringing into practical use the Lunar Method of determining longitude, by publishing in 1763 the British Mariners' Guide, and four years later instituting the Nautical Almanac. The principle of this method is the position of the Moon relative to the Sun, corrected by tables published regularly in the Nautical Almanac. Maskelyne, by virtue of his post as Astronomer-Royal, and because of his own system, is recorded to have been quite openly opposed, not only to mechanical timekeeping, but also to John Harrison himself.

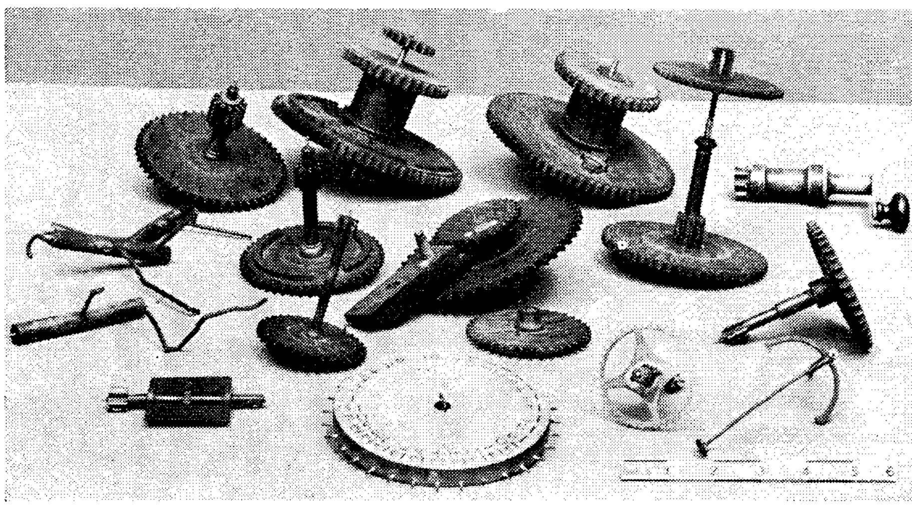
After the test voyage from Portsmouth to Jamaica, the Board ordered Dr Maskelyne to place on him for his third (and last) voyage.

This timekeeper was not made by Harrison. It was a copy of his No 4 "Deck Watch" made under his guidance, on the directions of the Board of Longitude, by a well-known London watchmaker, Larcum Kendal, who spent five years on the work and completed it in 1770. The instrument was of silver, 5.2 in. in diameter. It would be described today as a "turnip" pocket watch. Harrison called his No 4 a "Deck Watch" because it was intended as a portable auxiliary, and from that time the term "watch" was applied to all portable timepieces.

After the Jamaica trial, a further trial to Barbados was supervised by Dr Maskelyne. The result appears to to have been rather obscure—many technical objections were raised—but on the whole it was satisfactory enough conditions; otherwise, as he said himself, he would get nothing at all.

Before all this Harrison had privately made a watch devoid of any ornament, which the Navy had tested with much success in HMS *Tartar*. Reports of the tests came to the attention of George III, and as a result the Harrisons were granted audience at Windsor. After the old man had told his story, the King was heard to remark: "These people have been cruelly wronged." Aloud, he said: "By God, Harrison, I'll see you righted."

So at long last Harrison had a powerful patron. No 5 was tested with much success in the King's private observatory at Kew. Questions were asked in Parliament—very harsh questions that were difficult to answer. The Board bowed to the storm and allowed a clause to be inserted in the



*Wheelwork of John Harrison's clock of 1715 at the Science Museum in London*

trial the No 4 watch at the Royal Observatory, where it underwent one year's test under his direction. A good deal of controversy took place on the fairness of the tests, and correspondence and papers published by various interested parties disclosed a deep-seated and vitriolic feeling between the major parties.

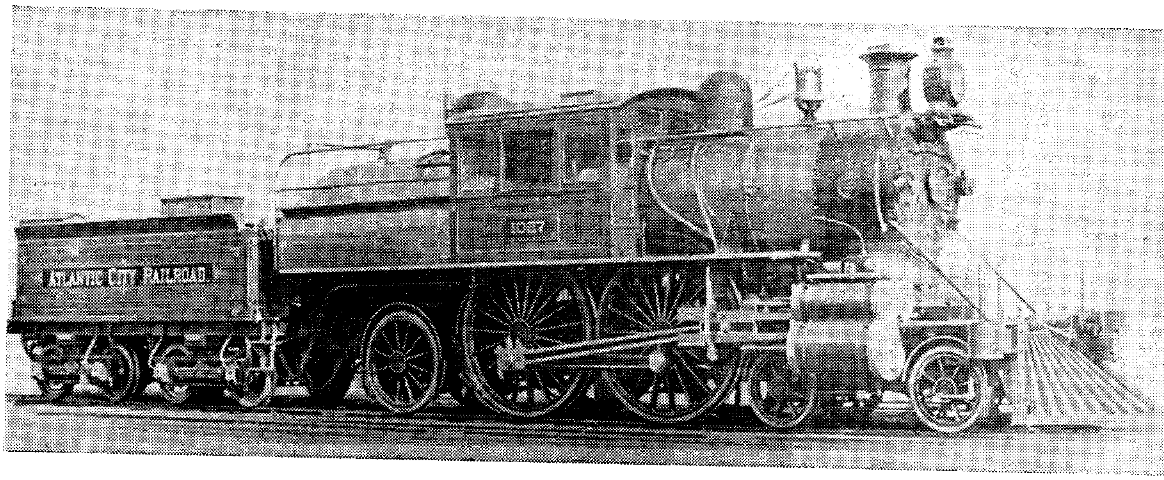
Captain Cook used the Lunar Method throughout his first voyage, but took a timekeeper with him on his second, to the Antarctic. He was quick to realise its advantages, and came to trust it and rely on it for navigation, though in the early part of the voyage he reported that he checked the timekeeper by lunar observations. He later referred to it as "our trusty friend" and "our never-failing guide," and made a special point of asking for it to be issued to for the Board to come to a decision.

After the Jamaica trial, the Board had paid £2,500. It now declared that it would pay a further £7,500 providing that No 2 and No 3 timekeeping machines were made over to its custody and that John Harrison would make a full disclosure, on oath, before a committee which included watchmakers (Larcum Kendall was one of them), of the nature of the mechanism and construction of the No 4 watch. Thus half the reward was accounted for.

As a final thrust, the Board flatly refused to pay the second half unless John Harrison made two more timekeepers which could be subjected to such tests as it deemed fit. Harrison was now a man of over 70 and his sight was failing. On 28 October he agreed to the first half of the General Supply Bill granting Harrison the second half of the reward so justly won.

Out of what can only be called pure spite, the Board delivered an ungentlemanly parting shot. It had advanced Harrison £1,250 for the construction of his No 2 and 3 machines, on the understanding that they were handed over in trust to the public. One of the conditions of payment of the first part of the award required him to hand over these machines; this he had done and, therefore, he could reasonably assume that the debt had been repaid. But at the last moment the Board entered a caveat, securing the £1,250 out of the second £10,000. Thus the Board kept the penny and the bun.

Such is the story of John Harrison and his £20,000 reward. ■



# ATLANTIC CITY FLYERS

GEORGE WOODCOCK on the fast trains from Philadelphia in the Gilded Age

FROM 1897, passengers on the Atlantic City section of the Philadelphia and Reading Railroad were able to travel at really high speed for 55 miles between Philadelphia and the coast.

The Philadelphia and Reading competed with the Pennsylvania, West Jersey and Sea Shore, which had a route mileage of 58. As the ferry crossing from Philadelphia to Camden was shorter on this route, the distances were much the same.

In 1880, W. P. Hensey of the Baldwin Locomotive Works was impressed by the work of certain single-wheel engines in England. At the request of J. E. Wooton, the motive power superintendent of the ACL and inventor of the Wooton firebox, he designed a 4-2-2 high-speed single-wheeler.

Two engines were ordered from the Baldwin Works. The first came out in October 1880 and was numbered 507. It had a single pair of drivers 6 ft 6 in. in diameter, with cylinders 18 in. × 24 in. and a pressure of 180 lb. The firebox was Wooton's, with a grate area of 56 sq. ft. It measured 7 ft wide × 8 ft long. The fuel used was buckwheat anthracite, which burns very slowly.

A weight of 15½ tons rested on the drivers, but a traction increaser, of the kind introduced on the LNWR by F. W. Webb, was fitted between the drivers and the trailing wheels. Webb's device was a roller operated by a steam cylinder the wheels could be coupled by friction. In the Baldwin engine the steam cylinder operated the compensating lever and threw some of the weight from the drivers to the trailing wheels. The total engine weight from the drivers to the trailing wheels. The total engine weight was 38 tons.

The other engine ordered was never built, and No 507 was the only one of its class. Baldwins guaranteed it for a speed of 60 m.p.h., hauling a four-car train. On a trial run, pulling a train of six cars, one of them a baggage vehicle, it covered 27 miles in 26¾ minutes, and in 11 minutes ran 13 miles.

Unfortunately, the Philadelphia and Reading Company went into receivership for some years. The order for the second engine was countermanded and No 507 was taken back by its makers.

### The Eames brake

It was sold to the Eames Vacuum Brake Company, which equipped it with a brake designed by Lovatt Eames. In this form it was tried on several American railroads until late in 1881. At the end of that year it was shipped to England and sent to the Miles Platting Works of the Lancashire and Yorkshire Railway, where it was given buffers and was slightly altered to conform with the English loading gauge. It ran on several English lines but failed to convert them to the use of the Eames brake.

In the summer of 1882 an exhibition of life-saving apparatus was held at Alexandra Palace in London. After having been shown there, No 507 stood for some time in the GNR shed at Hornsey, London, where it was broken up by a scrap merchant in 1884. The bell was hung in the shed fitting shop and used to announce the opening and closing times. In 1938 it was presented to Richard Pennyor, the American Consul in London, by Sir Nigel Gresley.

The P and R made no more experiments in high-speed travel for several years, and it was not until 1895 that another design was introduced. But the company still hankered after the single-wheeler. L. B. Parson, the motive power superintendent, removed the side rods from a Columbia engine, and for some time ran it as a 4-2-2. In 1893 the line was relaid with new rail of 90 lb. to the yard.

Hensey's single-wheeler of 1895, built by Baldwins, in no way resembled the 1880 design. It was a Vauclain compound. While the wide Wooton firebox was retained, the whole engine was much larger and of the Camelback type.

Two of these engines were constructed, Nos 385 and 378. They were externally similar, but had slight differences. The boiler of 378 was 4 ft 8 in. in diameter, and the boiler of 385 4 ft 10¾ in. While 385 weighed 51½ tons, the other tipped the scale at 54½. The cylinders were 13 in. bore h.p. and 22 in. bore l.p., both with a stroke of 26 in.

The single drivers were 7 ft in diameter. Boiler pressure was 200 p.s.i. Grate area was 76 sq. ft the grate measured 8 ft wide × 8 ft 6 in. long. The weight on the drivers was 22½ tons, four tons more than the weight of the last batch of Stirling's GN Singles.

Both engines were built under a penalty clause which guaranteed their ability to handle a five-car load from Camden to Atlantic City in an hour. On test this was exceeded with an ample margin. But an inability to keep time with heavier trains, which the four-coupled engines could handle, told against them, and both were later rebuilt as 4-4-0s.

The final and most notable development on the Atlantic City route came in 1897 with the arrival of a new design destined to have far-reaching results on passenger services everywhere.

It called for two Atlantics, very similar externally to the Singles, and again Vauclain compounds and Camelbacks. These two, which bore the numbers 1027 and 1028, had h.p. cylinders 15 in. × 24 in. and l.p. 25 in. × 24 in. Their coupled wheels were 7 ft ½ in. The total wheelbase of the engine was 26 ft 7 in. and the length over the engine and tender was 65 ft 9⅝ in. Working pressure was 220 p.s.i. Tractive effort amounted to 19,250, working compound, and 33,400 lb., working simple. A firebox 8 ft 6 in. wide and 9 ft 6 in. long gave a grate area of 80¾ sq. ft. A combustion chamber fitted to the boiler extended about 5 ft beyond the throatplate.

The tender was on bogies with 3 ft wheels and had a water pick-up. Together engine and tender weighed 173,600 lb. The shell of the boiler was slightly tapered from 5 ft 1 in. at the throatplate to 4 ft 10¾ in. at the smokebox. The boiler was pitched 9 ft 2 in. above the rails, and the top of the chimney was 14 ft 8¾ in. Both engines, when they were just built, had rather longer capped stacks, more like those of the Atlantic Coast Line Atlantics of 1895. By 1902 the shorter stack, like the one on the Singles, was in use.

### Little known

Although these engines, through their high speeds, received much publicity, and three encyclopaedias, two English and one American, cited them as examples of modern locomotive practice, details of their dimensions are hard to come by. In fact they seem hardly to exist at all, and those which I have given here are collected from a number of sources.

No 1027 went into service for the summer of 1897, and throughout the season did not have one late arrival, or one involuntary stop. The average time for the 55½ miles from Camden to Atlantic City was 48 to 50 minutes. On one occasion, with S. M. Vauclain riding the cab, No 1027 covered the 55½ miles in 42 minutes, and for a short distance reached a speed of 115 m.p.h.

Doubt has been cast upon this performance. In certain conditions the speed may well have been achieved. The day was probably fine and warm with little wind and Vauclain doubtless urged on the driver. Above all, the engine was probably fresh from a boiler washout. When a saturated engine is driven to its absolute limit, any dirt present in the boiler will lift water, with disastrous results to an extreme speed performance.

In 1902 a party of officials from England's North Eastern Railway made a trip on the World's Fastest Train, as it was called. The 55½ miles were covered in 56 minutes. At no point did the speed exceed 85, but for 35 consecutive miles a speed of 81 was maintained.

Usually these trains weighed rather over 200 tons for five cars, and their speed was slow for more than a mile at each end of the run.

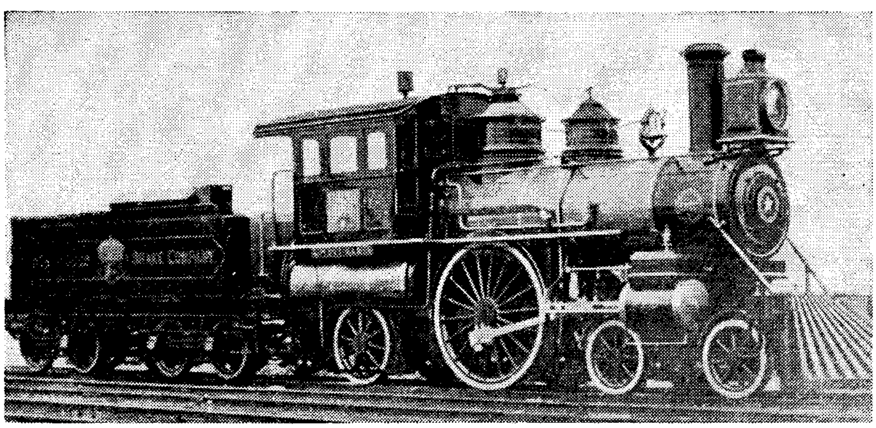
Similar Atlantics introduced in 1902—No 326, which hauled the NER party—were dimensionally like Nos 1027 and 1028 but rather plainer, with sheet metal cabs in place of the wooden ones on the first engines. A small shelter over the firebox protected the fireman, and the stacks were plain cast stovepipes unadorned with any form of cap except a plain half-round bead.

The 2-4-2 Columbia engines which had worked with the Singles after 1890 were also Vauclain Compounds. In the Vauclain system a high and low pressure cylinder drove upon a common crosshead, and the one cylinder was superimposed upon the other. Which cylinder was placed on top varied with the type of engine. The h.p. was the upper on a large-wheel machine, and the lower on a small-wheel freighter.

The traction engine man might recognise a Burrell single crank compound by Fredrick Burrell's patent of 1889; two valves were used, one to each cylinder. Vauclain used only one piston valve, to the h.p. cylinder only. Steam was crossed, exhausting from the front of the h.p., the rear of the l.p., and a simpling valve was placed in a pipe which connected the two ends of the h.p. cylinder so that it passed steam from one end to the other and so to the l.p.

This supply of live steam to the l.p. was supposed to be shut off as

*Title picture: P and R Atlantic No 1027 was built 65 years ago by Baldwins for the Atlantic City RR*



*Right:* LOVATT EAMES *of the P and R had a photograph of Lovatt Eames on its side, above the name. The cylinder on the cab roof emits exhaust from brake injector* soon as the engine had made a revolution or so of the drivers; for it had the grave defect of imparting a skewing effect to the slippers of the cross heads, with corresponding wear upon the piston rod glands and packings.

The first engine to be fitted was a 4-4-0 on the Baltimore and Ohio—in 1889, the year Vauclain took out his patent and the year of Burrell's patent as well.

In all, about 2,500 engines were built with the Vauclain compounding, 138 for Russia in 1895 and 1896. The design faded out in 1904. Most of these compounds in America were rebuilt in after years as simples.

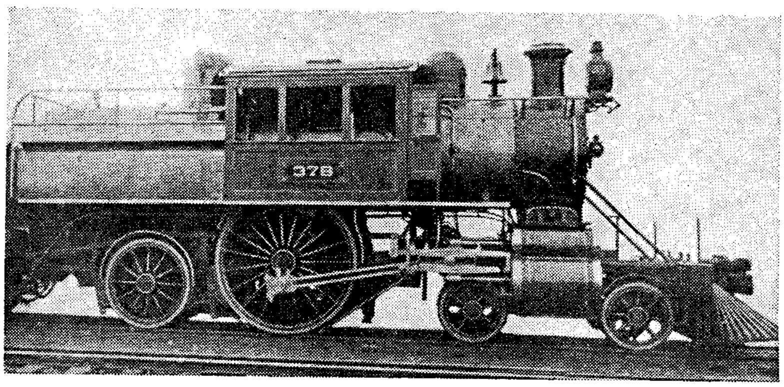
Forty-eight 0-4-4 well tanks for the Chicago Elevated Lines were compounded on the Vauclain system, and after the service was electrified, were sold for industrial and short lines, where some survived until the Thirties, and retained their compound cylinders.

The Pennsylvania RR service between Camden and Atlantic City was worked on the last decade of the nineteenth century by Columbia engines, and later by Atlantics with 6 ft 8 in. drivers, 20½ in. × 26 in. cylinders (two simple), 55½ sq. ft of grate area, and Belpaire fireboxes.

In 1904, an Atlantic with 229 tons ran 40 miles in 29 minutes, with a top speed of 89. The regulator was half open and the lever in the fourteenth notch of a 34-notch sector plate.

Samuel Matthews Vauclain, inventor of the system, was born at Port Richmond, Philadelphia, on 18 May 1856. He attended the day school at Altoona, and at 16, joined the Altoona shops of the Pennsylvania RR as an apprentice. He began work in 1883 as a draughtsman in the Baldwin Locomotive Works, and was soon made works manager. During the First World War he was chairman of the US Plants and Munitions Committee. He became president of the Baldwin Works in 1919, and chairman in 1929. When he died in 1940 he was 85.

It was on the final run to Atlantic City, after the eleven-minute ferry crossing, that the really fast running took place. Another company in the Atlantic City race was the Central Railroad of New Jersey which some 4-4-0s built in 1892; Nos 385 to 389 were Vauclain compounds and Nos 451 to 455 two-cylinder simples.




*Pennsylvania and Reading Single* 378

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**Around the TRADE**

MANY home craftsmen prefer fluorescent light to tungsten in workshops and garages. But they do not always fit them because the cost is higher than normal light fittings.

Now J. D. Swain Limited, of 47 Goldhawk Road, Shepherds Bush, London W12, are marketing an inexpensive fluorescent fitting of Italian manufacture with British tube, which is within the reach of most pockets.

There are two sizes: a single tube of 20 w. consumption with an estimated light output equal to a 100 w. tungsten lamp; and a double tube fitting (each tube being 20 w.

Each fitting includes a polished aluminium reflector, bayonet-type attachment for inserting into a standard lampholder and a starter choke which is fitted to the back of the reflector.

In test it was found that the single size gave sufficient illumination for bench work, but for general lighting of a workshop or garage the two-tube fitting is recommended.

There are no installation problems: the complete unit merely plugs into a standard light socket.

Price of the small size is 37s. 6d. and of the larger, 55s. Postage and packing on each size is 3s. 6d.

# SMOKE ON THE SKYLINE . . .

*Continued from page 483*

While I have been writing this serial, the *Lizzie West* has been sold, to take up a new role as a tanning ship at Fraserburgh; tanning is work which the motor boats cannot do for themselves. The *Lizzie West*, built in 1930 by Herd and McKenzie of Buckie, is the last remaining example of a Scottish-built wooden steam drifter. At present the steel-built *Wilson Line*, registered at Kirkcaldy and converted to diesel power by Richards Ironworks in 1959, is the only drifter in the Eastick fleet.

On the Sunday morning of October 29 last, the *Wydale*, a John Chambers craft of 1917, and the only surviving English-built wooden steam drifter, slipped her mooring and left Yarmouth for the last time, with the old pleasure steamer *Cobholm* in tow, bound for a breaker's yard in Holland. The Dutch company sent a two-man crew to take her, and Mr Eastick removed her Premier Trophy weathervane, which is to be preserved in the Yarmouth Sailors' Home Museum.

The *Wydale's* smoke, as it vanished over the horizon, signified the end of an era. It will not be long now before the steam drifter is quite extinct. The cost of coal, combined with crewing difficulties and with the failing catches caused by the intensive onslaught on the shoals at every stage of their development by the Continental trawlers, have all contributed to make this ancient industry a mere shadow of its former self.

* * *

The model took me about four years to build, working when time permitted. As it was my first serious attempt at a powered model, I felt greatly honoured when awarded a Silver Medal at the Model Engineer Exhibition of 1961.

● *This serial on the construction of* YOUNG CLIFF *at* ⅜ *in. scale began on March* 1 (*page* 262). *The other instalments were on March* 15 (*page* 326), *and March* 29 (*page* 402).

# REAR TOOL HOLDER

*MAURICE KELLY makes a simplex version of the Duplex design*

My simple rear tool-holder is a close copy of the Duplex design. A small tool-holder of this sort cannot differ very much from the Duplex design, but I thought that a description of my post might be of interest to readers, especially as castings for the Duplex are apparently no longer available.

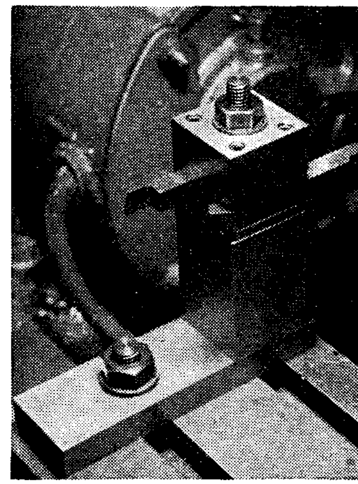
The tool can be made in a weekend and is extremely useful. With a cutting-off tool mounted on one side and the Duplex chamfering and facing tool on the other, you can turn out nuts, bolts and machine washers with ease. The cutting-off tool will operate at top speed on steel in the ML7, for which the drawings are dimensioned.

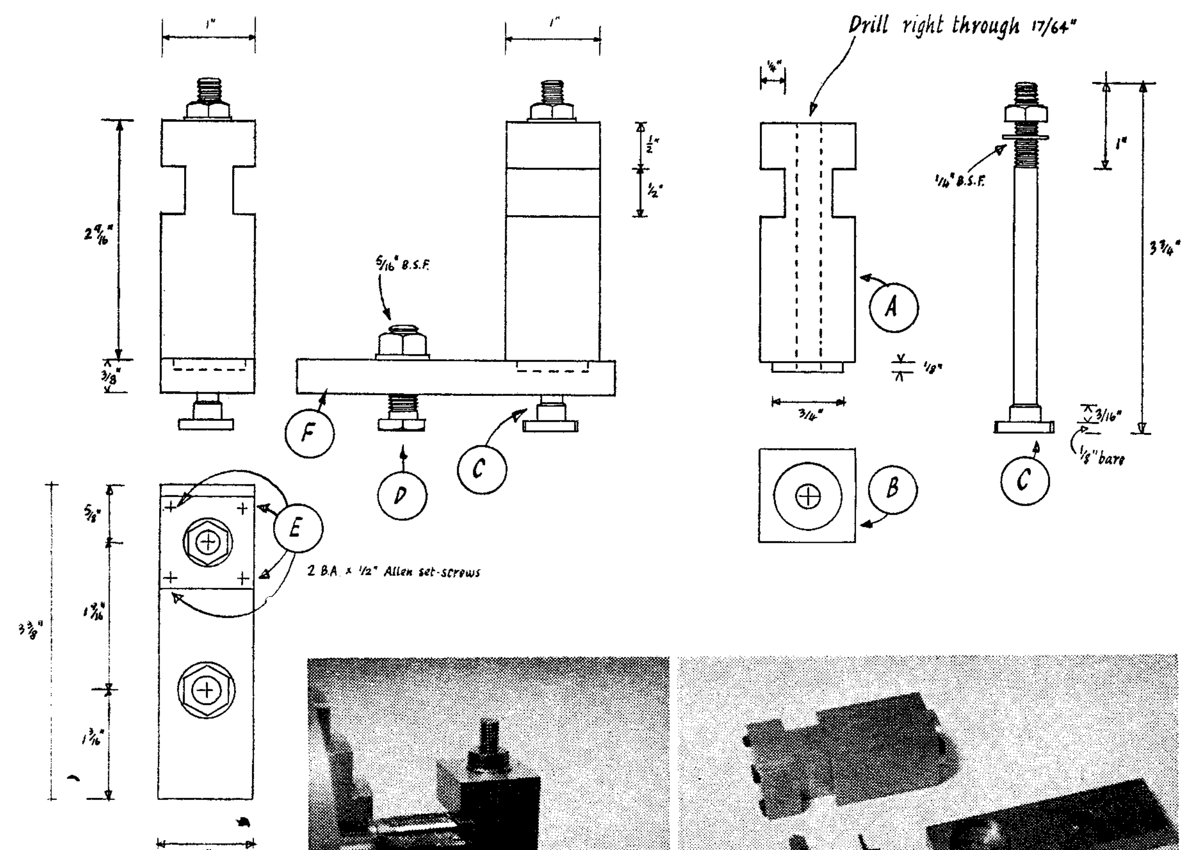
It is as well to begin by making piece *A*, which is a $3\frac{3}{4}$ in. length of $\frac{1}{4}$ in. b.m.s. with $\frac{5}{16}$ in. of $\frac{1}{4}$ in. BSF thread on one end (made with a die set to cut wide) and 1 in. of a looser $\frac{1}{4}$ in. BSF thread on the other. An ordinary commercial nut and washer are used for clamping, and the bottom end is screwed into a copy of the holding-down nuts on the ML7 topslide, turned from $\frac{5}{8}$ in. round b.m.s., filed down on the flange to $\frac{7}{16}$ in. to fit the T-slots.

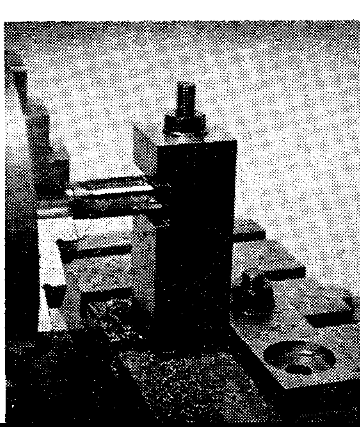
If the rod has to be screwed in with some force, so much the better. It could be silver soldered or pegged, but I have not found this necessary. For appearance, I oil-blued pieces *C* and *D*, using a drum of old sump oil which I keep under the bench.

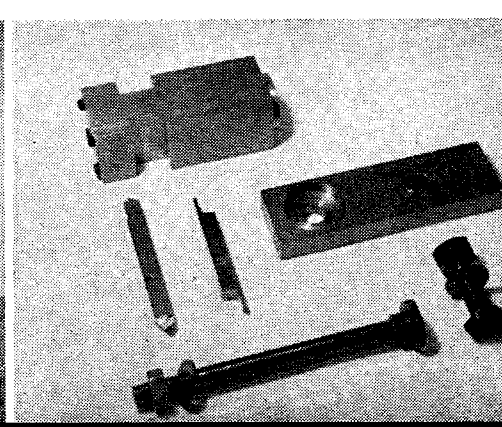
Piece *A* is readily machined from 1 in. × 1 in. b.m.s. held in the four-jaw chuck. After facing to length, $2\frac{11}{16}$ in., the centre is marked on one end and the centrepop set to run truly. I found the centre by setting the scribing block as closely as possible to $\frac{1}{2}$ in. and scribing four separate lines on the end of piece *A*, rotating the piece each time and carrying out the whole operation on a surface plate. The intersection was clearly discernible.

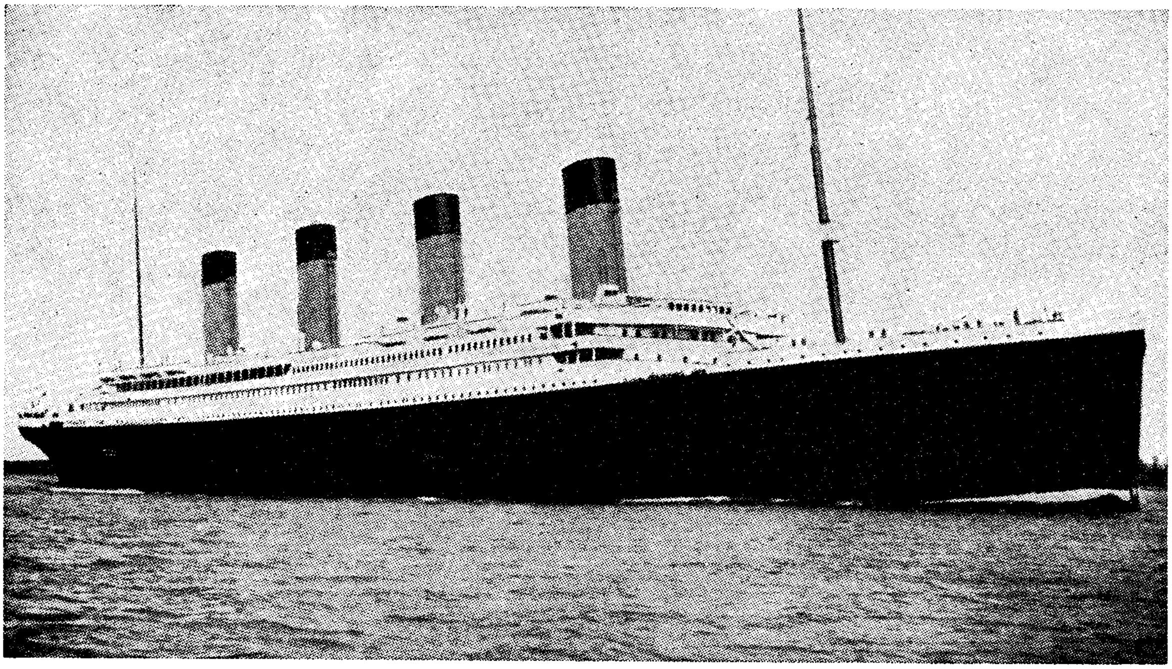
● *Continued on page 498*



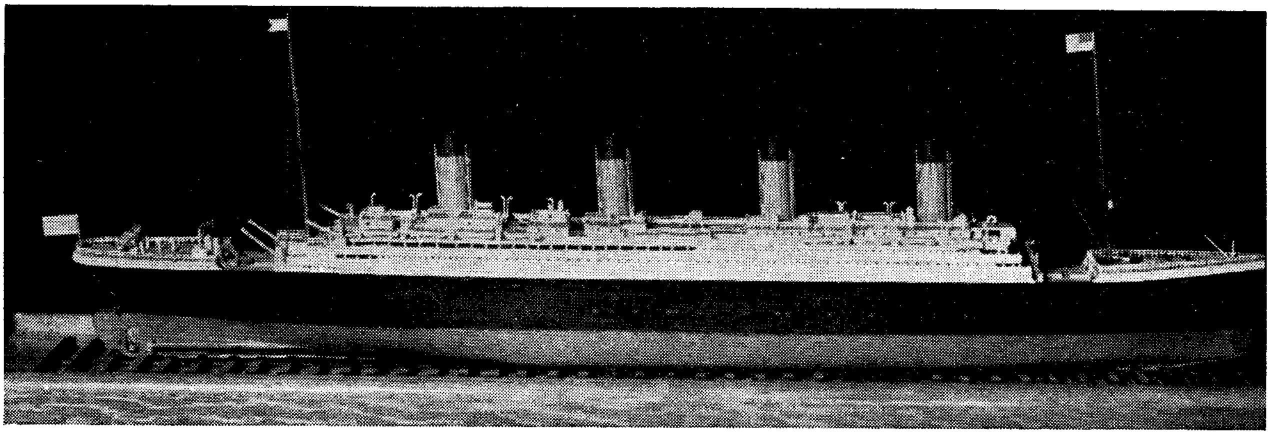






# The TITANIC



I HAVE been interested in the *Titanic* since childhood and hoped one day to build a model of it.

I took six months' research to draw a workable plan and one year to build the model. The basis of my constructional notes were from *Engineering* of 26 May 1911.

The hull of the model is $\frac{1}{16}$ in. thick and made of bass wood, forming a series of plates on a framing. The stacks are made of tubing, and the lifeboats and some fittings are white metal. The railings are made of fibre-glass screen. The flags on the model are based on the actual ship leaving Southampton.

The *Titanic* had one four-bladed centre propeller and two three-bladed. One of the differences between the *Titanic* and *Olympic* was that the promenade deck of the former was closed in, but that of the *Olympic* was open throughout.

My model is lit by eight small electric bulbs in the hull, powered by a battery, and gives a good idea of how the ship looked that fateful night.

I keep a globe, made of cellulose acetate, over the model but it was removed for photographing.

I now have a large well illustrated scrapbook dealing with the *Titanic* and the people of the period.

JOSEPH A. CARVALHO.

AT a quarter after noon on Wednesday, 10 April 1912, the *Titanic*, flagship of the White Star Line, sailed slowly and majestically down Southampton Water on the start of her maiden voyage to New York.

Those who watched shared in some of the pride of this magnificent ship, for she embodied all the latest shipbuilding ideas and techniques, and they made her the largest, fastest and most luxurious ship to set sail on the high seas.

Her hull was considered to be the safest afloat and pretty well unsinkable. Such was the confidence placed in this aspect of her design that it must be blamed as the source of the tragedy that we remember today after fifty years.

She had a double bottom divided into cellular compartments for greater security and was herself divided into compartments separated by watertight bulkheads. It was asserted that if the ship became flooded in two of these compartments her seaworthiness would not be impaired.

The design of the engine room and the adoption of two different types of power plant extracted the highest possible efficiency from the steam produced by the boilers.

Reciprocating engines and turbines have advantages and disadvantages over each other, and *Titanic* was installed with both kinds to drive her three propellers.

The port and starboard propellers were driven by two reciprocating engines and the exhaust from them was fed into a low pressure turbine which drove the centre propeller. When the ship had to go astern only the port and starboard engines were used and the exhaust steam went direct to the condenser.

But in spite of all these safety factors, three days later, at 11.45 p.m. on Saturday, 13 April 1912, she met a fate which shocked the whole world. As a result of the disaster there followed a complete revision of the standards with which ships had to comply for the safety of passengers and crew.

One of the sad things about the *Titanic* was that she carried insufficient lifeboats. There were only 16, eight on each side of the ship, and they represented one-third of what was required. Had there been more lifeboats there would not have been such an appalling loss of life. This is borne out by the rescue work of the *Carpathia* which arrived on the scene soon after the *Titanic* went down. The *Carpathia* accounted for all the lifeboats and took the occupants aboard.

Some indication of the number that may have survived, had there been sufficient boats, can be judged from the proportion of those saved and those lost: 711 were rescued, and 1,513 souls perished.

It was also largely through the *Titanic* disaster that the International Ice Patrol came into being.

The Patrol's mission is to find and track icebergs which calve from the glaciers in the Polar Region and drift southward with the Spring currents. Small icebergs are usually blown up so that they become harmless to shipping in the North Atlantic the more sizeable ones are shadowed until they, too, can be destroyed or melt in the warmer waters of the south.

Whenever icebergs are located their positions are radioed to all shipping.

OLIVER SMITH.

## Fifty years ago the *Titanic* hit an iceberg and went down in the North Atlantic. Two model engineers—one in USA and one in Britain—write of this tragic ship

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**FOR YOUR BOOKSHELF**

**The Development of the English Traction Engine** *by Ronald H. Clark (Goose and Sons Limited,* 23 *Davey Place, Norwich,* 84*s*.).

RONALD H. CLARK is probably the greatest authority on traction engines in Britain. His *Chronicles of a Country Works* and The Steam Engine Builders series are standard works in that field. He has spent a great deal of his time delving into the past for information on the engines—and only if you have tried to find information of this kind can you know what a difficult and exasperating task it can be.

His new book *The Development of the English Traction Engine* is a 390-page volume crammed with technical and historical data. Pictures and drawings of engines rarely heard of before will be found in abundance inside its covers. Engines like the Barran, the Barrow and Stewarts, and the Longstaff and Pullman, to mention but three, are featured.

The book opens with descriptions of under-mounted engines, particularly those built by Walter Hancock, and moves on to the chain engines—such as the engine which Aveling made himself, and the Tasker engine, a picture of which shows a man with a red flag.

Geared engines are described with particular care. Two chapters are devoted to them, the first to the period ending in 1880, and the second from that date onwards. Tractors, rollers, tram engines, three-wheeled engines and road steamers all come in for close scrutiny, but it is on the subject of self-moving engines and cultivation that Ronald Clark is at his best.

Three chapters cover this interesting subject. Digging machines and rotary cultivators are dealt with thoroughly, and such devices as the Darby, Cooper and Burrell-Proctor diggers receive close attention. Direct traction systems and cable systems also have a chapter each. The diagrams of the different systems are very well drawn.

For the modeller, the book is extremely useful. Mr Clark's draughtsmanship is above criticism, and his drawings in the chapter on the main features and general arrangements of the engines are most helpful. The enthusiast will find here a concise compendium covering developments from the earliest engine to the last.

As a work of reference, *The Development of the English Traction Engine* is excellent, but as a production it falls down. The publishers tell us that, in order to keep the price low, they have had to use a lithographic reproduction of typewriting. I think that the book would have been better as two, or even three, conventional volumes. Apart from being unwieldy in size and weight, it is not easy to read; I found that reading more than two or three pages at a time was tiring to the eyes. The engravings, and Mr Clark's drawings, reproduce very well.

It is a great pity that such a fine book should be marred by so many literals; I am afraid that there are far more than the *errata* sheet would have you believe. Of the author I have only one criticism and that is his references to details to be found in his previous books, particularly the Steam Engine Builders series. These books have been out of print for some time, and many young people interested in the subject are unable to obtain them. But, when I consider the magnitude of the work, I have only praise for the author and publisher.

R.O.

# Records are still broken

JOHN WEST looks at the new liners designed to encourage travel by sea

THE succession of disappointing financial results from passenger ship operators, who report either disappointments in their trading returns or increased operating costs, suggests that the public regards sea-travel as outmoded.

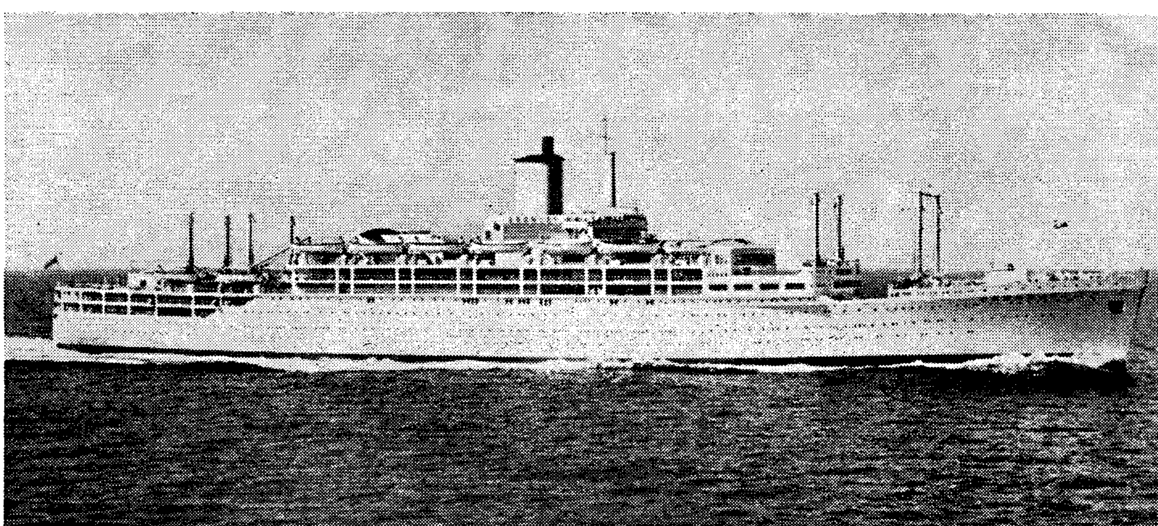
No new orders have been placed for passengers liners, but there has been considerable activity in the early part of this year, proving that ship operators are seeking new solutions to relatively new problems. At present in Britain the outstanding passenger liner awaiting delivery is the *Northern Star*, while the *Queen of Bermuda* is completing her refit and will shortly be ready for service.

Recent announcements show that records are still being broken. The P and O-Orient *Oronsay*, a 22-knot post-war ship of 28,000 tons, has recently completed a five-month voyage on which she covered a distance of 65,000 miles. This is the longest peacetime voyage ever undertaken by a ship owned by the P and O-Orient group of companies. The *Oronsay* left Southampton on August 15 and called at more than 40 ports in 22 different countries, making transit passages through both the Suez and Panama Canals. Like her sister ships, she was recently given a refit and was fully air-conditioned. She is readily identified by her vertical profile and curious funnel detailing. The stove pipe, nicknamed "Welsh Hat," which protrudes from the top of the funnel is a device to help keep the decks clear of soot and smoke by projecting the boiler effluent above the turbulent air zone.

Last year we recorded the sale of the *Stratheden*, a 22,000 ton pre-war passenger liner built by the P and O. Very recently the *Strathnaver* was also sold for breaking up. She was a sister ship of the *Strathaird*, and together they were known as the "White Sisters." They sailed to India, the Far East and Australia, as well as cruising in the Baltic, Mediterranean and Adriatic. It was only in 1948 that the *Strathnaver* underwent post-war alterations, the most drastic of which was the removal of two of her three funnels. *Strathnaver* was famous for her wartime service; she was regarded as a fast ship for her age. Technically she was of interest because, like *Strathaird*, she was equipped with turbo-electric machinery, following the fashion set by the world-famous *Viceroy of India*.

As the last of this small group of turbo-electrically propelled ships makes her way to the shipbreaker's yard, this form of propulsion is not dying with her. The *Canberra*, most recent ship in the P and O fleet, has an up-to-date version of this power plant.

Another ship sold for breaking up is the *Orontes*, which is two years older than *Strathnaver*. She was built

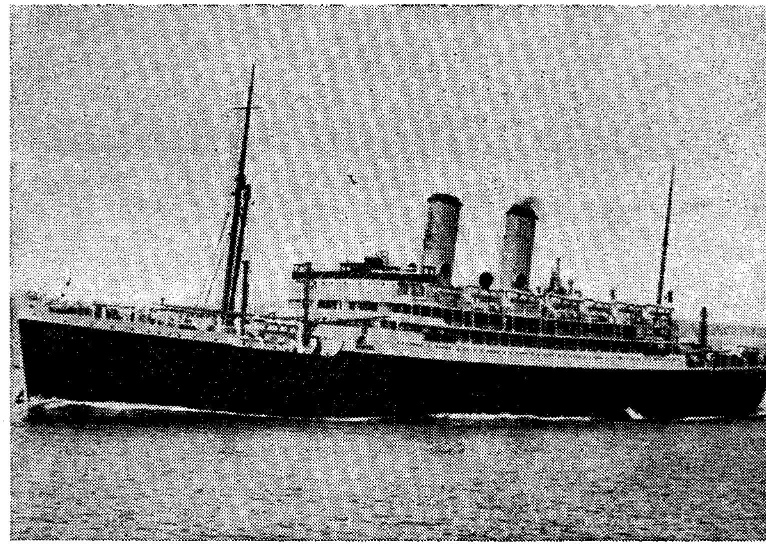


ORONSAY, *the P and O-Orient liner of* 28,000 *tons, wears a "Welsh Hat"* in 1929 for the Orient Line by Vickers-Armstrongs at a cost of £950,000 and has been sold to Spanish breakers for £283,350. A ship of this size built today would cost about seven million.

Both *Strathnaver* and *Orontes* have been used as one-class ships in the migrant trade to Australia. They have been withdrawn from service because the Australian Government decided not to take up large numbers of berths provisionally reserved for British migrants this year. Those who watch the coming and going of ships at Tilbury will miss the two liners. There is a trend towards replacing the older ships by larger faster ships operating from Southampton.

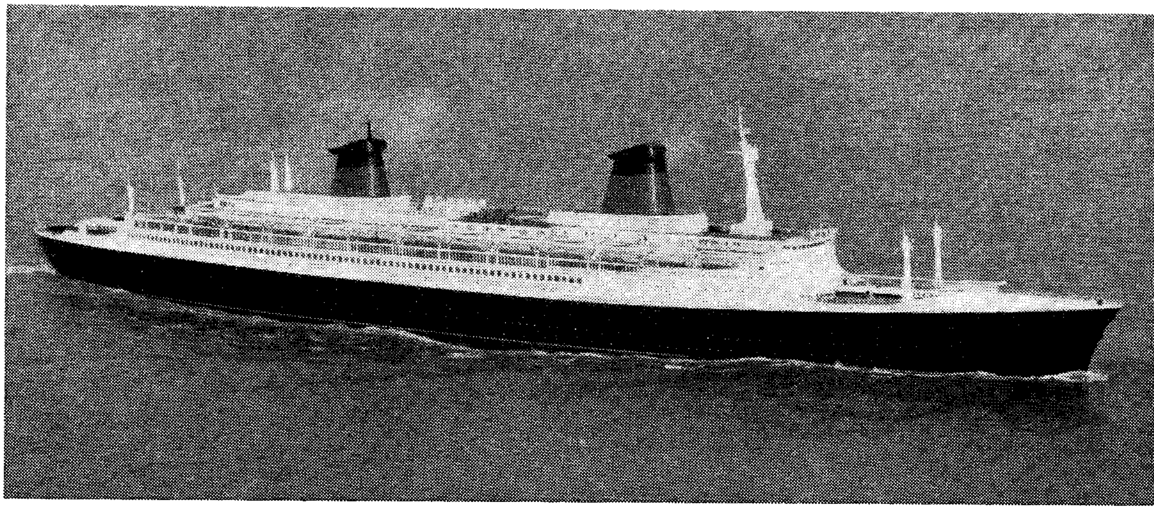
The biggest event of the year in new passenger liners was the debut of the s.s. *France*, the largest passenger liner built since the *Queen Elizabeth* and the longest afloat. Her entry into the North Atlantic service must have brought pangs of disappointment to those who had looked for a Q3. The 66,300-ton liner was built by Chantier de l'Atlantique and was launched on 11 May 1960. She has a length of 1,035 ft, a power of 165,000 s.h.p., and a service speed of 31 knots at 115,000 h.p. On her trials she reached a speed of more than 34 knots. She has been designed to sail regularly from France to the United States every two weeks, and has a total yearly carrying capacity of 92,000 persons. The naval architects who designed her were more anxious about the need to maintain the service speed of 31 knots than to produce a hull form which would give the highest trials speed. To improve her efficiency, they gave much attention to the saving of weight; the superstructure was built of aluminium, and light alloys were used extensively. This technique is not new to British ships, but it was the first time that a French liner had incorporated the new materials. As with *Oriana* and *Canberra* expansion joints were not fitted in the superstructure, the designers relying upon the elasticity of the light alloy.

The machinery installation, which produce the same power as the machinery used in the *Normandie*, weighs 8,000 tons compared with the *Normandie's* 11,000. This is obviously owing to more highly rated equipment; the *France* has only eight boilers whereas *Normandie* had 29. The boiler pressure is 925 p.s.i. and the super-



*Another P and O-Orient liner, the* ORONTES, *has been sold to breakers in Spain*

TRANSVAAL CASTLE, *the* 33,000-*ton hotel ship, is the newest liner to join the mail service to South Africa of the Union-Castle Company*



*Vive la* FRANCE! *This liner, the longest in the world, could be described as French civilisation afloat*

heated steam temperature 900 deg. F. Fuel consumption is claimed to be 49 per cent less than the *Normandie's*. The *France* has an oil fuel capacity of 8,700 tons, and is capable of making the return Atlantic crossing without refuelling. Accommodation is provided for 407 first-class passengers and 1,637 tourist class.

It will be interesting to see how popular this well-designed and luxurious ship remains over the next few years.

The only new British passenger liner to appear this year is the *Transvaal Castle*. She is a little smaller than her sister ship, the *Windsor Castle*, and has been built with the express purpose of joining the other Union Castle ships employed on the main service to South Africa. The service provides a weekly sailing from Southampton, for which a speed of 19 knots is required; the *Transvaal Castle* is capable of speeds up to $22\frac{1}{2}$ knots.

It seems that further changes will be made to the schedules to take full advantage of the two faster ships of the fleet. ▣

## TROUBLE ON THE TRACK...

*Continued from page 487*

This not only ensures that sleeper ends are well covered but it also offers, in the case of a derailment, some support to the outside wheels of an engine which otherwise might slide down a chamfered surface.

As mentioned earlier, the greater part of the track is sound. One particular stretch, of over 100 yd, has called for no alteration except for the annual painting of rails and clearing of blocked drainage holes.

Of the remainder, it may be said that 90 per cent of the maintenance work, apart from the major repair mentioned, has been caused by faulty cement work in the original installation. Prospective track builders may, therefore, note that model locomotive track building calls for a different technique from model locomotive building, and that the advice of a handy bricklayer's labourer may be of more use than that of the "wizard with a mike."

Opinions on track work and maintenance differ greatly and while, generally, opinions may be grouped, it sometimes seems that there are as many opinions as club members. ▣

## REAR TOOL HOLDER...

*Continued from page 493*

I then drilled *A* right through 17/64 in. It was found to reverse in the chuck, and I took care to use the same jaws for releasing as for re-gripping. The drill holes met up perfectly.

The $\frac{3}{8}$ in. seating was formed as in the drawing.

The photograph shows the set-up for machining the tool recesses. I used two pieces of $\frac{1}{8}$ in. b.m.s. as packing pieces and attached the whole to the cross slide by piece *C*. A $\frac{1}{2}$ in. end mill cut the recesses with the lathe running at mid-speed in top gear. I used a good supply of cutting oil. The depth was set by the leadscrew handwheel.

Clamping of the tools is provided by four 2 BA × $\frac{1}{2}$ in. Allen setscrews, set $\frac{1}{8}$ in. in from each edge. At this length, they do not protrude above the top of the post. With $\frac{1}{8}$ in. × $\frac{1}{4}$ in. b.m.s. packing pieces above and below a $\frac{1}{4}$ in. h.s.s. tool bit, a very firm fit is provided.

Piece *F* is best machined to length in the four-jaw chuck. After this, the centres of the marked holes are set to run true, beginning with the $\frac{5}{16}$ in. hole. At the same setting which is used for the other hole—it is 9/32 in.—the female seating is machined a nice fit for *A* and a full $\frac{1}{8}$ in. deep. The seating is lightly countersunk until *A* sits down properly. Piece *D* is a standard bolt reduced at the head to fit the T-slots.

My picture shows the post in position. It has been well worth the making, and it was pleasant to find that my scrapbox had achieved such dimensions that the only things which I needed to buy were the four Allen setscrews, from Whiston's.

In fact, the idea of this tool was half-suggested by an idle look through the scrapbox. ▣

# READERS' QUERIES

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

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

## Netta

What was the colour scheme of the O gauge *Netta* ?—B.C., Putney, London.

▲ *The livery is:*

*Boiler and firebox, cab front and sides, sides of splashers, tender sides and back, wheels, sides of cylinders—green as LNER.*

*Smokebox, tops of platforms, cylinders, axle ends, cab roof, tender frames and inside of tender, steps, buffer heads and drawgear—black.*

*The lining is black and white and the gold lettering is shaded red.*

*Castings for* NETTA *may be obtained from Kennion Brothers of* 2 *Railway Place, Hertford.*

## Spirit lamp

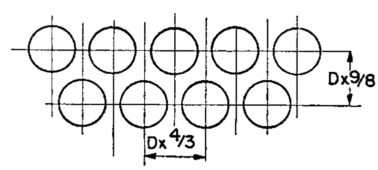
Will you kindly tell me if heating a stationary horizontal boiler of 3 in. dia. × 7½ in. with a spirit lamp would keep steam pressure up at 40 lb. ? I have a gas jet and I want to convert it to methylated spirit—not pressure-fed but with three ordinary flames.—J.M., Oldham, Lancashire.

▲ *To feed a wick spirit lamp by gravity as suggested is not a very sound idea because it is very difficult to ensure that the rate of fuel supply is exactly correct for the consumption of the lamp. If it is supplied too fast, the fuel will overflow at the wicks, and the flame will, therefore, get out of control.*

*When it is desired to keep up a constant level of fuel in the wick tubes, it is usual to employ the bird-feed system similar to the one used in many domestic oil heaters. In this system, the main fuel tank, which has no air vent, feeds a small subsidiary tank, so arranged that the fuel supply in the main tank becomes air-locked when that in the subsidiary tank reaches a safe level. No control valve is necessary, but some form of valve or tap is desirable between the two tanks to prevent overflow when the cap of the tank is removed for filling. At all other times it can be kept open.*

## Tube spacing

I am constructing a copper boiler in 1½ in. scale. The length of the barrel is 22 in., and diameter is 10 in. Length of firebox is 14 in. Would you please give me sizes, spacing and




gauge of both superheat and firetubes, which are approximately 24 in. long ?

Incidentally, I built the chassis on an ML7.—J.H.W., Helston.

▲ *We would suggest that your tubes be* 11/16 *in. o.d.* × 18 *s.w.g. seamless copper. If you have difficulty in obtaining these, use* ¾ *in. o.d.* × 18 *s.w.g.*

*For superheater flues,* 1¼ *in. o.d.* × 18 *s.w.g. would be suitable. A good formula for tube spacing is shown in the diagram.*

## Generator conversion

I enclose a description of a generator which I have.

I would like to know if I can convert it to a mains 230 v. motor. What would be its capacity ?—W.H.E., Castleford.

▲ *It is always doubtful whether a d.c. generator will work satisfactorily if converted for use as a motor.*

*If you propose to run the motor on a.c. supply, both the armature and field would have to be laminated, and the design of the field would have to be suited for a.c. In any case, complete rewinding of the generator would be necessary, and we have no details of the winding specification for such a machine.*

## Vertical boiler

I am building a coal-fired, vertical test boiler, very similar to the one in the issue of 10 March 1960 by J. Merrett, from an original design by E. T. Westbury.

The outer shell is 8½ in. × 4⅛ in. o.d. and is of 15 s.w.g. copper. The firebox is 6 in. × 3 in. o.d. × 16 s.w.g. and has twelve 5/16 in. × 20 g tubes. The top plate is of 14 s.w.g. and is reverse flanged, as in Mr Merrett's design, but the foundation ring (also of 14 s.w.g. copper) is not reverse flanged but is of V-section. The whole is silver soldered with Easyflo. Everything is seamless throughout. There are no stays.

Could you please tell me what the maximum safe working pressure would be ? Also could you please suggest a design of safety valve and state what the bore of it should be ?—A.C., Ferndown.

▲ *A boiler constructed to the specification given should be capable of working at a pressure of* 100 *p.s.i., assuming that it is well constructed and all joints are sound.*

*In any case a boiler should be given a hydraulic test, before being put under steam, at a pressure not less than* 50 *per cent higher than (but preferably double) its intended working pressure. If no signs of leakage or distortion are found as a result of the test, the boiler may be regarded as perfectly sound, but periodical inspection and test is strongly recommended to ensure that its strength is maintained.*

## Duplex hacksaw

Could you please supply the following information on the ME Hacksaw Machine by Duplex ? Are plans available ? What price are they ?

**BY THE EDITOR**

**SO many queries are received by Model Engineer that they impose a serious strain on the magazine's staff and advisers. Hundreds of questions on a great many subjects are answered through the post each week.**

**Many who write do not comply with the simple conditions which are set out in the heading to the Readers' Queries pages. Though we dislike sticking to the letter of the law, the time has come when we must insist on these conditions being observed. Unless a stamped addressed envelope and a query coupon are enclosed queries will not be answered.**

**Many questions are being sent by non-readers and there is danger that the service will be swamped. The conditions are framed to give preference to regular readers and to ensure that the Readers' Queries Service benefits those for whom it is designed.**

Who can supply castings? Are back numbers of ME still to be had describing the machine and dates of same?—R.V., Newcastle upon Tyne.

▲ *Plans may be had from our Sales Department, Ref. No WE 5, price 10s. 6d. Castings were formerly marketed by Messrs W. H. Haselgrove of Petts Wood, Kent, but this firm is now out of business, and we regret that we do not know of any alternative source of supply.*

*The issues of ME in which this machine was described in* 1950 *are August* 24; *September* 7, 21; *October* 5, 19; *November* 2, 16, 30. *Half of these are now out of print.*

## Canberra decks

The *Canberra* plan does not give details of the thickness of each deck. I would be very grateful if you could tell me this measurement.—J.F.C., Prestbury.

▲ *The thickness of the decks of* CANBERRA *is given in the third instalment of the series* [22 *September* 1960]. *Four-sheet Bristol board is recommended for the larger model and three-sheet for the smaller one. Alternatively, they may be made of very thin three-ply or thin plastic sheet.*

*At* 1/32 *in. or* 1/64 *in. scale it is practically impossible to make the decks thin enough for scale thickness: the deciding factor is to make them so that they will not buckle. The section at the stern on page* 421 [6 *October* 1960] *gives a good idea of what is required.*

## Miniature plugs

I would like the name and address of suppliers of miniature sparking plugs. Does the Seagull use ¼ in. × 32 t long reach or short reach plugs? —P.T.B., Switzerland.

▲ *The Seagull uses* ¼ *in.* × 32 *t.p.i. sparking plugs of standard reach. We do not know of any long-reach plugs of this size. Most dealers in model supplies keep these plugs in stock, and we suggest that you obtain them from Woking Precision Models,* 32 *Mount Hermon Road, Woking, Surrey, or RipMax Limited,* 39 *Parkway, London NW*1.

## Too thin for safety

Could you kindly tell me if a solid drawn copper tube 24 gauge, 1¼ in. dia., would stand a working pressure of 50 p.s.i. I have some tube and wonder if it could be used for an O gauge boiler.—S.J.C., Gloucester.

▲ *The gauge of tube which you specify is definitely on the thin side for a boiler to stand a working pressure of* 50 *p.s.i.* MODEL ENGINEER *recommends ample margins of safety in all boilers, because even a small boiler could cause a very dangerous explosion if it failed under pressure.*

*For this particular size the gauge should not be thinner than* 20, *to give a reasonable margin of safety.*

## English and American

I would like to know the American equivalents of English thread sizes. What size in inches is meant when Whitworth hexagon steel bar is called for?—V.V.H., Indian Rocks Beach, Florida.

▲ *Most of the information on English and American thread sizes and other standards is to be found in the ME Handbook. It does not give information on standard hexagon sizes; these are at present subject to some revision. The most authoritative information on the subject can be obtained from the British Standards Institution,* 2 *Park Street, London W*1.

## Welding

I have to weld a number of items of tubular structure ⅝ in. and 1 in. dia. × 18 to 10 gauge, as well as others of sheet metal between 26 and 16 g., and it is my wish to use an electric welder for the work. Any information which you could give on a suitable type to run on domestic supply (250 v. 50 c. single phase) would be very welcome. What effect does the arc have on television and radio reception?—A.S., Dagenham.

▲ *It would appear that the work you have in hand could be dealt with by one of the small electric welding sets which are now advertised by several firms including Messrs A. W. Gamage of Holborn. These sets are said to be capable of light welding operations, though we have no personal experience with them. Because they work on low voltages, they do not produce an arc, in the true sense of the term, but are really high intensity local resistance heaters.*

*Any electrical apparatus in which an inductive circuit is made and broken must necessarily have some effect on television and radio reception, and suppression would be very difficult. For further information on this matter, we can only refer you to the manufacturers of the apparatus.*

## Musical clock in Ireland

I hope to start work on C. B. Reeves' Musical Clock and would be grateful for some information. In MODEL ENGINEER of 12 February 1959 there is a note stating that the series on the musical clock would be photo-copied. Are these copies still obtainable?—G.C., Dundalk, Ireland.

▲ *Photostat copies of the articles dealing on the construction of this clock can be obtained from ME Plans Service at* £1 *a set.*

## Heinrici engine

Recently I obtained a vertical 3 in. bore Heinrici hot-air engine, with two 12 in. flywheels. I should think that it weighs about 80 lb., but after heating the displacer by a cluster of three Primus roarer burners, I can get no movement out of it.

I have taken it to pieces, and the only doubtful thing is that the vertically moving displacer appears to be badly dented.—J.E.D., Reedham, Norfolk.

▲ *It is difficult to advise you definitely why your Heinrici engine fails to work. The Heinrici was constructed in various forms and in fairly large quantities for many years on the Continent, and is generally regarded as one of the most reliable of hot air engines.*

*Denting of the displacer should not affect its working very seriously, provided that it does not cause friction in the displacer cylinder. It is important in all hot air engines that the working parts should move with a complete absence of unnecessary rubbing parts or high spots. The fit of the piston in the cylinder, and of the piston rod of the displacer in its gland or guide, must be perfect, to prevent leakage of air without causing any more friction than can be avoided.*

*The displacer should work about* 90 *deg. out of phase with the power piston. In the engine which you describe, this relation seems to be more or less fixed by the arrangement of the linkage, but there is the possibility that it could be deranged if any alterations were made to the engine.*

# Can You Help?

**Readers who can offer information to those whose queries appear below are invited to write c/o Model Engineer. Letters will be forwarded.**

### Gilt letters for tender

Can you suggest where I could obtain gilt transfer letters, about 2 in. high, suitable for railway initials on a 7¼ in. gauge tender?

Most model firms seem to stock only very small sizes for O or OO gauge.

I would be grateful if you could help, as no one to whom I have talked seems to have any ideas at all.—R.M.T., Putney, London.

# POSTBAG

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

## PRESERVATION

SIR,—Mr K. E. Wilson's letter on the GWR Preservation Society in Postbag of March 1 seems to call for support because the "duplication of effort" in the preservation of railway relics to which he refers is a phenomenon which is occurring today in many fields beyond the comparatively narrow world of railways.

Few will disagree that the ideal way of preservation is by purely individual effort; but this demands resources in the way of finance and space that are out of reach of most people, certainly so far as steam engines, locomotives or stretches of railway are concerned.

The next best thing is for relatively small groups of responsible people to club together and pool their resources in order to secure for posterity the objects of their affections. If by this means they are also able (I am thinking of locomotives in particular) to secure a length of track, and perhaps other items of rolling stock as well, so much the better. It seems to me that the existence of several such societies, each with a specific object in view, does not represent an adverse duplication of effort any more than does the preservation of, say, traction engines or grandfather clocks by private individuals. Good luck to them, I say; the more we can hand down of the past and present to future generations, the better.

There are, it seems, pessimists who believe that the willingness of many people to subscribe is a purely temporary phenomenon, and that the small societies concerned are bound to find themselves financially in deep water later. Certainly this is possible, but it should not hold people back from attempting to rescue locomotives from the scrap man while they still exist. In a few years it will be too late; indeed, for many famous locomotive types it is too late already. What to do eventually with the objects secured for preservation is a bridge that need not be crossed until the time comes. If it becomes necessary for some of the societies to amalgamate—a sort of 1923 Grouping on a minor scale—well, is this so dreadful?

If one is to draw the line at all in railway preservation (and one must obviously do so) it should be to forget about schemes for re-opening stretches of line that have long since lost virtually all their rolling stock and equipment. For those who can spare the cash and effort to consider seriously such wild schemes, there are a thousand and one other things that merit preservation at only the fraction of the cost—and it is to those that I humbly believe financial allegiance should be made. What about a GWR 4300 class Mogul, for instance—the forerunner in this country of all standard mixed traffic locomotives.

Harefield, Middlesex. K. M. BROWN.

## MODERN OLD WAYS

SIR,—Like Mr Pritchard [Postbag, March 2], I am lost in admiration for the old-timers who used primitive equipment. But we new-timers are still having plenty of fun with shellac chucks and T-rests.

Only this week I used a shellac chuck to turn the wheel rim of a model spinning wheel which I am making in brass. The rim is $4\frac{1}{2}$ in. dia., channel shaped, $\frac{9}{16}$ in. wide and nowhere greater than $\frac{1}{16}$ in. in cross section.

Even with a super all-geared, all-gadget lathe, how could you turn and re-chuck and be sure of concentricity with such a flimsy job? That is, without any more fuss than a piece of wood and a bit of shellac.

My picture shows some of the parts of a model spinning wheel—all done with a selection of hand tools and a T-rest. (How much quicker than making a set of forming tools for the sliderest for a one-off job!)

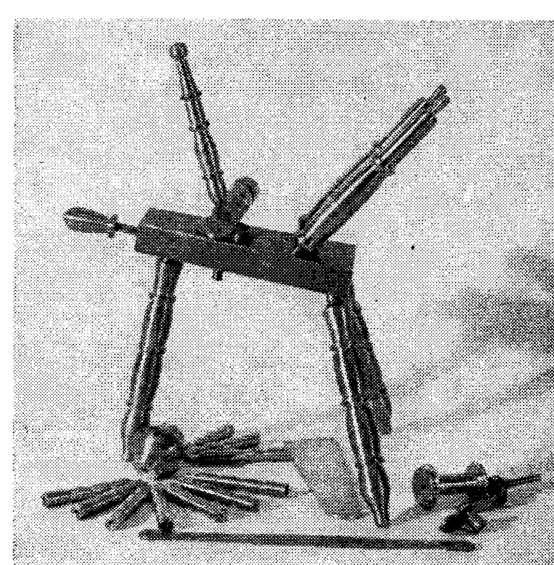
Solder chucks are useful, too—I must have used a dozen when I made my hot-air engine.

There is much for which to thank the modern machine tool, but the old craftsmen can still teach us a lot which is worthwhile.

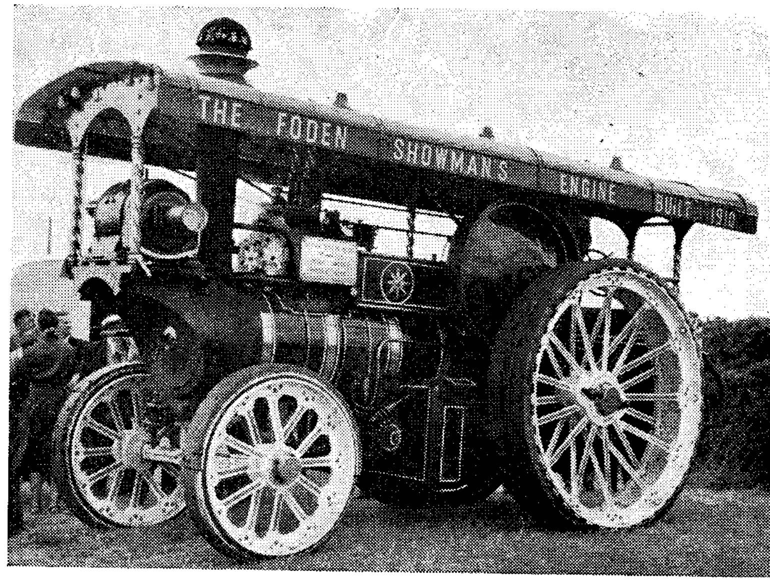
London. ANN C. CARTER.

## STEAM CULTIVATING

SIR,—I was delighted to read Robin Orchard's article on Fowler steam cultivating equipment. It might interest him that I have two $1\frac{1}{2}$ in. working scale models of the Fowler BB engines under construction.



*Old-fashioned models require old-timers' methods, is the view of Ann Carter who is building a model of a spinning wheel*




*Mr R. Cole, of St Columb, believes* PROSPECTOR *to be the sole surviving example of the Foden showman's engine*

About eighteen months ago I was lucky enough to purchase two partly completed engines. I have been working away at them steadily ever since. The job is a long one as I duplicate every part to be made, but I hope that at some time in the not too distant future I shall have a fully working steam ploughing/cultivating set, with ancillary equipment.

My interest in ploughing engines goes back many years to my boyhood days, when during hot, dry summers the equipment was used for breaking up autumn stubbles on my father's farm in West Suffolk, and also for spring made draining and so forth.

In those days I was privileged to be allowed to cart the coal twice daily to the engines, while one of the horse tankers was kept fully occupied carting water throughout the working day, which began at six and often finished at eight or nine at night.

I always found the drivers very keen and enthusiastic for their charges, and I spent many happy hours on the footplate enjoying the captivating aroma of hot oil and steam and the fascination of the moving parts. There seemed to be a tremendous feeling of power when the engine was pulling a heavy load.

It is my opinion that those BB and class 2 compounds were the finest example of engineering skill that ever left the works of John Fowler, and are infinitely more fascinating to the model engineer than the usual run of fairground showman's engines and road traction engines.

I hope we can look forward to more articles on this fascinating branch of steam power and to more photographs of engines in steam.

RAF, York. JOHN SLATER.

[*Squadron Leader Slater holds the DFC and AFC.*—EDITOR.]

## DRUMMOND BELT

SIR,—Mr H. A. Pritchard writes that he has had trouble with a round leather belt on a Drummond B lathe.

I have had one of these (No B401) since 1939, with the same belt—but it is not round leather. The sketch shows the correct belt to use—it is of twisted hide.

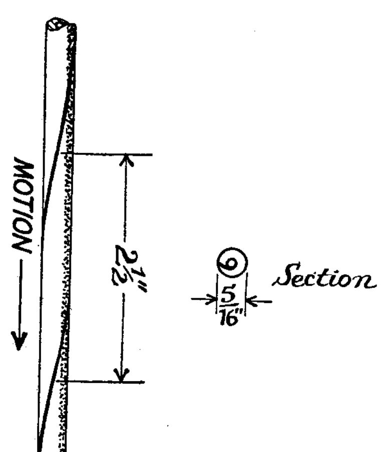
And there will be found in the lists of firms who supply the Clerkenwell district "twisted gut belts for foot lathes." These may be suitable. Also, it might be possible to make a driving belt from one of the very tough plastic materials now on the market.

The genuine twisted-hide belt cannot be beaten, and the sketch shows why. The twist gets hold of the pulleys, and the belt is far more flexible than the solid one. Observe the hollow centre in the section. This belt has never failed to get as much out of the lathe as my strength can put into it, without the back-gear being in.

In the Drummond B the pulley and the first pinion for the back gear are in one piece, so when Mr Pritchard's pulley has worn a bit more, by reason of the fan belt slipping, he will have to turn off all the grooves and get a new cone cast and turned. That will have to be put over the core of the old pulley with the pinion on it.

I suggest he enquires of Buck and Hickman Limited, 2 Whitechapel Road, London E1; if they cannot supply a twisted-hide belt no doubt they will direct him to some firm who have the right material.

Mill Hill, London NW7. H. H. NICHOLLS.




*Mr H. H. Nicholls comes to the aid of Mr H. A. Pritchard with this sketch of the twisted-hide belt used on the old Drummond B lathe*

## SOLE SURVIVOR

SIR,—My photograph is of Foden showman's engine *Prospector*. It is believed to be the sole remaining example of a Foden showman's road locomotive.

It was built in 1910 for Walter Shaw and Sons, Showmen of Manchester, and it was bought in 1959 and fully restored by its present owner Dr W. R. Dyke, of Callington.

Thanks for MODEL ENGINEER, but more traction engine articles and photographs please.

St Columb, Cornwall. R. COLE.

## ODD BALL

SIR,—From time to time MODEL ENGINEER has published mathematical problems under the pseudonym of "Polygon."

It is only very recently that I was given the following problem, which I thought might be of interest. I will apologise in advance if it is one already well known.

You are given twelve golf balls,

and told that one of them is substandard in weight—the odd ball is either too light or too heavy, but you are not told which. You are given a pair of scales. In three weighings on the scales you must find out which is the odd ball, and whether it is too heavy or too light. A "weighing" means every time the scales are read.

The problem is entirely straightforward, and without any "catch."

Guildford, Surrey. R. M. HUGO.

*[This is an old problem, but Mr Hugo need not apologise; there must be many to whom it is new.*—EDITOR.]

The most effective reagent for dissolving silver is nitric acid—the usual commercial "strong nitric acid" (about 70 per cent $HNO_3$) diluted with an equal volume of water. But don't get it on the skin, and don't breathe the fumes, particularly the red nitrogen dioxide which may come off when the acid attacks metals. It is not desirable to swab it about with cellulosic material (cotton wool) as the nitrocellulose likely to be formed is dangerously inflammable and may even "go up" spontaneously.

As an alternative to actual nitric acid, a mixture of potassium nitrate and accumulator acid (sulphuric acid, about 40 per cent), which will contain nitric acid, might well be quite effective.

Queen's Park, Chester. F. G. WILLSON.

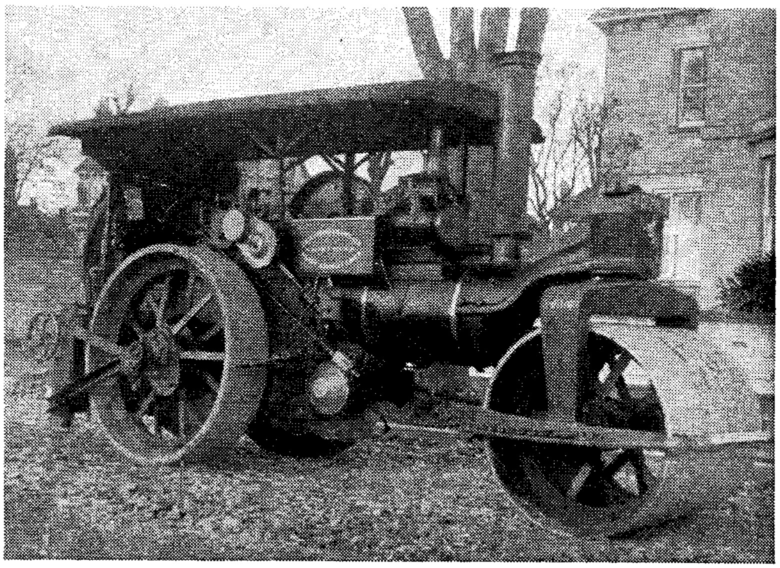
*[" Nitrate " was a misprint for " hydrate " potassium nitrate is nitre, or saltpetre.*—EDITOR.]

Old files were hand-cut, and the small but inevitable irregularities prevented the onset of chatter.

I have a 4 in. dead-smooth file that belonged to my father and it is at least 60 years old. I would not part with it for anything it has the miraculous property of imparting a high polish to the work without removing any measurable amount of material. It is marked with the imprint of a fish and the name "G. Antoine Glardon."

And now to change the subject I am spending some of my holidays in the Isle of Wight, and would like to know if anyone there has a 3½ and 5 in. track. If so, I will take a locomotive with me.

Orpington, Kent. HAYDN D. SMITH.



*Steam, in the form of an Aveling and Porter roller, is still a power in the Midlands. Mr S. J. Coles took the picture*

## STEAM POWER

SIR,—I took this photograph of an Aveling and Porter steamroller at work in the Leamington Spa area in January. It was a joy to see steam still being used.

The roller was in first-class condition. It is No 14129, weighs 12 tons (front axle 9 tons and rear axle 4 tons 15 cwt) is 6 ft 7 in. wide and has a roller diameter of 4 ft 3 in.

Warwick. S. J. COLES.

## NOT NITRE

SIR,—Some of your readers must have smiled when they read in Queries that potassium nitrate was a "strong caustic alkali." It is, of course, a typical neutral salt.

Silver is entirely resistant to aqueous sodium hydroxide, as well as to potassium nitrate.

## MODERN FILES

SIR,—I agree with J. R. C. Moore when he says that files "ain't what they used to be." It is not their durability I question, but the degree of finish which one gets from them.

Modern files are machine-cut, which means that their teeth are equally spaced to a high degree of accuracy. This is not a virtue but a fault; they all tend to dither or chatter. To use a radio analogy, the constant frequency creates a resonance.

## TINY ENGINES

SIR,—O Gauge again! I was delighted to see the article by Mr Reynolds and the letter from Mr C. L. Bennett (March 22).

Anyone who may be getting ambitious ideas from Mr Bennett's letter should realise that the locomotive to which he refers is quite the most marvellous in that gauge which I have ever seen or heard of. For its size, its performance is quite amazing, and hardly likely to be equalled, let alone exceeded.

My reference to the blower was merely to point out that it does in fact consume steam, of which in very small locomotives there is usually none to waste, and to find out from Mr Edwards' experience if the exhaust alone can be made to draw the fire satisfactorily when the engine was running, or if the blower was essential. It should be very easy to supply draught from an outside source when the engine is standing still.

As regards coal-firing, Mr Bennett's object and mine may be different. I would like an engine which would haul six or eight coaches round my 200 ft circuit. Mr Bennett said in his first article in 1926 that he could do 90 ft on one firing. Excellent as that figure is, it would entail two stops to fire up on my track. That is why I am interested in methylated firing. Of course, Mr Bennett may have bettered this figure by now.

I was glad that Mr Reynolds suggested suitable boiler sizes, because when you fit a 1¾ in. or 2 in. dia. boiler you have really given up all pretence of a genuine scale model (British) in O gauge.

I hope that other readers who have got good results with scale engines will write to ME giving the methods which they have found successful.

Llanddulas, Abergele. D. J. R. RICHARDS.