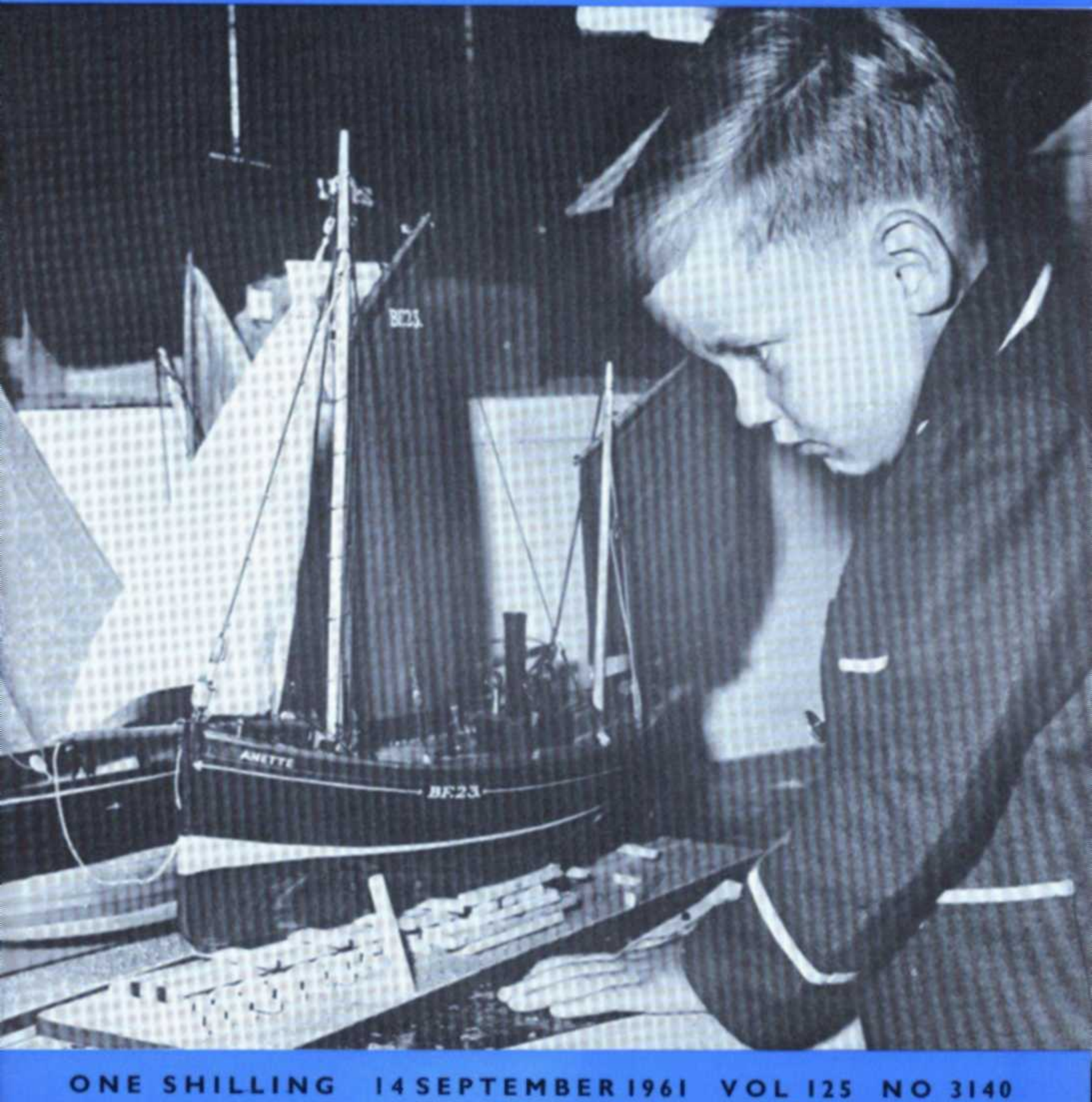
# Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED




ONE SHILLING 14 SEPTEMBER 1961 VOL 125 NO 3140

14 Sept. 1961 Vol. 125 No 3140

**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 65s. (USA and Canada $9.25), post free.*

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## Cover picture

*Getting a few ideas for the future? A youthful visitor to the Exhibition admires one of three model fishing boats entered by Mr J. M. Russell of Potters Bar, Herts. This one, in 1/36 scale, is* ANNETTE

## Next week

*This year, for the benefit of those who could not attend the Exhibition, we are publishing as many illustrations of the models as possible. The first selection covering eight pages appears next week*



# Smoke Rings

**A weekly commentary by VULCAN**

WHEN the *Canberra* competition closed we had received 15 firm entries. It was a little disappointing to see that only three of these—and two were not completely finished—arrived at Central Hall.

Replies to telegrams enquiring for their whereabouts disclosed that the constructors could not get the models finished in time and had withdrawn from the competition.

In the circumstances the two judges, Mr John West, the designer of *Canberra*, and Mr Oliver Smith, of MODEL ENGINEER, decided that it would be in the interest of all for the competition to be held over until the next Exhibition.

The two builders of the unfinished models attended the Exhibition and they were subsequently told of this decision. They both agreed that, since more work was needed on their own entries, this was the fairest thing to do.

But disappointing as the competition was, it brought a reward of a different kind.

Mr West was much impressed with what he saw at the show; it far exceeded his expectations. In fact, he spent much more time on the opening day examining the models than he had originally intended.

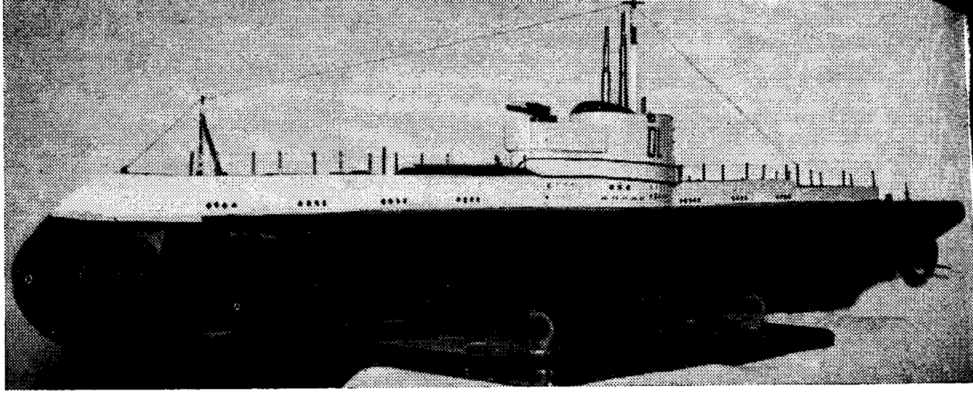
The following week he devoted a little more time to the interests of MODEL ENGINEER. At his Pall Mall club, where the Editor and Mr Oliver Smith lunched with him, he agreed to write a monthly shipping news feature for the magazine.

This is an extremely generous offer. For a man who has to attend anything up to eight conferences a week and who at any time might have to fly to the other side of the world—Mr West, in fact, flew to Aden before the Exhibition closed—time is very precious, and we at Noel Street are very grateful to Mr West for the interest he is taking.

It is hoped that his first article will appear in October.

## Panama relics

FERDINAND DE LESSEPS, the French engineer whose vision



*Mr L. P. Christopher, of Bombay, constructor of this model submarine, could scarcely believe his eyes when, visiting the Model EngineerExhibition, he came face to face with Mr David Ashton's almost identical working model of* OLYMPUS

inspired the Panama Canal, was a man well in advance of his time.

When work began on the tremendous task of cutting a waterway to link the Atlantic and Pacific de Lesseps imported large numbers of steam shovels and excavators from France and Belgium.

But tropical diseases and financial problems defeated the Frenchman, and the US Government bought the rights and took over the construction of the canal.

De Lesseps began work in the 1880s but it was not until 1904 that the United States resumed operations. They used much of the French equipment, but rejected the Belgium steam shovels and excavators, which slowly vanished beneath the spreading jungle.

There they remained for about 70 years until a group of engineers came across them. They were still in a good state of preservation, though not in working order, and they were sold for scrap.

I am indebted to reader Ivor L. Moore, of Philadelphia, for the cutting from the *New York Sunday Times* from which this information has been taken.

Mr Moore raises a point which will spring to the minds of those who read this. Are there any photographs of these old machines? Perhaps one of our distant readers in the Canal Zone may have some information.

## Almost identical

A WORKING model submarine, a scale version of the British submarine *Olympus*, can emulate almost everything that the big vessel can do.

Under radio control it can start, stop, reverse, turn to starboard or port, signal submerge, surface, and fire gun, torpedo and rocket.

Visitors to the Model Engineer Exhibition will assume that I am writing of the remarkable *Olympus* model which is under construction by Mr David Ashton and was one of the central attractions at the show.

But I am, in fact, referring to a 5 ft 8 in. version of the same submarine which has been built by Mr L. P. Christopher, of Bhandup, Bombay, and which won for him the first prize in its section at the Model Builders and Handicrafts Exhibition in Bombay.

At present Mr Christopher is visiting Britain. He made use of the occasion to call at Central Hall. You may imagine his surprise when, almost opposite the entrance, he came face to face with a slightly larger version of his own model.

After his visit he wrote to David Ashton: "When I saw your model submarine in the Exhibition, I thought I was having a nightmare. When I go back to India and tell my friends that I saw another model of *Olympus* they will never believe me."

Well, we can assure any doubting Thomases in India, that another, larger, model does exist and that, when completed, it will perform under radio control the same manoeuvres and functions as Mr Christopher's model.

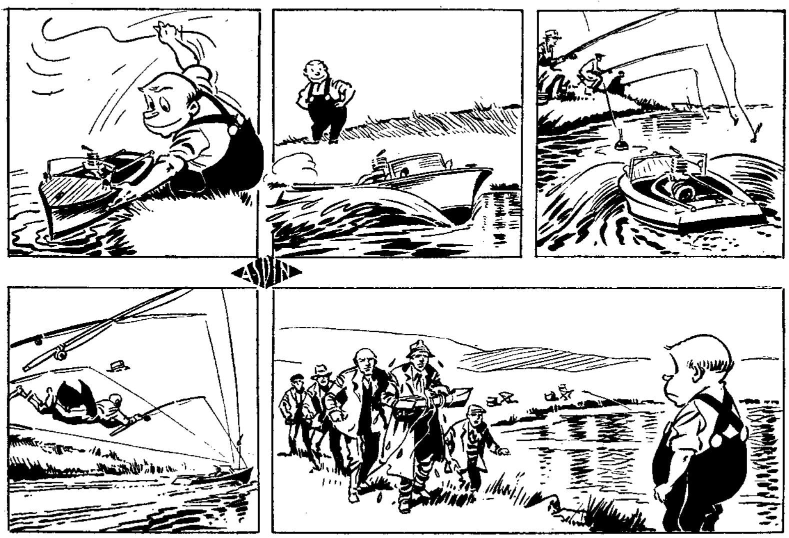
## Mayflower model

THE publishers of the excellent new *Mayflower* paperbacks—all works of quality, whether the author is Robert Graves or P. G. Wodehouse—are searching for a model.

Obviously, a big display of Mayflower Books at Foyles in London should have a model of *Mayflower* in the centre. Who will lend one to these highly reputable publishers?

Miss Pamela Bennett of Mayflower Books, at 41 Neal St, London, WC2, tells me that payment will be made for the loan of the model, that great care will be taken of it, and that it will be insured if the owner wishes. As the display opens at Foyles on September 19, any reader who can help should communicate with Miss Bennett at once. It is advisable to telephone her (at Covent Garden 1416).

**CHUCK . . . . . . THE MUDDLE ENGINEER**



EDGAR T. WESTBURY, Chief Judge at the Model Engineer Exhibition, comments upon the stationary engines and says that the inside of a model should be accessible

# BEST FOR YEARS

READERS of the ME who believe that "there's nothing like steam" should have been well satisfied with the display of stationary and marine steam engine models at the Model Engineer Exhibition. Both in quantity and quality, the collection was the best that had been seen for many years.

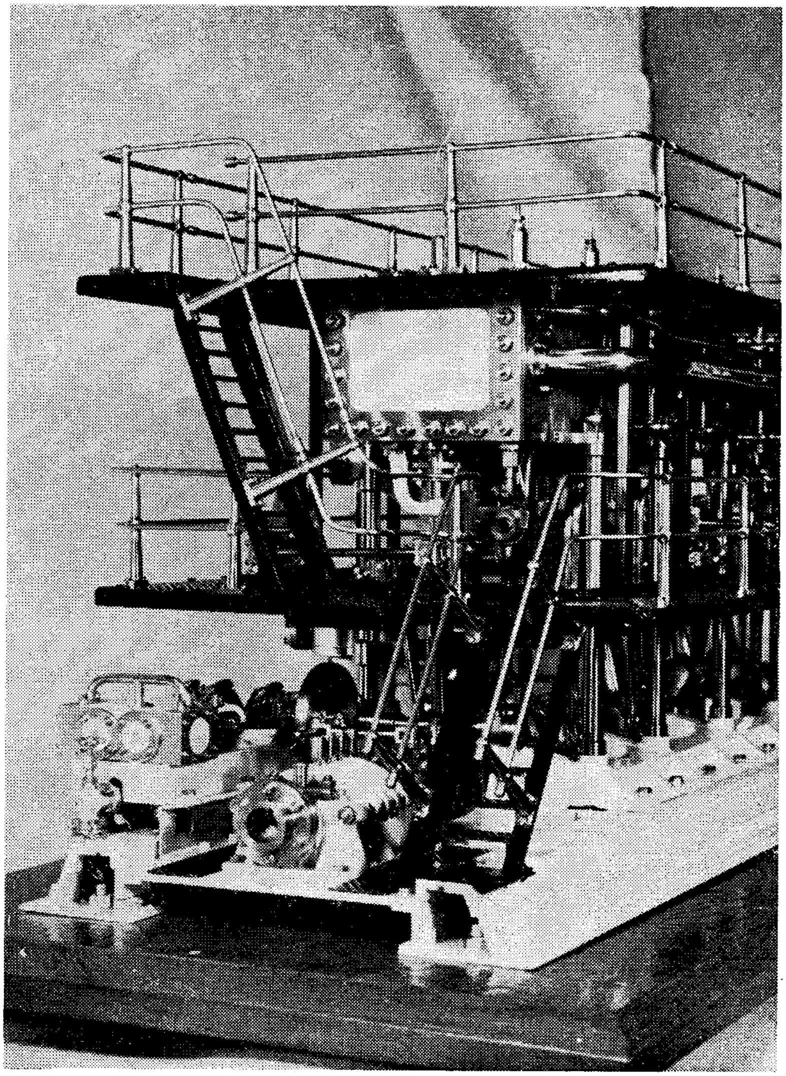
One exhibitor, H. J. Trevitt, presented no fewer than eight models, demonstrating the history of the steam engine from its earliest days until the late 19th century. They included a Newcomen atmospheric pumping engine Boulton and Watt non-rotative and rotative beam engines, later centre-column and A-frame beam engines and two grasshoppers. All were of a high standard of fidelity and finish, and though the quantity of work in each was not outstanding the collection as a whole merited high praise.

An interesting model of one of the very earliest direct-acting steam engines erected at Wheal Prosper in 1811 ("wheal" in Cornish sign is a mine) was exhibited by R. Cocks. It was a distinct breakaway from the almost universal practice of the period, in which a central pivoted beam was employed. All the main working parts were in vertical alignment, and to counteract their weight a box loaded with stones was fitted. As in many early engines, masonry was an integral part of the structure.

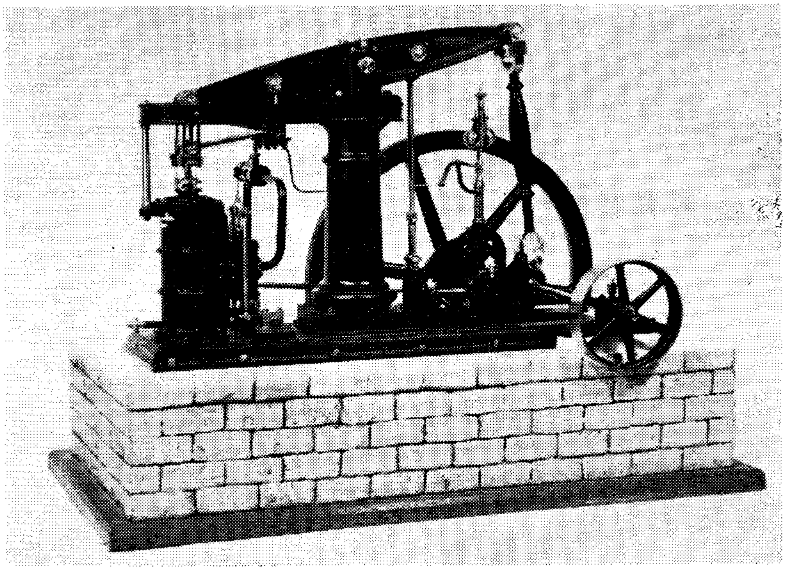
## Mammoth model

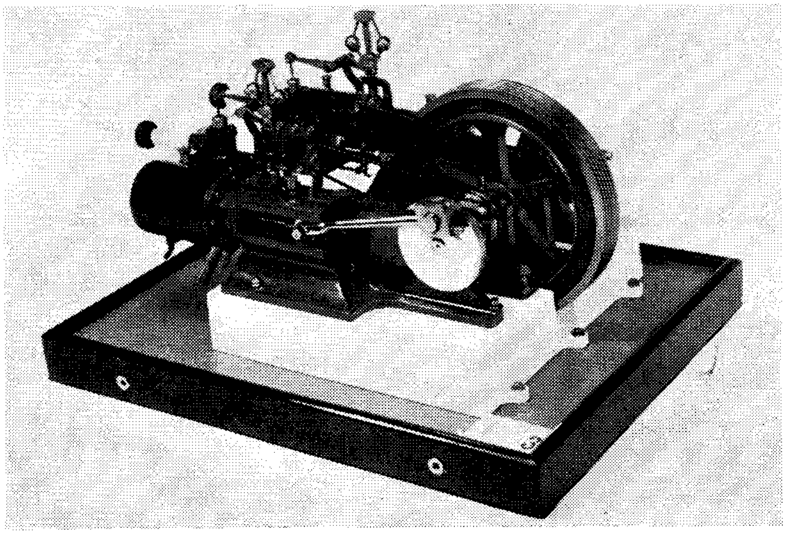
The single-acting, surface-condensing Cornish engine by T. C. Stephens was a monumental exhibit in more ways than one. In the mere matter of size, it could not fail to impress; but whereas many large models tend to show up any defects in detail or finish, there was little to criticise in this respect. The structure of the engine was supported by timber, including massive arched columns, which were fashioned and finished equally as well as the metal parts, some of which were quite delicate.

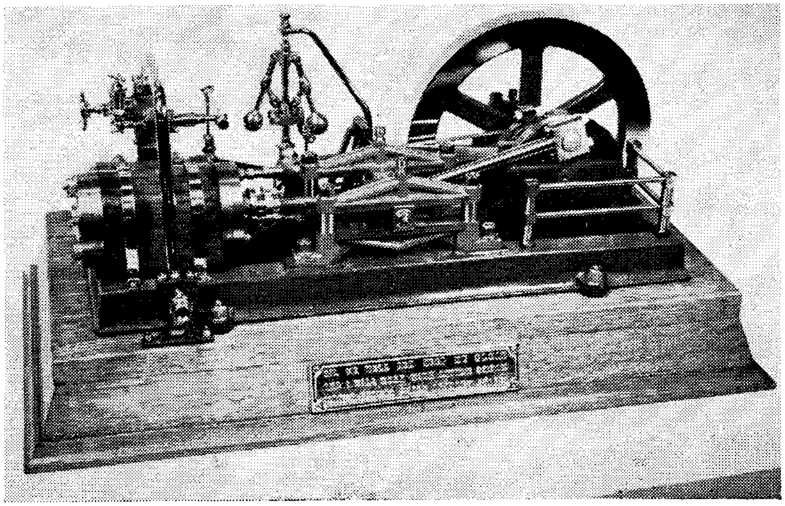
Two good examples of the ME beam engine, as recently revived in 1 in. scale, were exhibited by F. Skelton and J. W. Ravenscroft. There was not



*C. Cole of Ampthill in Bedfordshire built this quadruple expansion marine engine in ½ in. scale*







a great deal to choose between them, but the second was slightly better in finish, including very neat paintwork and a bright-finished column. They well illustrated the way in which models made to a single set of working drawings can be widely varied in appearance to suit the taste of the constructor.

The industrial steam engines included a 1 in. scale model of the historic Fieldhouse horizontal engine, complete with winding gear, by J. W. Gibson, and a main-and-tail colliery haulage engine, in $1\frac{1}{2}$ in. scale, by J. Hollins. Both were of excellent workmanship and finish.

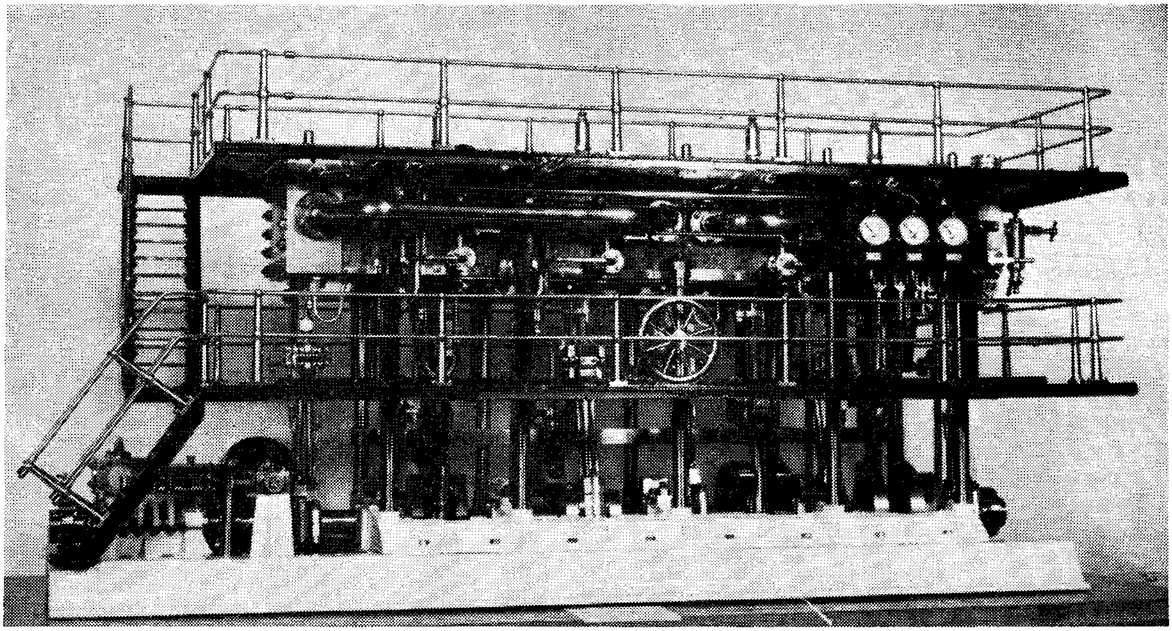
A neat example of the double Tangye mill engine to ME design was also entered by J. W. Gibson. The horizontal mill engine by T. Price, was well made, but open to some criticism in details, including the arrangement of the governor gear, and the lavish use of plating on pipework and other parts.

**Quadruple expansion**

Marine engines were represented by two very interesting models. The double-diagonal or 90 deg. V-engine in 1 in. scale, by E. B. Wilcox, recalled the early days of steam navigation, and had undoubtedly been the subject of much careful research, but in workmanship and finish it failed to equal some of the earlier models made by this veteran exhibitor. Later and more orthodox marine practice was exemplified in the $\frac{3}{4}$ in. scale model of a quadruple-expansion engine by R. Cocks. The complexity of detail in engines of this type presents a challenge to the most intrepid constructor. While the general workmanship was good, some of the details were a little out of character. Most engines of the size portrayed would be fitted with steam reversing gear. The control of the engine from the middle grating was also somewhat questionable, but the neat twin-cylinder turning or "barring" engine was a commendable feature.

Access for the inspection of all the relevant details of a model is essential for judging it properly. In working models particularly, the complete and

*Top: Beam engine sent from Herne Bay, Kent, by F. Skelton. Centre: From Stockport came a Double Tangye mill engine, the work of J. W. Gibson. Left: A second mill engine. It was built by T. Price of Bradley in Staffordshire*



*Side view of Mr C. Cole's marine engine*

permanent enclosure of all parts, though not always unavoidable, may result in the loss of well-merited points. Sometimes photographs of internal parts are submitted with the model, but to accept them as concrete evidence might set up a rather dubious precedent; taking this to its logical conclusion, it might be argued that it would not be necessary to show the model at all if a set of photographs was submitted.

**Internal combustion engines**

Though never as numerous as steam engines, and generally less spectacular in the visible details, internal combustion engines are always of interest and often show signs of diligent experimental research. Most of the engines in this class were built from ME designs, with detail modifications. They included two examples of the Centaur gas engine by L. J. Oldridge and E. Parker. Mr Oldridge's was fitted with a separate fuel tank, and a geared vertical governor instead of the one originally designed for camshaft mounting, but its finish, including painting, was somewhat below the standard of the less complete engine by the other exhibitor. Both engines were reliable and efficient workers.

A very well finished example of the *Kittiwake* 15 c.c. o.h.v. engine was exhibited by J. Taylor. Many of its parts were machined from the solid, or were fabricated; they showed evidence of painstaking work. A tangential-flow silencer and an Atom Type R submerged jet carburettor were fitted.

The water-cooled *Kiwi* Mk II engine by G. Kershaw was without much embellishment in detail, except for the addition of an air filter to the carburettor intake, but the air-cooled *Kiwi* by A. Leeson was modified in several details, including the fitting of a carburettor with twin throttles for air and mixture. Mr Leeson's contact-breaker gave the impression of having been hastily improvised, and did not blend with the rest of the design.

H. W. Hooper, who has been almost exclusively interested in making non-working models of motor-cycles, ventured into internal combustion engine design with an o.h.v. air-cooled twin engine of 50 c.c. It embodied some interesting features, such as twin camshafts operating the inlet and exhaust valves from opposite sides of the engine, through the usual push rods and rockers. Presumably it was fitted with internal flywheels, as there was no external flywheel and the crankcase was large. The design in some respects was rather crude, and certain details, such as the connection of the float chamber to the carburettor were not very practical. But as an essay in individual design, the engine was by no means unworthy of serious consideration.

The first of the *Sea Lion* o.h.c. four-cylinder engines to appear in the ME Exhibition was made by F. G. Bettles, who is best known as a traction engine enthusiast. Apart from the engine itself, some very interesting work had been done on accessory equipment, including a very neat tubular radiator with belt-driven cooling fan and a centrifugal clutch and reversing gearbox with reduction gearing. While the finish was not of the standard seen on many of the competition models, the engine was a sound, practical piece of work which had involved critical machining and fitting operations. It should be very successful.

**Wankel model**

Evidence that model engineers are not slow to follow up the latest developments in full-sized engineering was shown in the 1.5 c.c. Wankel engine by J. Taylor. So far as is known, this is the smallest engine of its type which has yet been built. It has obviously called for very precise machining and fitting to enable it to function. I am told that it works quite successfully on glow-plug ignition. Unfortunately the external and visible work on such an engine is very plain and austere, giving hardly any clue to the work involved in its interior working parts.

There is some evidence of a re-awakening of interest in the construction of model i.c. engines, and I hope that it will continue and accelerate, to swell the number of exhibits in this class in the future. ▣

# Where were the clever tool-makers this year?

**T. E. BRISTOL notes a decline at the Model Engineer Exhibition**

In contrast to the wealth of talent and enterprise shown in some of the general engineering models at the Model Engineer Exhibition, the class for tools and workshop appliances was relatively uninteresting. This was surprising because, in nearly all previous exhibitions, the design and workmanship of the tools and equipment had generally reached a high standard.

I hope that the decline is only temporary, as there are no indications that toolmaking is becoming any less popular among model engineers. Where there are workshop problems in the construction of any type of model, there is always scope for ingenuity in producing devices, from the simple to the elaborate, to cope with them. Furthermore, many model engineers are interested in making tools for their own sake, and not merely under the spur of necessity.

About half the total number of exhibits in this class were useful, practical, and well-made, but did not present any notable features of design. The other half were either a combination of good workmanship and mediocre design, or good ideas imperfectly executed. Two turret toolholders, both by B. L. Roberts, may be described as practical utility tools, and the same applies to the two-way rear toolpost by G. Chirgwin. Such devices undoubtedly widen the scope of the lathe, and expedite work by reducing the amount of tool changing necessary, but the amount of work in them is hardly sufficient to justify high awards, however well it is carried out.

The dial test indicator stand, together with its wooden case, by G. D. Chambers, was a good example of a toolroom accessory which every apprentice or trainee may well be encouraged to make for his own use, besides being very appropriate as a test piece, in which quality rather than quantity of work is essential.

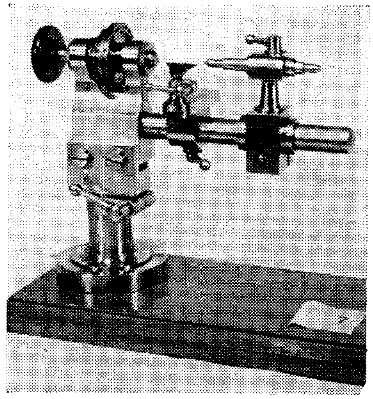
Few ME Exhibitions fail to produce some essay at the construction of a small lathe, and excellent examples have been seen at various times. The only one this year was the watchmaker's lathe by A. H. Wilks. It was a nicely made and finished little machine which should be capable of useful service, but the use of ball races in the headstock, instead of the double-opposed cone bearings which have long been recognised as the best for this purpose, lowered it in the estimation of the judges.

A number of items by D. N. Vick, including the twist drill grinding jig designed by Duplex, and the worm wheel, worm and division plates of the Turpin dividing attachment, were rated fairly high in workmanship and accuracy. The late entry by P. J. Gordon, a vertical milling attachment for a $3\frac{1}{2}$ in. lathe, had very few faults in workmanship, but its mechanical complication, and lack of proportion in design, related to the purpose for which it was intended to be used, put it at a disadvantage.

An object lesson in improvisation was presented by Dr R. Cutler's exhibit, described as a vertical compound milling machine. The slides for traversing the work table horizontally both ways, and for vertical motion of the spindle head, were adapted from Myford vertical slides, and were mounted on a column which had apparently been the bed of an instrument lathe. The spindle bearing was clamped in a light alloy rectangular block and arranged to be driven by a flexible shaft. While this assembly may be quite capable of fulfilling its designed function, it can hardly be regarded as an exercise in real construction or recommended as an example of machine tool design.

The spherical turning attachment by B. C. Wood was accompanied by specimens of work which proved its practical utility, including a ball built up from segments and lamina of different coloured wood which, when machined, produced a polychromatic geometric pattern. The tool travels in an arc about a horizontal centre which, though not a new idea, is rather unusual. The angle bracket on which it was mounted, and also some of the moving parts, seemed unnecessarily massive, and one or two details, such as the use of knurled gib screws on the radial slide, were open to question, but the workmanship and accuracy were very good.

As usual, tools and equipment occurred among the Students' Cup entries. Among the work by single individuals, the lathe accessories by R. W. Tilley showed a certain originality. They comprised a milling cutter arbor with a No 2 Morse shank to fit the lathe headstock socket, and a toolpost grinding attachment with driving motor and belt-driven spindle head. These components were arranged to clamp in seatings at either end of a massive slotted bracket, which could be mounted in place of the standard toolpost. A split, externally-tapered contracting bush and thrust adjustment ball race formed the spindle bearing, and screwed adaptor extensions were provided to carry the various sized grinding wheels.



*From little Lydney in the Forest of Dean: watchmaker's lathe by A. H. Wilks*

The Green and Silley Weir Training School entered a very interesting taper gauge, which comprised an articulated double parallelogram for controlling the angular disposition of two straightedges, with axial screw adjustment and locking clamps. Its size was such that it would not be applicable to very many jobs within the sphere of model or light engineering, but the accuracy and finish were very commendable.

An ME Duplex power hacksaw was entered by S. Coupe. Apart from one or two differences in details, it followed the published design closely. It was well made and would undoubtedly give good service as a labour-saving workshop aid.

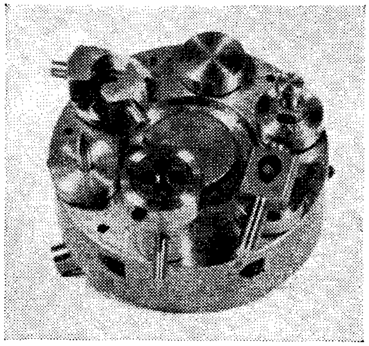
The scope which horological, optical and scientific apparatus offers for fine craftsmanship and working detail was well in evidence. As usual, clocks took a leading place. The most interesting of them was the perpetual calendar clock by C. W. Jowett. Its design undoubtedly owes a good deal to the teaching and influence of C. B. Reeve, whose articles in ME have induced many readers to take up clockmaking. The only criticism which might be offered is that the motion work was not normally visible as it was completely hidden in the grandmother half-length case, which was not of Mr Jowett's own construction. The timekeeping part of the motion is similar to that of the Reeve musical clock, but the calendar work, with its three dials (in addition to the seconds dial, which is essentially associated with the timekeeping motion) is of original design.

An interesting electric clock, following a design published in the ME some years ago, was shown by M. Wilding, whose ME Jubilee clock won a well-merited award at the previous ME Exhibition. The clock has a half-seconds pendulum, and works on one of the many versions of the well-tried Hipp principle, which makes contact to provide an impulse only when the pendulum swing falls below a predetermined arc. The dial motion is somewhat similar to that of the Bulle clock, employing a worm reduction gear to drive the minute arbor, and thereby reducing the wheel train work considerably. As a simple, reliable and reasonably accurate timekeeper this kind of clock has much to recommend it, and the example shown was well executed.

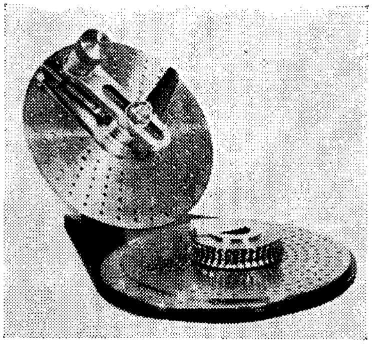
C. B. Reeve's latest clock, a long-case eight-day with tubular chimes, was shown in the loan section, together with two examples of his earlier work, a typical bracket clock and a small verge striking clock motion. These fine exhibits are always a centre of attraction to both amateur and professional horologists.

The ME research microscope (L. H. Sparey's design) by P. R. Berry was well finished, and had already proved its usefulness in practical work, including photomicrography. It was faulted only on very small details, such as incorrect attachment screws, which do not in any way impair its functions.

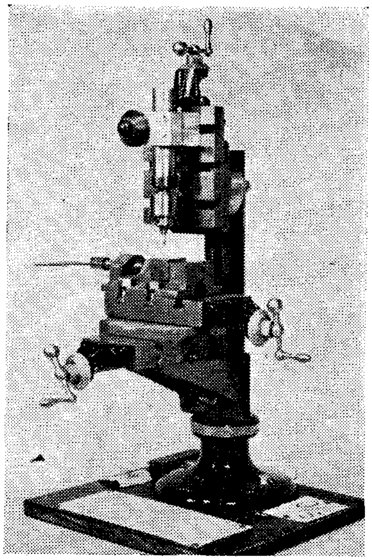
A rather unusual type of instrument was the orrery by H. H. Earl; this device, invented by the Earl of Cork and Orrery in about 1770, is very useful for demonstrating the orbital movements of the planetary system and other heavenly bodies. Mr Earl's was of specialised and original design and was very well made, but the lack of any means of mechanical operation would seem to limit its practical value.



*B. L. Roberts of Llanllyfni, which is of course in Wales, showed a turret head suitable for a 3 in. or 5 in. lathe*



*D. N. Vick of Stroud, near Gloucester, entered a dividing head and a twist drill grinding jig, both ME designs*



*Dr Robert Cutler of London had made a vertical compound milling machine*

The collection of physical science instruments by R. C. Fox were typical, in workmanship and finish, of high-class laboratory apparatus, and would undoubtedly fill a useful educational role. They included devices for electromagnetic and static experiments, and an optical bench with its essential fittings. Another optical exhibit, the diascopic projector by A. E. Bowyer-Lowe, embodied several original and practical features, among them a system of ventilation by convection, which enables high power illumination to be used without the need for forced cooling. It was made to take relatively large ($3\frac{1}{2}$ in. × $2\frac{1}{2}$ in.) slides or colour transparencies, but design could readily be adapted to the more popular 2 in. × 2 in. slides or 35 mm. filmstrips. The workmanship was of much the same standard as that of the clocks and other instruments shown by this exhibitor in earlier years.

It would be interesting to investigate the motives which inspire some exhibitors to produce unusual and even, it might be said, incongruous models. Some of them may be intended to illustrate the history of a subject. Among the footwear made by J. Kirtley, in brass and light alloy, were boots, shoes and sandals of various periods. But the collection was not comprehensive, and the choice of material was odd.

An example of a model built to demonstrate a mechanical principle was the Kitchen rudder in $\frac{3}{4}$ in. scale by R. Cocks. It was operated by a small electric motor, through spur and worm reduction gearing, and demonstrated the working principle of this well-known device, which enables a vessel to go astern without reversing the propeller. Possibly Mr Cocks intends to fit it to a model power boat. If so, it might well be lightened in its structural parts. Much faster working would be desirable for efficient navigation.

The Admiralty deep-sea diver's helmet by W. C. Holbird was a good example of the art of coppersmithing. Apparently it had been beaten from a single sheet of metal, except for the various attachments. Its fidelity to the original seemed to be very close, but a little more care expended on the finish, especially in the awkward places, would have been to its advantage.

Some originality in construction, and no mean artistic talent, were shown in the standard-mounted electric lantern by the indomitable chef, Henri Chevaux. The lantern itself had a distinct antique flavour, and so, to some extent, had the elaborate

● *Continued on page* 333

**RADIO CONTROL TODAY** *Continued from August 17, pages 210 to 212*

# Scope for ingenuity

*RAYMOND F. STOCK concludes with a word on pure mechanics*

It is possible, if one wants the maximum value for money, to control another function over a single channel by changing the pulse rate while retaining the normal mark-space ratio variation for primary use. When no such consideration applies, the normal pulse rate will be kept as high as possible, to smooth out the ripple in the command signal to the servo system. Assuming that a lower frequency of pulsing is acceptable for normal primary use, Fig. 33 gives a type of circuit which will respond to an increase of pulsing rate.

The transformer primary is fed with pulses. These can be derived from the back contact of the channel relay, assuming that this is spare, or less conveniently by placing the primary in series or parallel with the circuit normally worked from the front contact. The second method is generally practicable only when an electromagnetic device such as a motor is operated for the primary control. Anyway, the idea is to feed current pulses through the transformer primarv, which naturally produces corresponding voltage pulses across the secondary.

#### Effect of transformer

In any transformer the secondary pulse is caused by the *change* of primary current, so that the output pulses occur only at the beginning and end of a pulse—irrespective of its length, or of the gap between pulses.

Consequently, the secondary output ignores mark-space variations—within limits, at least—and is proportional to pulsing rate. The output is rectified by four diodes in a bridge circuit—or a meter rectifier, 1mA type—and the direct voltage is applied between the emitter and base of a transistor. Almost any type will do, such as OC71, OC72 and Red Spot. The amplified output in the transistor collector is fed to a relay shunted by a high value capacitor (for example, 20mF). A meter in series with the relay will indicate a current rise on increasing the pulsing rate, and should be largely unaffected by changes in mark-space ratio, though at full mark and full space there will be no output at all. The transformer should not be critical; any small output transformer, or hearing aid type, of from 15 : 1 to 50 : 1 may serve. Its precise character, together with the values of capacitor, H.T. voltage and relay resistance will determine the output for any given pulsing speed: the idea is to adjust things so that the relay never pulls in normally, but can be operated positively by increasing pulse rate.

It is unlikely that positive operation can be secured with a pulse rate change of less than 30 per cent. The relay can be employed to control some other circuit, most likely a selector; it would be rather too greedy to expect to use the " second channel " for continuous pulses in another proportional system.

When you need really precise control you are advised to restrict it to one control for a channel with mark-space systems; but if the circuit of Fig. 28 is adopted, the faster pulsing required can easily be attained. Where pulses are being originated by a mechanical drum or disc, a second control switch is arranged to cut out a resistor in the circuit of the motor driving the control box unit, thus speeding it up. When electronic pulsing systems are employed there is usually a simple way of switching some component to vary the multivibrator frequency.

The types of system which I have outlined represent the commonly-used ideas. There are almost endless combinations, but they are variants of the basic themes described and will be selected by the modeller to suit his particular problems. Generally, the slower the model the less need for precise control. Where weight and size are of overriding importance, as in a 24 in. launch, a single channel radio would be most attractive, with a positional-steering + simple-engine sequence. Alternatively, a 4-reed system could be used, two channels for progressive steering, and two for the engine.

In a larger model, such as a passenger liner above 48 in. long, either of these basic methods could be used, with a longer and more elaborate sequence (or compounded sequences) for the first method. The slight delay introduced by longer sequences is less important as the size of model increases, owing to the inherent ponderousness of the performance. Obviously, where it can be accommodated (or afforded) simultaneously operating high-speed channels can always be used to advantage, and in fast models are almost essential. I would prefer to have a single high-speed channel for an accurate, proportional, mark space system than several slower channels offering only progressive control, if the model were a fast boat powered by internal combustion. Full control is desirable, but achieving it with i.c. power involves a major step in control gear complexity. This, of course, is not a radio problem so much as a straightforward mechanical one, but the increasing popularity of the compression ignition engine makes it a common difficulty.

#### Controlling i.c. engines

Electric power is flexible and lends itself to control by selectors and stud switches, easy to integrate within a control system. Internal combustion engines require two, or possibly three, inputs. With a petrol engine, speed control is not too difficult, even in a two-stroke, and the contact breaker can be rotated, for ignition timing, by a small geared-down servomotor. A proportional throttle is pleasant to have, but a progressive system is quite satisfactory.

Idling speed is usually low enough to enable a centrifugal clutch to be used for Stop. Reverse must, of course, be by gearbox; the most practical type follows full-size marine practice and uses epicyclic gearing, the change of rotation being obtained (and possibly Stop as well) by tightening or loosening brake bands. The two band-operating levers can be cam-controlled, the camshaft is turned through high-ratio reduction gearing from a servomotor. The motor unit would be provided with a contact disc (on the lines of Fig. 10) so that it would home on any of three positions, Ahead, Stop and Astern. The cams can also be cut to have a long dwell in the two outer positions: continued rotation of the camshaft could then be arranged (on a further cam) to open the throttle as the camshaft was driven round to additional speed positions in both Ahead and Astern.

Similar considerations affect compression ignition engines, though speed control is generally less easy. The very few sideport two-strokes now made are more flexible than the higher-performance, higher-speed "racing" types, but recent progress tends to show that most engines will respond to throttling, to some degree. Throttling the gas-flow in both inlet and exhaust is necessary, though the inevitable back pressure of any marine silencer and exhaust pipe installation may be found sufficient on the outlet side. Otherwise a valve in the exhaust port(s) linked to the throttle butterfly or other valve is necessary. Any engine can be simply tested in a bench rig to determine which method is required, and an installation can be made accordingly.

**Controlling steam engines**

Steam powered vessels need no special treatment since the control gear will be obvious. Throttle valves and reversing levers can all be operated by linear (leadscrew and nut) or semi-rotary actuators.

Installation can make a system troublefree and enjoyable, or a constant nuisance. While the details must always depend on a particular model, two methods are recommended. In small models it is convenient to make all the equipment, from aerial to rudder and engine linkage, in one unit on a common base which can be placed simply and quickly inside the model with some quick release fastening. If the engine can be incorporated, with pick-up at a convenient flexible coupling, so much the better: you can then bench-test in vibration conditions.

In large models the individual elements must be separated, probably in different watertight compartments—which are more valuable in keeping fuel and oil where they should be than in keeping water out. Each detail can be mounted separately and coupled up to a neatly arranged wiring loom, with a local plug and socket, at each point. Two, three and four pin polarised battery plugs are useful, but are not high quality components; better are B7G and B9G plugs and sockets (valve sockets) giving seven and nine ways in a very small space.

Having completed this type of installation, force yourself to make up a duplicate loom on a bench test rig. The separate elements can then be plugged in for ease in checking where you can get at them. The only doubtful factor is the aerial. It may not behave precisely the same as the one in the model, and so the final testing should always be with a meter, while the boat lies in the water.

Most of my comments have concerned model boats, but some of the conclusions affect model vehicles. Cars are not popular radio control subjects, though in fact they benefit more by control than ships or aircraft. While aeroplanes are enjoyed while they are running free, a model car is dull if it can perform only pre-set circles and straight lines. But cars are not easy to equip. Nothing shows up the deficiencies of a control system, speed for speed, like a vehicle; its path is precisely determined, within the limits of skidding, by the angle of its steering wheels, and any imprecision or wander is immediately and painfully apparent. Consequently, I feel like being dogmatic here and severely condemning all equipment except a really accurate proportional system.

The ideas briefly noted in Figs 17 and 29 are suitable bases for a car installation. As precise control is needed, the range in sharply limited by vision; a small aerial—or none at all, pick up being on the signal coil—is possible, and can be hidden within the body. If you make a racing car, you have a perfect excuse for not fitting a reverse.

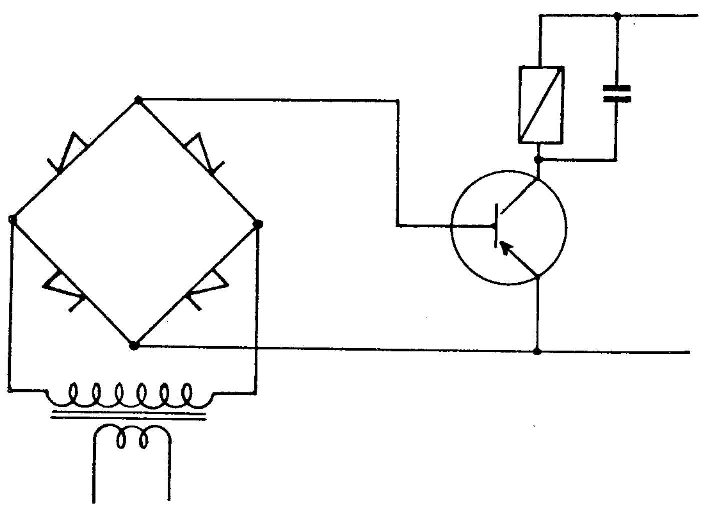


*Fig. 33: Circuit responding to an increase in pulse repetition rate*

**Synchronous system**

One system in radio control I have not seen but it has innate possibilites. This is the "time-multiplex" system of sharing information between channels, over one radio channel. The idea is that a continuously rotating sampling switch in the control box investigates the on-off condition of each channel in turn. A synchronous (correctly, isochronous) distributor in the model routes the pulses received over a single high-speed channel, to various circuits corresponding to the original ones sampled. Thus, if the switches turned at 10 r.p.s. and sampled 12 circuits, there would be 120 discrete yes-no bits to accommodate each second. There is only one difficulty: keeping the two ends in phase. No amount of governing can do it locally; but the method *is* possible, by making one of the sampled channels convey a synchronising signal once in each revolution. A comparable system is used in missile telemetering; possibly some reader with ingenuity and a taste for electromechanical devices will come up with the answer.

I have used the term "control box" to indicate the operator's controls, their mechanism and housing. Commercial radio control transmitters are normally provided with switches or push buttons for keying the channel or channels. When the gear is bought, the ship modeller may well require to make some modifications, to incorporate control mechanism. If the mechanism is simple it can be built into a small box which is then fitted to the transmitter over the area from which keying switches have been removed. The original leads to the keying switches can be carefully identified, unsoldered and re-connected to their new positions. This pre-supposes that the complete transmitter will be held by hand or the combined unit mounted on a tripod. When a separate control box is required, it will be provided with a long multicore lead which can end in a plug and socket at the transmitter. It is usually necessary to wire radio frequency chokes into the keying leads by the socket, inside the transmitter case. This isolates the leads and prevents them from interfering with the radiating properties of the aerial.

**Servo power**

In writing of servo power, I have indicated electrical circuits for simplicity, but readers will appreciate that most of these devices have mechanical or pneumatic analogies. When a model is electrically driven, it is convenient to use one main battery for propulsion, radio and servo power, but other systems may be attractive where i.c. or steam drive is used. Electrical signals are essential at first as the output of the channel relay or power transistor, but thereafter they can be "converted" to some other system. The modeller who is happier with mechanical gear than with electrical may like to take advantage of this.

Rotary power is generally not required, and when produced—by an electric motor, for example—must be transformed in some way to a substantially linear force. The straight-line output of compressed air (or depression) cylinders is directly useful, and a short stroke cylinder, or a chamber with a flexible diaphragm, is a direct replacement for an electromagnet.

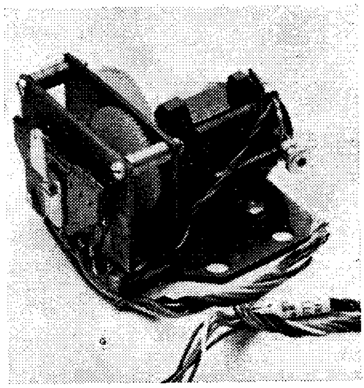
If condensation problems can be avoided, steam power can be used similarly. Hydraulics present a challenge through the fine clearances needed to maintain efficiency, but they could also be employed.

All such media using a working fluid (gas or liquid) have other advantages over electric power. Apart from linear action (and, with hydraulics, positive locking in any position without using power) these systems derive their main power from an engine-driven pump, more efficient than secondary cells. Electrical output falls over the discharge life of a battery, and sets a definite limit to operation as well as requiring a margin of safety in the voltage. Furthermore, in the absence of fast-moving high-inertia parts (such as motor armatures) overshoot and hunting in servo systems are much reduced.

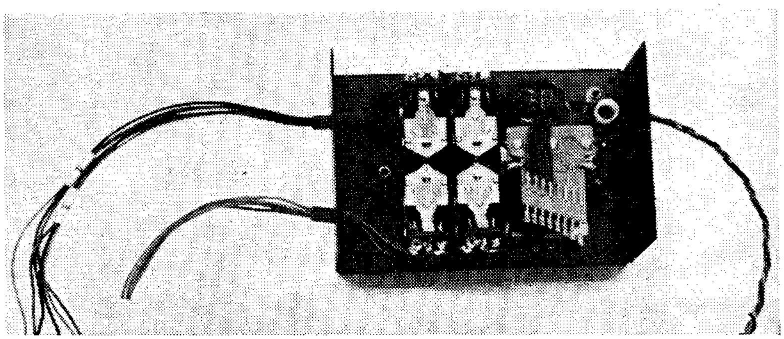
The main detail to be considered is an electromagnetic valve controlling the working fluid. There is much scope for ingenuity here. Designs will generally be based upon an electromagnetically deflected diaphragm, or a solenoid-operated valve, which presents a restriction to fluid flow. The diaphragm is most convenient for converting rapid pulses—as in a mark-space system—into a corresponding flow of gas, while the valve is more positive for controlling discrete pulses.

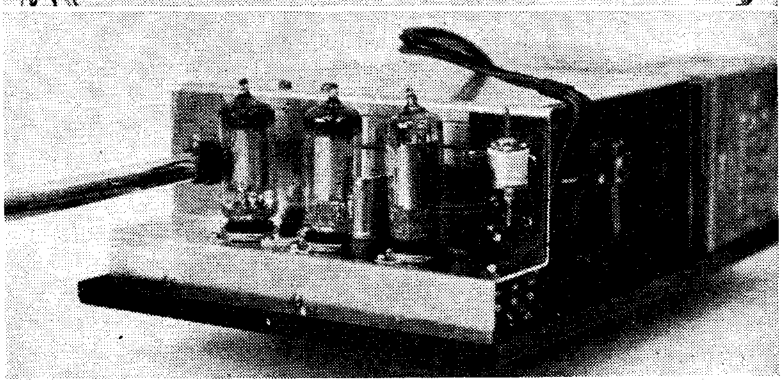
These ideas and similar ones offer a wide scope to modellers with suitable resources. The actual radio link has been brought to a fair state of perfection, it is difficult to envisage any improvement without moving into a different order of equipment.

Control gear and servo mechanisms have not been developed to the same degree. Possibly owing to the strong influence of aeromodelling practice, with its over-riding demand for lightness and simplicity, mechanical and electrical elements have lagged behind. Now that transmitters and receivers are out of the teething stage and are more widely obtainable, the mechanical enthusiasts can, perhaps, begin to influence their part of the subject, with considerable benefit to radio controlled models as a whole. ■



*This REP motor-driven actuator, which is ideal for a small boat, uses nylon gears, with printed circuit contacts*





*Top: In the ED Black Arrow 4 the tuning coil and an interstage miniature transformer can be seen (at top right). Above: ED transmitter with three little valves, crystal, tuning coil, capacitor and telescopic aerial (left)*

□ *Earlier instalments of this serial were: Radio Control Today, May 25 (page 635); Single Channel Systems, June 8 (page 699); Reeds are Reliable, June 22 (page 773); Stepping Motors, August 3 (page 134); Mark-space Systems, August 17 (page 210).*

### FOR YOUR LIBRARY

A great deal of useful information can be adapted from Mr G. Sommerhof's book *Radio Control of Model Aircraft* to the control of model boats or even model cars.

It may be had from Percival Marshall Ltd, 19-20 Noel Street, London W1, price 7s. 6d, or 8s. by post.

# Methods of SUPPORTING and CLAMPING

MOST jobs in the workshop require preliminary work for the real operations which follow, and the preparations usually include support and clamping of components. They may vary greatly, of course, according to the work in hand. One occasion may demand simply the support of a casting on a surface plate for it to be marked off. Another time a component may have to be clamped firmly to withstand the thrust of a machining cut.

Support for a casting on a surface plate can sometimes be arranged through two plates, bolted one each

By GEOMETER

end. Their bottom edges should be straight for the casting to stand firmly. It can be levelled by surface gauge, and set upright to a square, before the plates are finally tightened. Then marking off can follow, in the certainty that the casting cannot alter its relationship with the surface plate, as might happen were it merely supported on packing.

A casting for a steam cylinder provides an example of this method of support, when a steel plate is clamped each end by a bolt through the bore, as at *A*. The plates can be cut from thick rectangular strip, and set up in the four-jaw independent chuck for their bottom edges to be trued by a facing cut. Two adjacent right-angular edges can also be faced true, so that, if required, the plates can be turned through 90 deg. on the surface plate.

Two pieces of angle steel may be used for supporting components in this way, with the advantage over flat plate that their flanges admit of clamping to a machine table. An example of their use is in setting up a cylinder to drill holes for studs in the port face, as at *B*. The port face is levelled by surface gauge on the surface plate; and the angles are clamped securely. Paper packing can be used between them and the ends of the cylinder to avoid scratches. The steamchest, already drilled, is used as a template, aligned carefully, and then clamped by two flat strips and bolts.

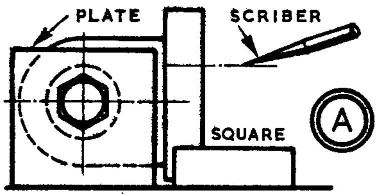
Many jobs can be supported in a machine vice, and there are various ways of making substitutes for this useful tool. One way, as at *C*, employs steel angle material for the base, and square and rectangular steel bar for the jaws. These are fixed jaw *X*, sliding jaw *Y*, and abutment *Z* for the screw. Sizes of material should agree with dimensions of work which is normally undertaken. The screw can have a Whitworth or BSF thread, either of which is capable of good service, and the screw can easily be renewed, with the abutment, when wear occurs. There is usually only one screw to a vice, but if a wide example is made two can be fitted. Then a pivoted jaw will admit of firm clamping of non-parallel material.

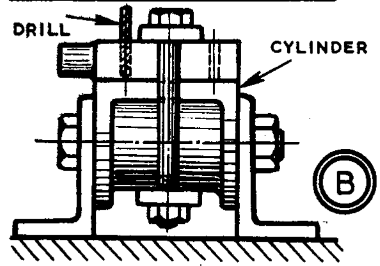
Fixed and sliding jaws, and the abutment, are faced to length in the independent chuck; and the fixed jaw and abutment are drilled and tapped for screwing firmly to the angle side pieces. The sliding jaw can be drilled and countersunk for screws which hold a packing piece and plate to the underside. To admit of clamping the vice on a machine slide, slots may be drilled and filed (or milled) in the side pieces. Then the ends of clamps can be entered.

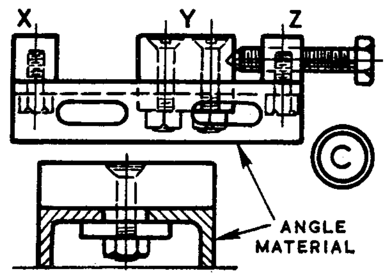
Small work brings problems of its own for holding it securely without damage, besides which the ordinary bench vice lacks convenience for tiny parts. A pin-vice is the solution to many problems; or a small vice can be made on the principle of a toolmaker's clamp, as at *D*, to hold in the bench vice for handwork. Its construction needs only two pieces of square steel bar and two BSF setscrews.

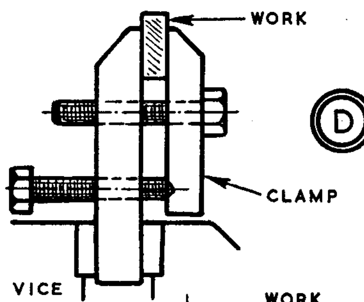
For supporting round work on the drilling machine table, two pieces of angle material make a substitute vee-block, as at *E*. Two bolts clamp them with washers, the thickness and number of which give a spacing according to the diameter of the work.

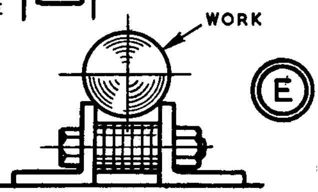
Facing of the base on angle material can be done by mounting it on the angle plate on the faceplate, and it can be machined to width, as at *F*, bolted directly to the faceplate. ■

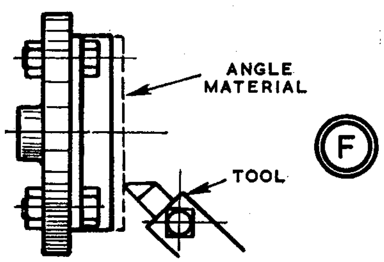


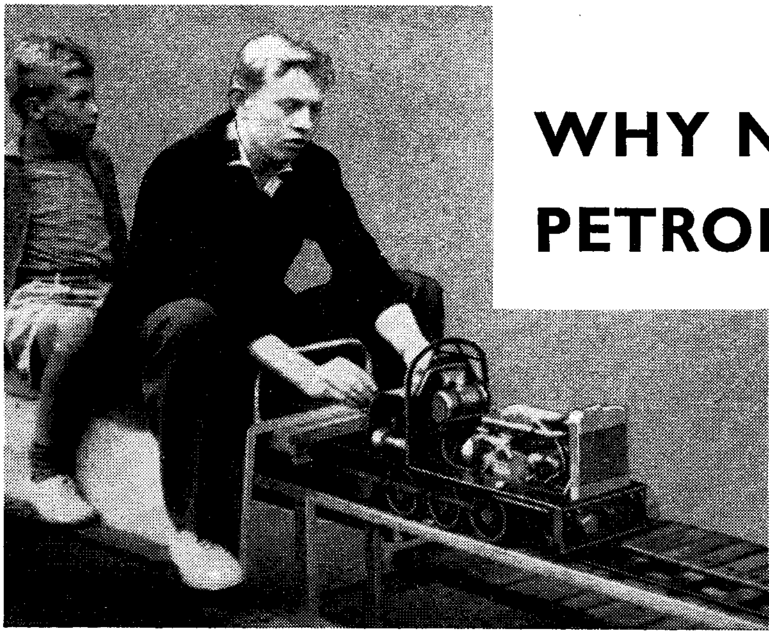





# WHY NOT BUILD A PETROL SHUNTER?

**D. F. CARDY has one in 5 in. gauge. At garden fetes it does its share with the steam locomotives on the track**

*Chassis in its final form, with a four-cylinder engine. The author's brother is driving it at an Ipswich exhibition*

It is four years since I began to build my petrol-driven shunting engine in 5 in. gauge. The Colchester Club had been running a portable track at local fetes, and it seemed to me that an engine capable of being used at a moment's notice would be very useful, especially for breakdowns and for the period before steam was raised. There was also a healthy controversy in progress on the relative merits of steam and diesel locomotives; some members were employed by a local company manufacturing diesels.

I settled on an 0-6-0 diesel shunter of 500 h.p. built by the Hunslett Engine Company. For transmission I decided to use a mechanical system. Hydraulic and electrical systems are not efficient at low powers, and I felt that their flexibility would have to be sacrificed as the engine needed all the power possible in order to compete with the steam locomotives. I based the gearbox on the infinitely variable one of the 1831 locomotive. The final drive to the jackshaft was by 8 mm. chain.

The basic chassis was soon completed. The engine, of my brother's own design, was a 37 c.c. water-cooled unit developing $\frac{1}{2}$ h.p. at about 5,000 r.p.m.

My first tests were encouraging, but at fetes the prolonged running caused many troubles, although the hauling power was all that could be desired. The source of the troubles was mainly that the engine required considerable development. I, therefore, decided to test the engine further and to make another chassis for it when necessary. In the meantime, I looked for a 50 c.c. two-stroke petrol engine of the type used on pedal cycles. Eventually, after making a new crankshaft I assembled an engine, complete with air cooling. It developed only about $\frac{1}{2}$ h.p. at 4,500 r.p.m.; I had thought that a large amount of silencing, with the inevitable back pressure, was necessary and the crankcase volume was increased somewhat when I attacked the crank webs with a hacksaw to balance the engine. The ignition was by flywheel magneto.

I made a single plate clutch from a Ferodo disc. A two-speed gearbox, with forward and reverse, took the power to the final drive, which was a bevel one. The bevels were from a reputable make of hand drill. Although they have worn considerably, they still work all right.

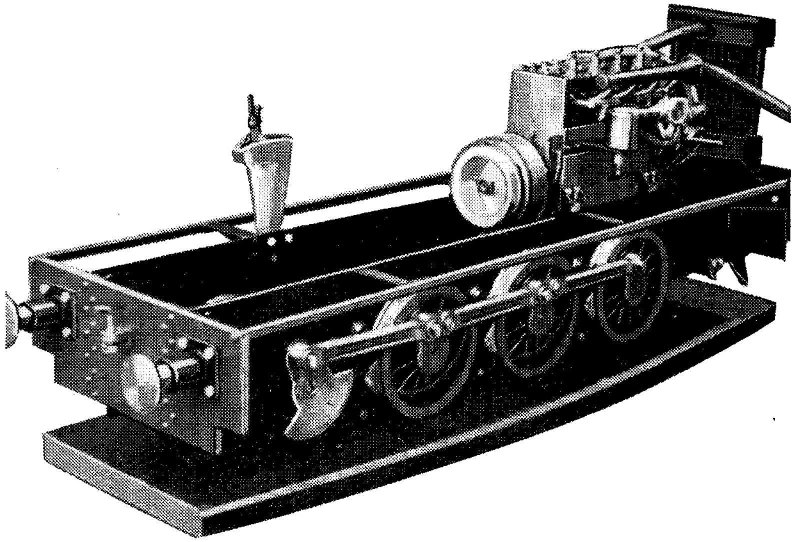
My biggest problem was the petrol feed, which had to be pumped because a gravity feed was not possible. It was also this feed which caused all the trouble later.

Again everything seemed to be satisfactory, and on one occasion the engine saved the day by running continuously for nearly three hours when another locomotive had a boiler failure. The superstructure was hastily fitted, but at the next fete everyone was puzzled when, after half-an-hour's running, the engine stopped and refused to start again. The performance was repeated later after everything had cooled. I found that, when the petrol became hot through being enclosed with the exhaust in the newly-fitted superstructure, cavitation was caused in the suction side of the fuel pump. This was, of course, owing to the increased vapour pressure of petrol at high temperature. I had a diaphragm pump running at engine speed (4,500 r.p.m.). I decided to replace it by a much larger pump driven from an axle eccentric. A second float chamber coped with the pump pressure and acted as a reservoir when the locomotive was picking up passengers.

In this form the engine has done its share with the steam locomotives. It has about the same hauling capacity as a $3\frac{1}{2}$ in. gauge *Britannia.* At an outing to the Cambridge track last summer, it ran until there was no petrol left. In first gear, starting from rest, it took four adults up a curving gradient with no wheel slip.

While I realise that I have given only a few details it seems that a locomotive such as mine can hold its own with the steam engines. It is very well silenced, and the only complaints have been about the smell of the exhaust. This problem cannot be completely overcome with a petroil mixture, but a decreased oil content after running in helps considerably.

I believe that, if a suitable full-sized engine is selected, and if care is taken to make sure that everything can be got in without making the outline look like a biscuit tin, the result is well worth the effort. ■



*Bare chassis with the four-cylinder engine installed*

## TAPER ANGLES FOR JACOBS DRILL CHUCKS

SIR,—An extract on taper angle from *Machinery's Handbook*, published by The Industrial Press, 148 Lafayette Street, New York 13, N.Y., may be of some use to R.G.H. [Can You Help, June 22].

I should like to thank, and congratulate the staff for the enjoyment and information I have received from MODEL ENGINEER. I look forward to each week's issue and am quite sure that at double or treble its present price, it would not lack a large and appreciative body of readers. Many thanks again for your excellent magazine.

Dublin. MARTIN DOWLING.

SIR,—R.G.H., Worksop, Nottinghamshire, has asked about the taper angle of a Jacobs drill chuck.

According to *Machinery's Handbook* Jacob's taper No 2 for 0-$\frac{3}{8}$ in. is 0.97861 inches per foot. No 2 is as drawing: A—0.5590 in., B—0.48764 in. C—0.87500 in long. This is the maximum and minimum diameter and length of the taper plug.

I have a 12th edition *Machinery's Handbook* (over 1,800 pages). All engineering standards are given; in *Machinery's Handbook of Screwthreads*, Model Engineer threads are given as a standard, with Whit., BSF, UNC and UNF metric and American. It is a very useful book for quick reference.

As for tapers in general, there are Jacobs, Jarno, Morse, Brown and Sharp and Standard tapers for milling machine spindles. All are given as taper in inches per foot and not as taper angle.

I have taken MODEL ENGINEER since 1912 when it was twopence. I bought it first at Smith's bookstall on Beeston Station, Notts, as a schoolboy, I used to catch the 8.15 a.m. to Nottingham, the 1.2 p.m. back to Beeston, and the 2.3 p.m. and 4.50 p.m. for afternoon school.

I have C. Hamilton Ellis's book on the Midland Railway and have seen most of the engines described, including the American-built locomotives and the Matthew Kirtley 0-6-0 double-framed goods engine; yes, and she was clean, though her Midland colours were a bit the worse for wear.

We knew where the coal came from with *Bestwood*, *Bolsover* and *Moira* on the trucks.

Thank you for all the interesting articles published in ME and all the pictures and drawings.

Christchurch, Hampshire. FRANK L. CAVE.

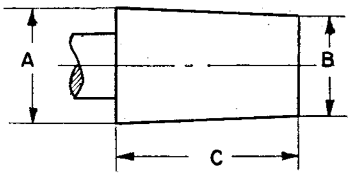
SIR,—Page 1,410 of the 12th edition of *Machinery's Handbook* gives nine tapers which vary according to chuck.

Usual chuck capacities for different series numbers are: No 0 taper, drill diameter 0-$\frac{1}{8}$ in., No 1 taper 0-$\frac{1}{4}$ in., No 2 0-$\frac{3}{8}$ in., No 2 (1) " short " 0-$\frac{1}{4}$ in. or 0-$\frac{5}{16}$ in., No 3 0-$\frac{1}{2}$ in., $\frac{1}{8}$-$\frac{5}{8}$ in. or $\frac{3}{16}$-$\frac{3}{4}$ in., No 4 $\frac{1}{8}$-$\frac{3}{4}$ in., No 5 $\frac{3}{8}$-1 in., No 6 0-$\frac{1}{2}$ in., No 33 0-$\frac{1}{2}$ in.

The chucks fitted with Nos 6 and 33 tapers would appear to be special if, the capacities given, 0-$\frac{1}{2}$ in. are correct.

No 2 (1) sizes are for No 2 " short " taper.

Brighton. T. W. ATTWATER.

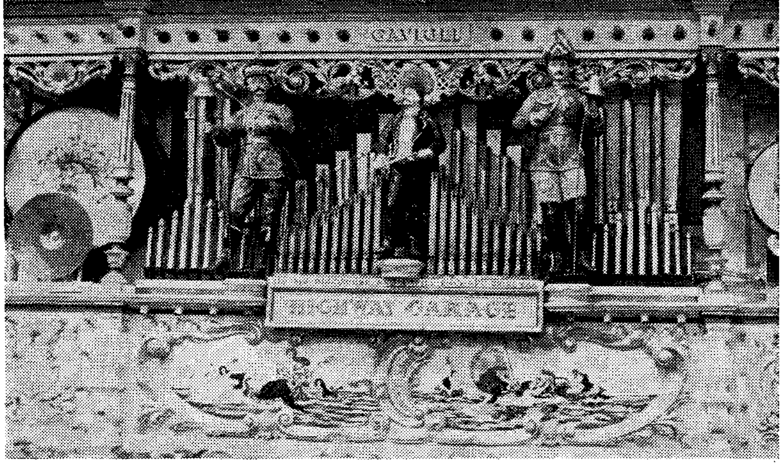



**JACOBS TAPERS FOR DRILL CHUCKS AND SPINDLES**

| Taper Series | A | B | C | Taper per ft. |
|---|---|---|---|---|
| No. 0 | 0.2500 | 0.22844 | 0.43750 | 0.59145 |
| No. 1 | 0.3840 | 0.33341 | 0.65625 | 0.92508 |
| No. 2 | 0.5590 | 0.48764 | 0.87500 | 0.97861 |
| No. 2 (1) | 0.5490 | 0.48784 | 0.75000 | 0.97861 |
| No. 3 | 0.8110 | 0.74610 | 1.21875 | 0.63898 |
| No. 4 | 1.1240 | 1.0372 | 1.6563 | 0.6286 |
| No. 5 | 1.4130 | 1.3161 | 1.8750 | 0.62010 |
| No. 6 | 0.6760 | 0.6421 | 1.0000 | 0.62292 |
| No. 33 | 0.6240 | 0.5605 | 1.0000 | 0.76194 |

**USUAL CHUCK CAPACITIES FOR DIFFERENT TAPER SERIES NUMBER**

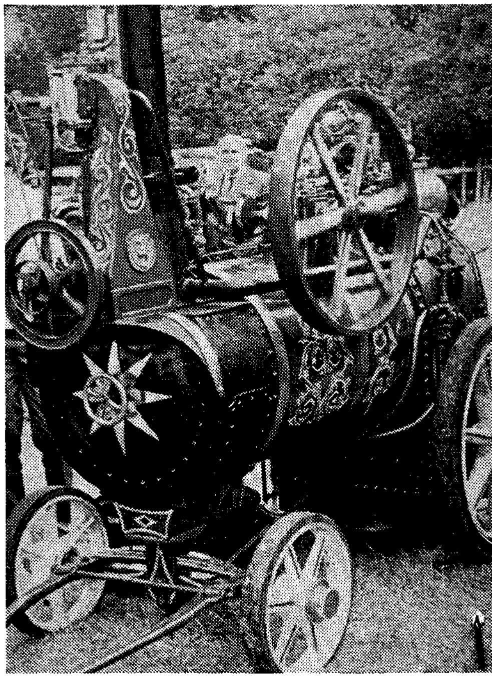
| Taper Series | Drill Diameters |
|---|---|
| No. 0 | 0-$\frac{1}{8}$ in. |
| No. 1 | 0-$\frac{1}{4}$ in. |
| No. 2 | 0-$\frac{3}{8}$ in. |
| No. 2 (short) | 0-$\frac{1}{4}$ in. or 0-$\frac{5}{16}$ in. |
| No. 3 | 0-$\frac{1}{2}$ in., $\frac{1}{8}$-$\frac{5}{8}$ in., $\frac{3}{16}$-$\frac{3}{4}$ in. |
| No. 4 | $\frac{1}{8}$-$\frac{3}{4}$ in. |
| No. 5 | $\frac{3}{8}$-1 in. |
| No. 6 | 0-$\frac{1}{2}$ in. |
| No. 33 | 0-$\frac{1}{2}$ in. |

*Above: "Bid me discourse and I will enchant thine ear," says the lettering below the conductor on Rowland Hill's organ, which still plays the old tunes*

*Left: Exactly 40 years have gone by since this steam wagon, A. Fearnley's Sentinel, first travelled the highways*

# CANOPIES WE



*Above: It was new in 1887, this Walker centre engine now owned by A. G. Knight who lives at Great Casterton*

WHILE drivers who had the benefit of a canopy were glad of it during the heavy showers at Rempstone Rally, the hardy souls on open footplates were not deterred in any way. The official opener, Mr A. J. Jinks, had a roof over his head as he toured the field on the Soames steam cart.

Well protected, too, was Eric Middleton on his Burrell *Winston Churchill* (No 3909 of 1922), an 8 h.p. showman's engine which was among the first in Britain to be bought and reconditioned for preservation by a private individual.

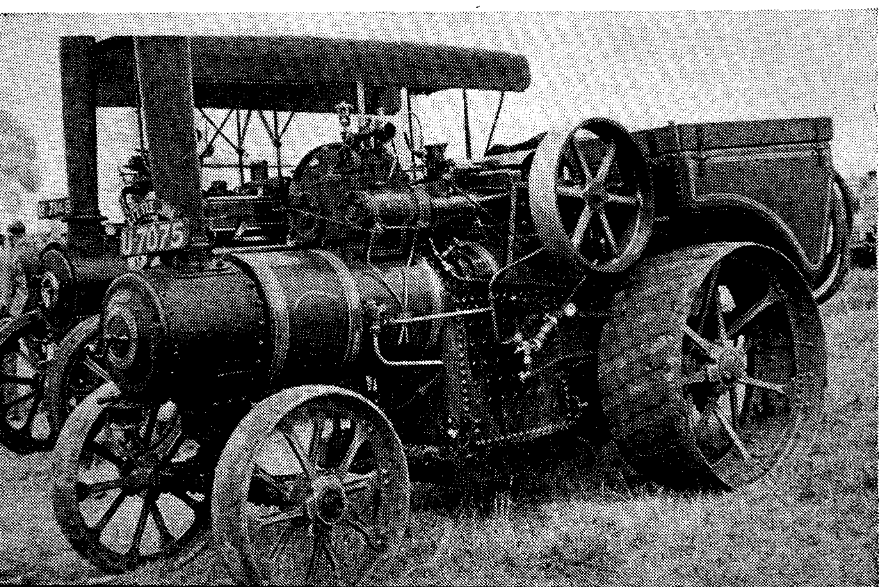
The tractor crews were in general better off than the traction men, though C. A. Parker of Lincoln had no canopy on his Foster *Wellington*. She is No. 13031 of 1913, and she performed well with A. Mitchell's Fowler *Tiger*, No 16525 in the back-to-back race. In this a pair of engines are coupled together, tender-to-tender, with a piece of string. When the flag drops, each pair starts off, trying to keep the string taut but intact. If it breaks, both engines must stop to rejoin the ends.

Among the "wagon-type tractors," the 1937 Sentinel No 9278 travelled at 66 m.p.h. This was vouched for, out of court, by a police officer who followed her in a police car. She has also travelled down the M1 along the centre lane, without obstructing other traffic.

The four Ransomes present included one which is believed to be the last ever built—No 42036 of 1932, owned by A. E. (Tim) Sage of Leicester. Another R.S. and J., in wonderful condition, was *Cambria*, No 27014, new in 1917 to the War Department for forestry work in Wales. She is now owned by C. T. Dabell of Gotham, who also runs a bus company. He told me that he would rather leave a bus out in the weather than his beloved *Cambria*.

Besides the full-sized steamers, there were several large scale models in steam, among them one built to 3 in. scale by Leslie Hewitt of Ilkeston, in showman finish with double cylinders, 1¾ in. bore by 2½ in. stroke, *Midge* cylinders upside down,. She is about 5 ft long and 3 ft 3 in. high. Her boiler has been passed by the inspector to 150 p.s.i., and she is taxed and insured for the road.

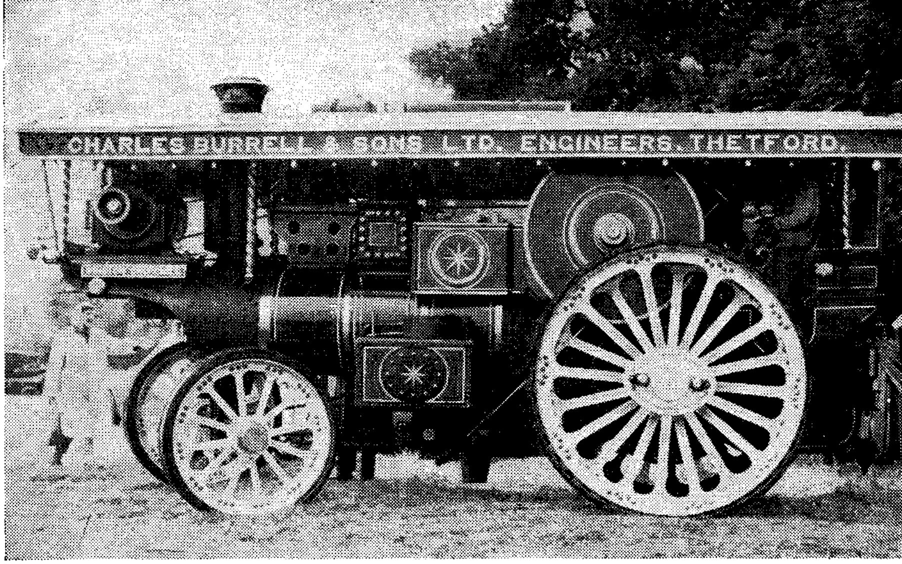
From Daybrook in Nottinghamshire, came G. B. Lowe with his 3 in. scale freelance single-cylinder engine. A locally owned small engine was the one in 4 in. scale owned by J. Wood of Wymeswold, and driven by four-year-old Johnnie Wood. It bears the words "Charles Rix, Engineer, Dereham," and is believed to be about 70 years old. More information would be appreciated by the owner and by Mr W. T.



*Left:* LITTLE JIM *is a Mann tractor of 1920 owned by F. A. Smith, Boston*

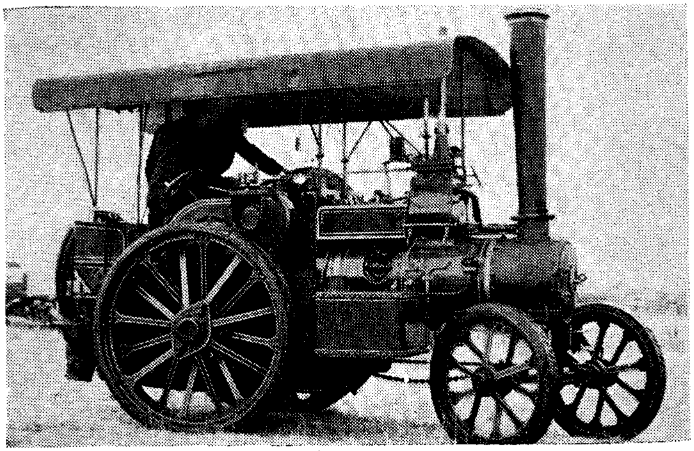
## NEWS REPORT – I

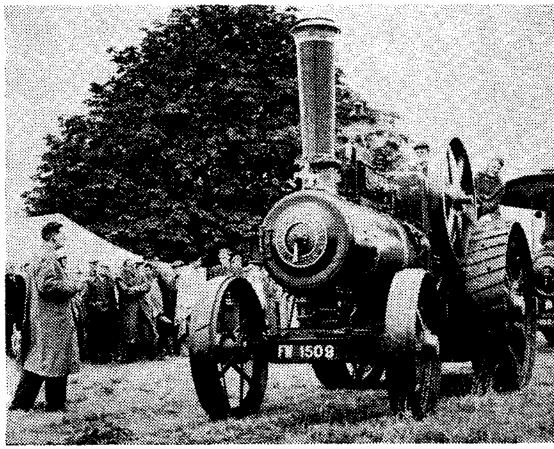
*W. J. HUGHES goes to the village of Rempstone, near Loughborough, for the annual traction engine rally*




# ERE USEFUL

*Burrell No* 3909 *special scenic engine of* 1922 *(formerly C. Holland's* PRINCE ALBERT*) was exhibited by E. Middleton*






*Left: Fowler tractor No* 15625*, a five-ton engine of* 3 n.h.p.*, was new in* 1920*. It belongs to A. Mitchelly and Son of Skipton. Right: Ruston and Hornsby No* 161250 *of* 1929 *enters the ring. Its owner is A. G. Knight*

Palmer of Seagrave, Leicestershire, who originally found the engine in pieces at an engineer's yard.

Not much bigger than this model was the double-cylindered centre engine built by W. Walker of Tewkesbury in 1887—the first of its kind which I have seen in preservation. It belongs to A. G. Knight and Son of Great Casterton, Rutland. A separate vertical organ engine is mounted on the smokebox, and altogether it is a pretty little tning, with plenty of polished brass and a chime whistle.

Besides the fifty-odd steamers at the rally, there were about forty veteran and vintage cars, and more than twenty motor cycles. It was pleasing to hear again that unmistakable note of the Scott Flying Squirrel, and to see the twin polished aluminium valve-rocker covers of the Riley Imp.

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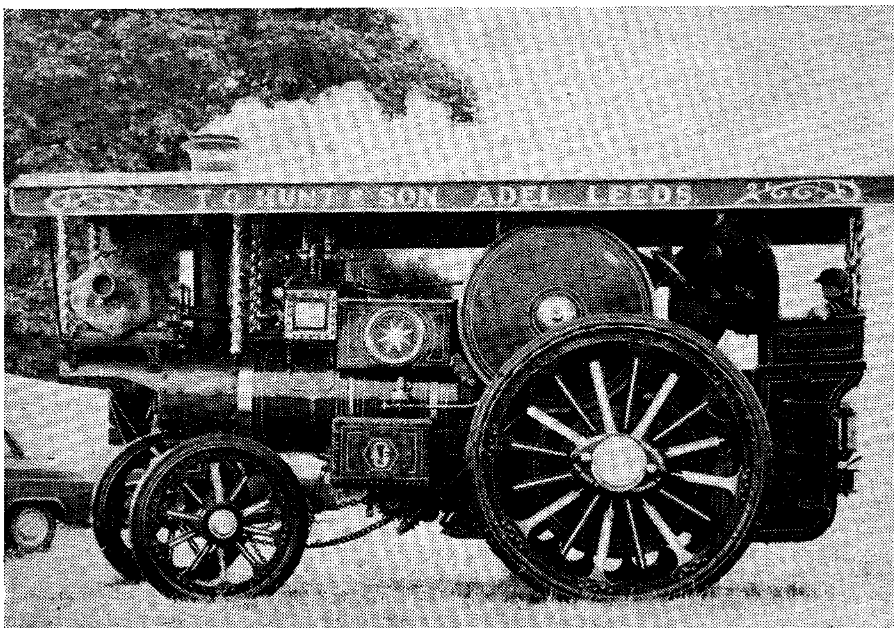
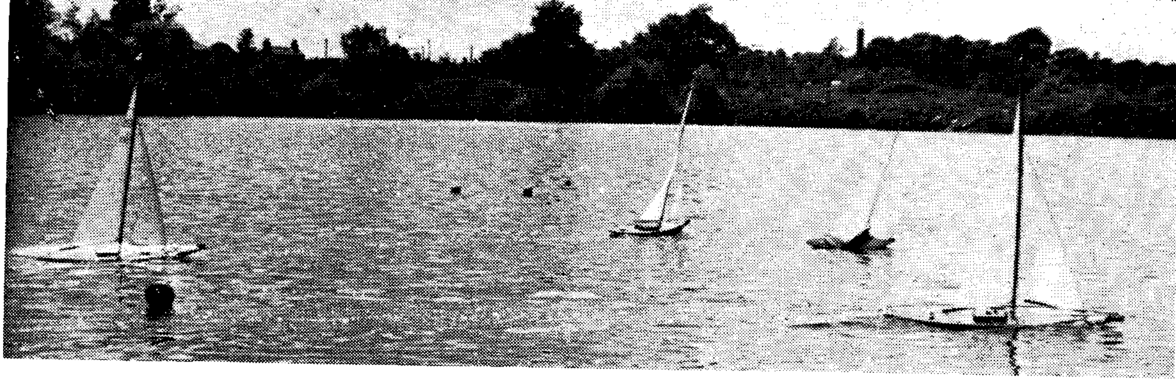
*Right: Burrell showman's No* 3849 *of* 1921 *has a terrific steam siren. The pictures on this page are by Anthony Beaumont; those opposite are J. Derry's*





## NEWS REPORT – 2

# 'NO REGATTA TOMORROW' – says official

*Top of page: Start of Q and Ex-A race at the IRCMS regatta, which had to be switched from the Hampton Court Rick Pond to a water close by London Airport*

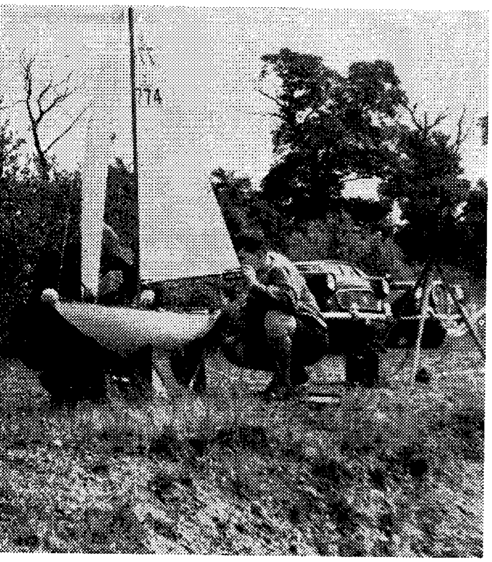
*Below: Alan Tamplin does some repairs*

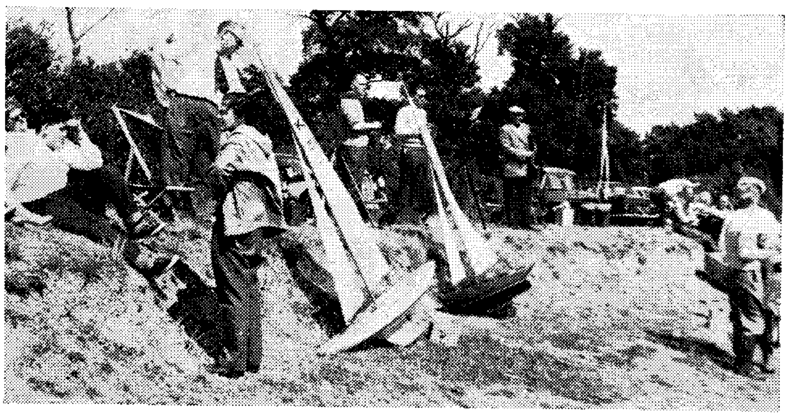
AFTER arrangements had been in preparation for months, the secretary of the International Radio Controlled Models Society was told by an official of the Ministry of Works that the society's annual regatta could not be held on the Rick Pond at Hampton Court, London.

The information was given to him on the eve of the event. No reason was stated. Forunately, the thorough preparation enabled the IRCMS to use an alternative sailing water at Hatton Cross, near London Airport. Although the society did not have the use of the excellent club facilities of the MY Six Metre Association, a large tent was obtained and members' wives served refreshments throughout the day.

No prize was offered for the pairs event, and the Challenge Cup was held over.

—ROY MARTIN





**RESULTS**

**Saturday: Steering contest (open)**

| | | | |
|---|---|---|---|
| 1st | Foster | *Cinderella* | 6 m. |
| 2nd | Cascoigne | *Senorita* | Q |
| 3rd | Redhead | *Isis* | 6 m. |

**Q and Ex-A class race**

| | | |
|---|---|---|
| 1st | Tamplin | *Selma* |
| 2nd | Cascoigne | *Senorita* |
| 3rd | Merrick | *Gypsy* |

**Ex-6metre race**

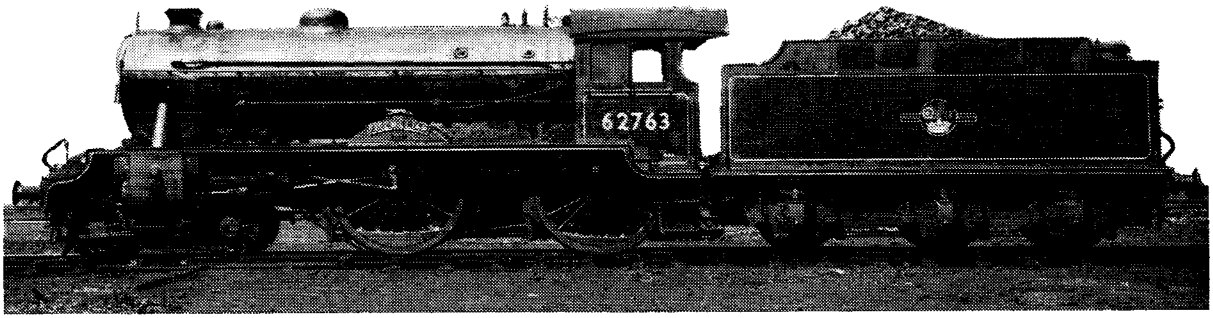
| | | |
|---|---|---|
| 1st | Foster | *Cinderella* |
| 2nd | Brothers | *Bee* |

**Sunday: Steering contest (open)**

| | | | |
|---|---|---|---|
| 1st | Tamplin | *Selma* | Q |
| 2nd | Foster | *Cinderella* | 6 m. |
| 3rd | Jeffries | *Radionnaire* | 5.5 m. |

**Team relay race**

| | | |
|---|---|---|
| 1st | London, IRCMS | Q class |
| 2nd | Newcastle, IRCMS | 10 raters |




**LIBRARY OF LOCOMOTIVES**

AN ME STAFF FEATURE *Continued from August 31, pages 255 and 256*

# THREE SCOTS SHIRES ARE THE LAST

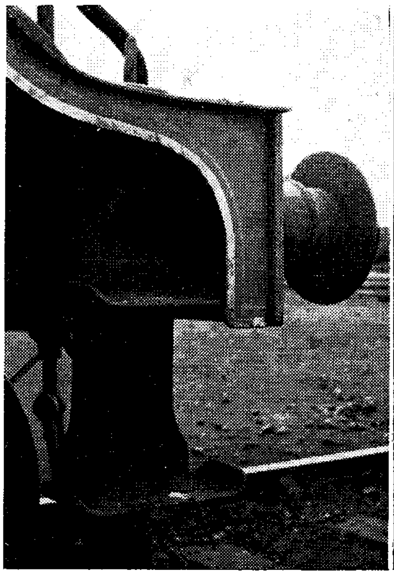
*ROBIN ORCHARD pays further tribute to a good-looking class which since 1957 has been "cut up without mercy"*

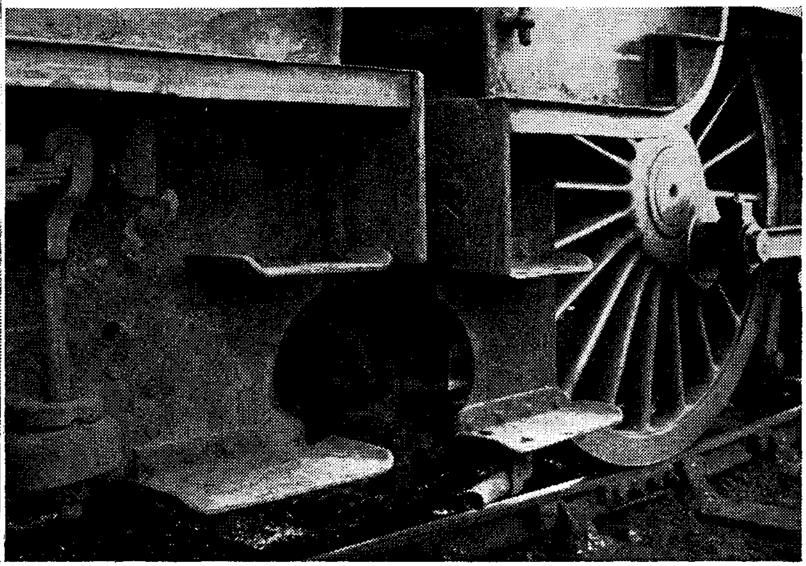
THERE is nothing spectacular to record of the Shires and Hunts. They were at the same depots for years carrying out almost the same duties.

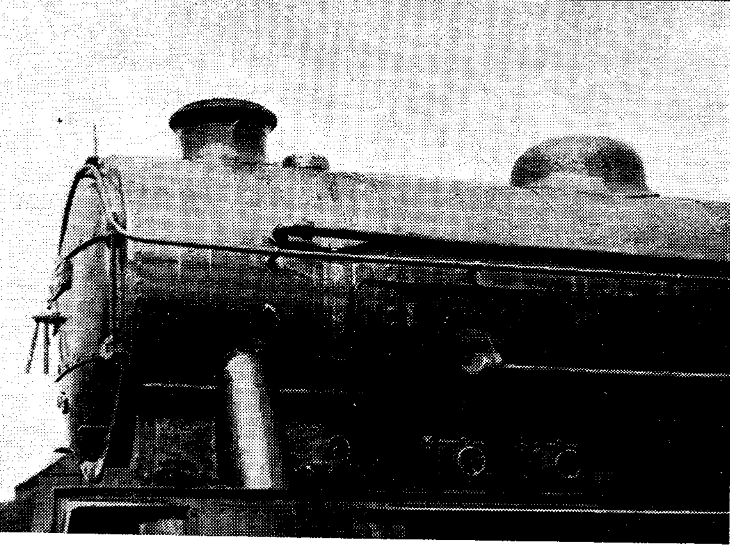
Originally they were employed in Scotland in the express passenger classification, working the Glasgow-Edinburgh, Carlisle-Edinburgh, Perth-Edinburgh and Aberdeen-Edinburgh service, turn-and-turn-about with the Scottish Directors. Over the years they were gradually demoted from top class work, to finish their lives on shorter, lighter hauls. They were allocated to Perth, Eastfield, Edinburgh St Margarets and Haymarket and Dundee, and even up to recent years were to be found at these depots. In England they were stationed at Leeds, Hull and York, where they were still to be seen in recent times.

They were mainly confined to the North East of England and to Scotland, although in the early days of their lives they not infrequently ran to King's Cross. Manchester and Liverpool expresses, which they handled well, were their principal cross-country trains. They were just another class with a wheel arrangement which always seemed to produce speedy, versatile locomotives. Crews liked them, even if the ride they gave was a little rough.

In 1928 *Peebles-shire* showed how well she could



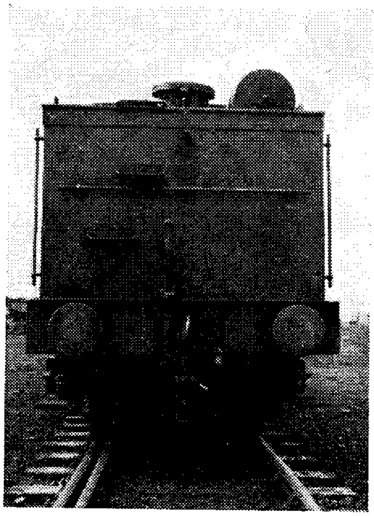


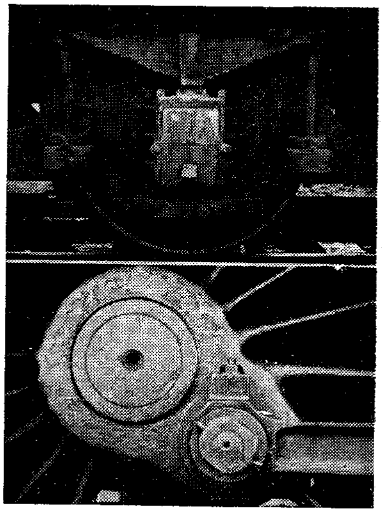


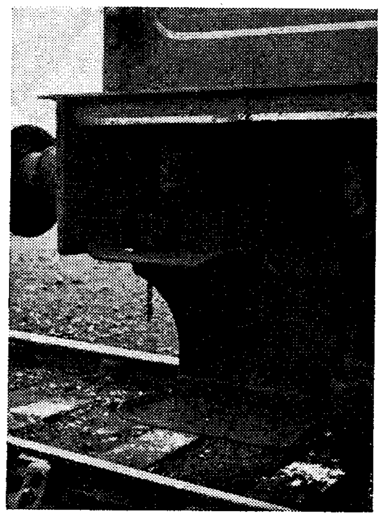
run on the difficult line from Carlisle to Edinburgh, a route which contains very steep and long gradients. The schedule for the section from Carlisle to Newcastleton was a very tight 32 minutes, yet with speeds of 65 m.p.h. in places *Peebles-shire* was through with time to spare. All the remainder of the run was completed in similar style, and the train reached Edinburgh nearly four minutes ahead of schedule. Its highest speed was over 70 m.p.h.

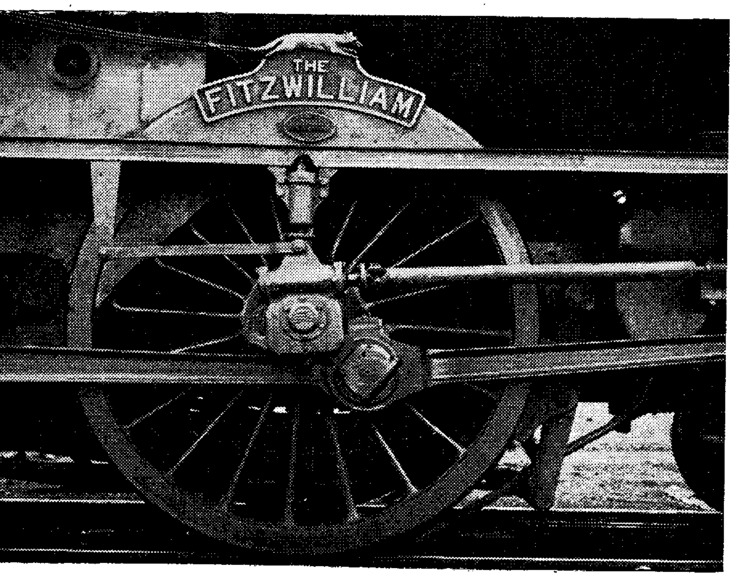
Today only three of the whole class are left. They are Shires. All the Hunts have been scrapped, and possibly while I am writing this the last three Shires are travelling to the scrapman.

The first to be withdrawn was *The Morpeth*. Thereafter they all remained until 1957, when the scrapping proper began. They have been cut up without mercy. In 1957 four locomotives were scrapped, No 2735 of the Shires and Nos 2766, 2769 and 2772. In the following year the work was stepped










up and 12 passed to the scrap heap, Shires 2702, 2703 and 2732 and Hunts 2736, 2742, 2749, 2750, 2754, 2755, 2764, 2767 and 2774.

Compared with 1959, the two earlier years were very mild, for 36 of the class were liquidated. They were Nos 2700 (the original) 2701, 2704, 2706, 2707, 2708, 2713, 2714, 2715, 2720, 2721, 2722, 2724, 2725, 2728, 2730 and 2731 of the Shires, and Nos 2737, 2738, 2741, 2745, 2746, 2748, 2751, 2752, 2753, 2756, 2757, 2758, 2760, 2761, 2768, 2770, 2771, 2773 and 2775. This left only 23 out of an original 76. In 1960 the total fell to 14 with the withdrawal of Shires 2705, 2709, 2710 and 2719 and Hunts 2739, 2740, 2743, 2759 and 2762.

This year the scrapping has been high. Only three of the whole class remain. The D49/2 Hunt class was officially extinct from about May when the last example, No 62747 *The Percy*, was withdrawn. The other Hunts cut this year were 2727, 2744, 2763 and 2765.

None of the remaining three, all Scots Shires, will see the end of this year. Already Shire class Nos 2711, 2716, 2718, 2723, 2729 and 2733 have gone. Those left are 2712 *Morayshire*, 2717 *Banffshire* and 2734 *Cumberland*.

★ *To be continued on September* 28

# Around the TRADE

## For twist drills

MODEL ENGINEER workshop has recently examined and tested the Model 2000 drill grinding attachment designed and manufactured by Guys (Handtools) Ltd.

The attachment is a smart-looking, robust tool made to accommodate twist drills from $\frac{1}{8}$ in. to $\frac{3}{4}$ in. diameter. It can be used with any bench grinder. Provision for setting the head at a predetermined angle incorporates a positive locking device which ensures that all drills will be ground accurately to the same angle with no fear of any slight discrepancies. The range of movement is sufficient to grind drills at all the angles recommended for different classes of work.

Guys suggest that the attachment can also be mounted on the lathe. MODEL ENGINEER does not encourage the amateur to adapt his lathe for any grinding operations; every precaution should be taken against abrasive dust if the lathe is used in this way. Make sure, too, that the grinding wheel is at its correct speed to obtain a good finish.

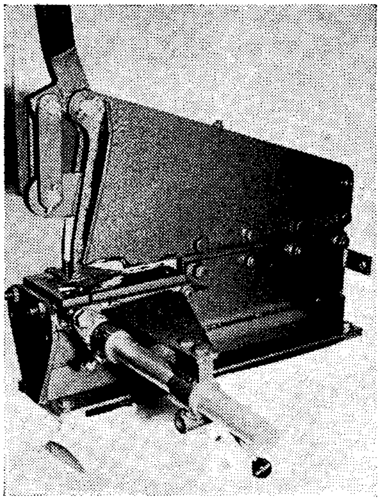
The same makers have produced a small hacksaw frame for taking a Junior type of blade with a securing pin at each end. The frame is stoutly made from solid steel and is fitted with the pistol type handle grip. It has a knurled adjusting screw for obtaining the correct blade tension.

The price of the drill grinding attachment is 42s. and of the hacksaw frame 5s. 9d. They are obtainable from most good class tool suppliers, or direct from 13-17 East Dulwich Road, London SE22.

## New bench shear

NEW principles of construction and operation have been incorporated in the GB sheet shear manufactured by Ferrous Transformers Ltd, Church Road, Croydon, Surrey. It is constructed entirely of steel, and has three blades, each of which can be reground and adjusted. Instead of working on the usual scissors principle, which necessarily entails some bending or distortion of the material, the machine operates by removing a narrow strip of metal from the waste side of the cut. This results in clean cutting, with no twisting or buckling, and also enables notching or slotting to be carried out. Sheets of any length can be fed forward freely and without obstruction.

A useful addition to the machine is a stop bar, with an adjustable gauge which can be set for cutting parallel

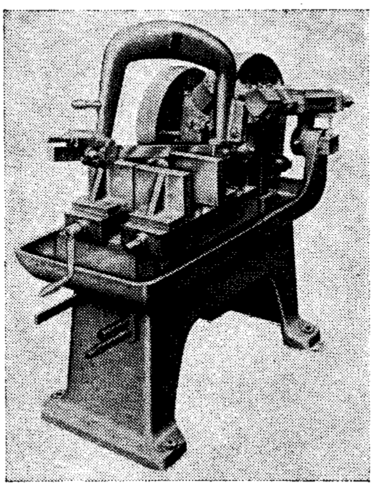


strips of various widths. It is removable for dealing with large sheets, or can be replaced by other locating devices for repetition work. Supplementary equipment includes a tubular sheet support, adjustable in two dimensions for carrying large and heavy sheets

The standard shear has a capacity up to $\frac{1}{8}$ in. thick for mild or stainless steel, or $\frac{3}{16}$ in. thick for non-ferrous metals. A special small version, measuring only $5\frac{1}{2}$ in. × $5\frac{1}{2}$ in. × 5 in., excluding the hand lever, will cut steel up to 20 s.w.g., removing a strip 3/32 in. wide, and is well suited to many purposes within the sphere of the small amateur or professional metalworking shop.

## Machine hacksaw

RAPIDOR machine hacksaws made by Edward G. Herbert Ltd, Atlas Works, Levenshulme, Man-

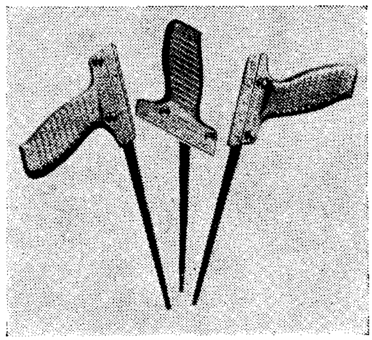


chester 10, can now be obtained equipped with either the normal type of vice or with the patent "centre-cut" vice which was first put on the market five years ago.

The centre-cut vice permits the saw blade to work through steel-lined slots in the centre of both jaws, so that the bar and the blank being sawn off are both rigidly held. It is, therefore, possible to hold and cut short lengths of material which could not be dealt with in the offset vice employed on such machines. The vices have a capacity of 8 in. × 8 in. for the smaller model, and 12 in. × 12 in. for the larger model. They are not intended for angular cutting, as swivelling movement would be impracticable with the slotted jaws.

In the photograph, a Rapidor No 1A machine is cutting a disc only $\frac{1}{2}$ in. thick into two parts, an operation which would be impossible in a machine fitted with the ordinary vice.

## Three-way saw



THERE are so many varieties of sets of saw and adjustable saws that it would seem impossible to design a new type, yet the new Rolls Three-Way padsaw appears to be unique.

The pistol-grip handle is designed to accept a 9 in. tapered keyhole blade in eight different positions, thus affording easy access to awkward sawing positions in corners, close to ceilings and walls.

In addition to varying the position of the blade, or reversing it in the handle, it can also be shortened to meet the needs of a particular job.

The Three-Way Padsaw kit, which sells for 5s. and is obtainable from Woolworths, also includes a 10 in. standard hacksaw blade.

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We are sorry that a picture of a Myford lathe was used in an advertisement by Charles Portass and Son. The slip-up occurred when the original block was damaged during printing.

**By J. J. Constable**

# This lubricator is different

As you will see from photograph No 41, the mechanical lubricator on *Sirena* is rather unorthodox in appearance and its innards differ from those of the more usual oscillating pump. While there is no reason why an oscillating pump cannot be fitted, I will describe the one shown.

The amount of oil supplied to the engine can be varied in several ways as well as by the number of teeth on the ratchet engaged in each revolution of the eccentric on the crankshaft. The throw of the small eccentric operating the ram, the size of the ram, and the amount of travel given by the return spring have proved ideal I would rather have an oil-stained shirt than a useless engine; too much oil is better than too little, particularly with cast iron cylinders and the problem of rust. So far I have had no trouble; the pistons are packed with graphited yarn as an alternative to the oil grooves.

Full details of all the various parts that make up the lubricator are seen in Fig. 80. I made the container from 1/16 in. gauge brass tube shouldered down at the top to form a locating rim for the cap, which is from the same material. The cap is a snug fit and the short stub of 3/32 in. dia. rod provides for easy removal and filling without my removing the engine bonnet.

For the bottom of the container I used a disc of 1/16 in. gauge brass, silver soldered into position. I find it easier to do this kind of work by turning a small recess in the barrel, making the disc to fit, and brazing. The off-centre 7/32 in. dia. hole will take the delivery valve which screws into the valve box and, in effect, holds the pump proper in place. Particular care should be taken to see that the bottom of the container is perfectly flat and free from burrs, or an oil-tight seal will not be possible. I have known many a pump blamed when it was doing its job but the oil was by-passed on its way to the cylinders.

The rectangular piece of 1/8 in. gauge brass, complete with bronze bush, is silver soldered to the barrel. Take particular care that it is in line with the outlet hole in the bottom. The brass pad carries all the operating gear and the small 7/64 in. screwed shaft. On assembly, screw the ratchet wheel on to the longer threaded part; the shorter end carries the stainless steel eccentric. The ratchet wheel can be obtained from ME advertisers; a slight variation in the number of teeth is not material.

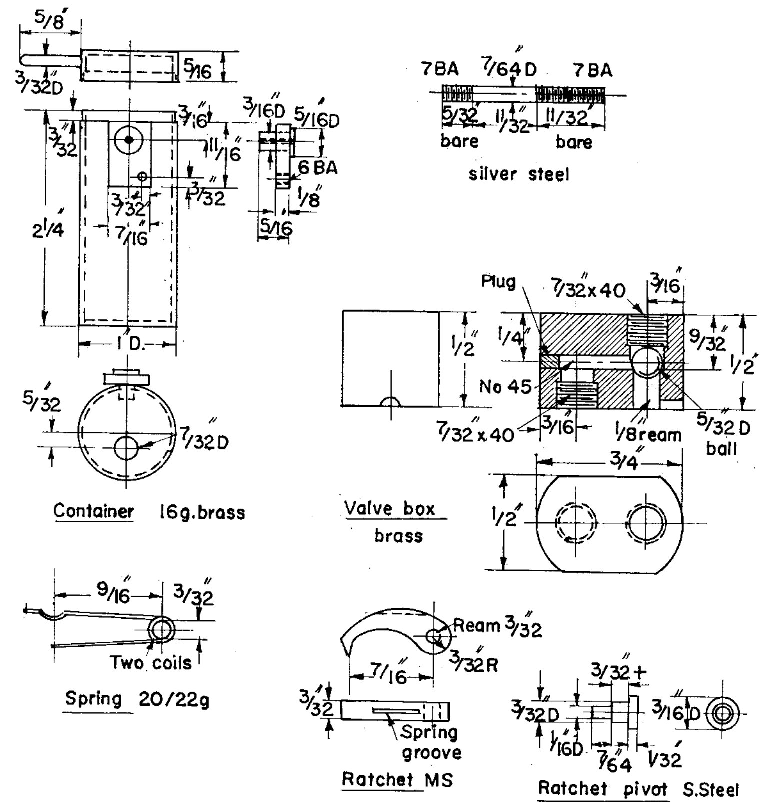
A really good finish should be aimed for on the working face of the eccentric. Although the eccentric is constantly lubricated, the oil will not entirely overcome a poor finish. The 4 BA hexagon shouldered nut screws on the end of the shaft, and the shoulder provides a bearing for the ratchet arm, which should be perfectly free to oscillate in a vertical direction with the minimum of side play.

Make the valve box from a piece of 1/2 in. square brass. After drilling a passage with a No 45 drill, you will need a plug. It is silver soldered into position before the ball seat is completed for proper seating of the ball. Any heating after a ball seat is formed is likely to ruin the good work. I would emphasise the importance of this ball seat as the correct functioning of the pump depends upon it.

The small semi-circular passage allows the oil to be drawn up as the plunger is retracted. You can cut the passageway with a small round file. The valve box must seat accurately on the bottom of the container and, when in place, must provide an oil seal. If there is any doubt about this, interpose a thin copper washer.

Use a piece of 2 BA hexagon rod for the barrel. The reamed hole in the centre should be a really good fit

*Below and on opposite page: Fig. 80. Mechanical lubricator for* SIRENA, *the Sentinel modelled in 5 in. gauge*



for the plunger. Although a gland nut is provided, it will not make up for all deficiencies.

The plunger is returned at the end of each stroke by the $\frac{1}{2}$ in. spring, which should be an easy fit on the plunger and as light as possible, because the eccentric, besides pumping the oil, has to overcome the spring tension. The end of the plunger has a $\frac{3}{16}$ in. dia. ring to provide a shoulder for the return spring. Your best method is to turn a slight pip on the end of the $\frac{1}{8}$ in. dia. rod, make a corresponding hole in a thin slice of a $\frac{3}{16}$ in. dia. rod, and silver solder the parts together. Any cleaning up can then be done in the lathe. I do not recommend turning down a length of $\frac{3}{16}$ in. dia. stainless steel.

In the making of the delivery valve I would once again stress the need for a good ball seat. The small spring should be as light as possible and a nice fit in the cap. It is important that both ends of the spring are square so that the ball is kept on its seat. The mild steel link connects the eccentric drive to the ratchet arm, which pivots on the 5/32 in. dia. hole, while the two $\frac{1}{16}$ in. dia. holes take the ratchet pivot and the spring stud. These are slightly riveted over after they have been placed in position; the riveted heads can be seen in the picture. Three 7 BA tapped holes allow for slight adjustment so that one tooth is engaged to a revolution of the eccentric.

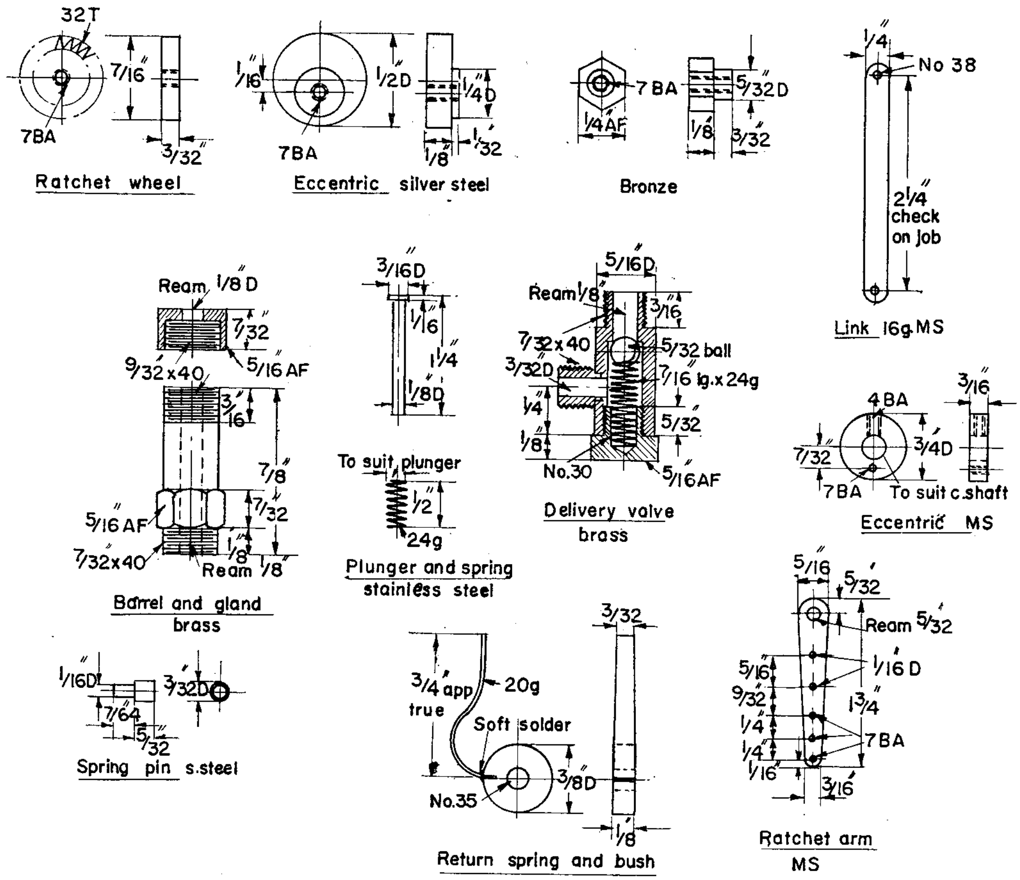
With a Junior hacksaw, I cut a groove in the ratchet for the spring to rest in; it is about $\frac{1}{16}$ in. deep at the lowest point. After riveting the ratchet into place, see that it is perfectly free to move by making sure that it is fixed on in the right direction. The drive occurs on an upward stroke of the ratchet arm.

The spring coil seats on the other small stud, with the cranked part in the ratchet groove and the straight part on the lower side of the ratchet. Should there be any tendency for the spring not to remain in place, cut another shallow groove in the lower part of the ratchet.

My bush to hold the return spring is a slice off a $\frac{3}{8}$ in. dia. brass rod, drilled through the centre with a No 35. A narrow slot is cut to take a piece of old clock spring, which is soft soldered into place; if it is not overheated, the temper will not be drawn. At first the spring should be about $\frac{3}{4}$ in. long. Any cutting to length should be done after assembly. A 6 BA slotted screw provides for final adjustment. The $\frac{3}{4}$ in. dia. eccentric is secured to the crankshaft with a 4 BA socket-headed grubscrew, and two small 7 BA studs connect the link to the eccentric and ratchet arm.

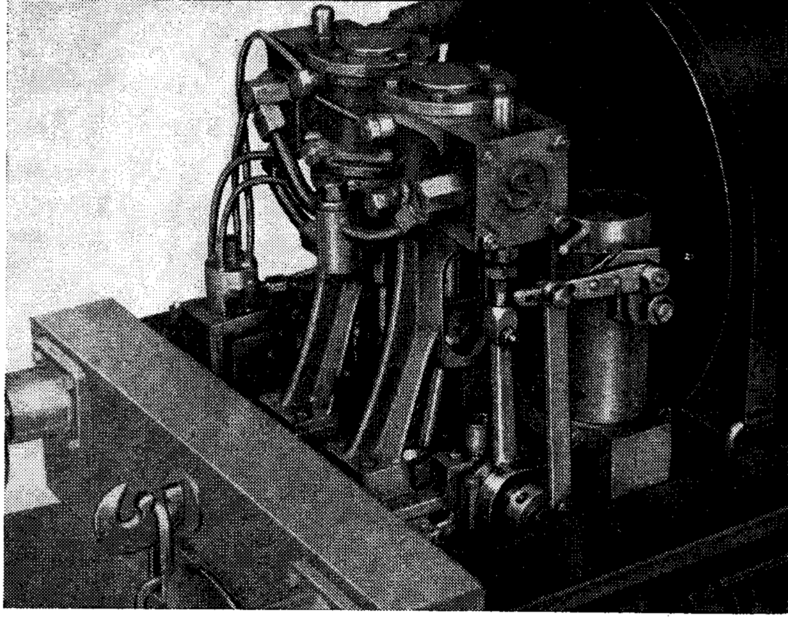
Assembly is quite easy. Screw the barrel into the valve box, making sure that the 5/32 in. dia. ball is in place. Put the plunger, complete with the spring, through the gland, and pack with graphited yarn. Insert the plunger into the barrel and test the gland for tightness. The spring should easily return the plunger. Place the pump into the container and fix it in position with the delivery valve, taking care that the plunger is vertical with the driving spindle hole. By the hand-screw ratchet wheel on the spindle, thread through the bush and screw on the stainless steel eccentric. You can hold the work by hand.

Then mount the ratchet arm assembly and fasten it with the stepped 4 BA nut. You can test the pump



with a gauge which should not read less than 200 p.s.i. The pressure should be built up to 150 lb. and then left for about an hour. If it has not fallen below 120 lb., the pump can be passed; if it cannot be maintained, check for leaks and examine the seating of the ball in the valve box.

It will be seen from the photograph that the lubricator is held in position with an eccentric which is silver soldered to a piece of brass fixed to the bedplate. I have not described it as constructors may wish to use their own method.



*Photograph No* 41: *Engine and mechanical lubricator*

**Drain cocks**

The cylinder drain cocks on the engine are single-cock, with one lever operating all four ports. Except in size, it is the same as the one on my other engine. It has proved very satisfactory. There is no tendency for it to become stiff, as with constant use it is continually lubricated by cylinder oil which passes through with the condensate.

Full details of the components are in Fig. 81.

The taper plug cock should first be made from $\frac{1}{4}$ in. dia. stainless steel rod.

Holding a length in the three-jaw chuck, face the end and centre it with a small centre bit. Loosen the jaws, and then pull it out until just over $1\frac{1}{4}$ in. protrudes. Re-tighten the jaws.

The $\frac{3}{16}$ in. part is turned down to to $\frac{1}{8}$ in. dia. for threading 5 BA, and the $\frac{1}{8}$ in. parallel portion the $\frac{3}{16}$ in. Turn the taper part with the rod supported by the lathe back-centre. The lathe top-slide should be set over the required amount and a really good finish obtained. For such work, I find that a really keen thin parting blade, with the corners slightly rounded, provides a good finish.

As a similar taper will be required in the body, the top-slide should be firmly locked in the set-over position and not disturned until the body has also been bored. Once the plug has been turned to the taper, it can be removed from the chuck. It should not be parted off at this stage.

Make the taper bore in the body with the table still set over in the same position as for the plug cock. Holding a piece of $\frac{5}{8}$ in. dia. brass or bronze rod in the chuck, drill a 5/32 in. dia. pilot hole right through. With a small boring bar held in the toolpost, use the lathe top-slide to bore. Only small amounts should be taken off at a time, as the boring bar will be very slender and in any event only a small amount of material has to be removed. Use the taper plug as a gouge until it enters the body by the right amount. The boring bar should be really sharp, and not more than 5 thou should be taken off at a pass. Near the final stages, make several passes with the same cross slide setting.

As soon as the bore has been finished, the $\frac{1}{2}$ in. dia. portion can be turned down and threaded $\frac{1}{2}$ in. × 26. The body can then be reversed in the chuck and the $\frac{5}{16}$ in. dia. shoulder turned down.

Drill the four $\frac{1}{16}$ in. dia. cross-holes through body and plug, and also the No 46 hole for the outlet nipple. The

● *Continued on page 330*

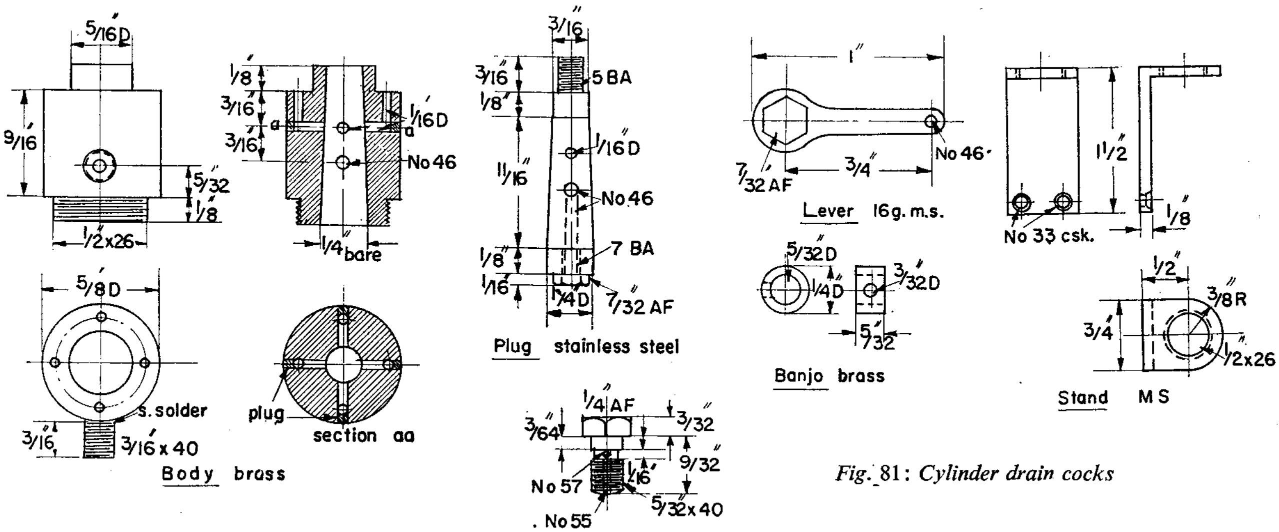



*Fig.* 81: *Cylinder drain cocks*

# READERS' QUERIES

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

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

## Stirling at Fall River

I am building a $\frac{3}{4}$ in. scale Stirling 8 ft Single and I would like to know what colour various components of the originals were painted. The parts which I am not familiar with are the inside and outside of the main frames, the inside and out of the bogie frames, the outside of the tender frames, the inside of the cab, and the running boards. Any help you can offer will be appreciated. Do you know if British Railways have any drawings for the Stirling 8 ft Single?—R.P., Fall River, Massachusetts.

▲ *The mainframes were painted dark maroon and the insides of them, under the boiler, were in vermilion. The outside of the tender frames was dark brown. Running boards were black with the valance or edging in dark maroon.*

*All wheels were green and axle ends black, with lining between the two colours. The inside of the cab was probably buff down to waist level, and then black.*

*It is possible that the chief engineer's department, British Railways Eastern Region, Doncaster, may still have the drawings for the Stirling Single.*

## Roundabouts

I am making a fair roundabout. I have got a good way on with it, but have run up against trouble with the twists—the twisted brasswork to which the horses are attached, going up and down on the cranks. I believe that it is possible to twist them out of square, brass tube. Could you please tell me of any other way?—L.G., Wheatley, Yorkshire.

▲ *A method of twisting brass tube by a square silver steel bar, which is gradually withdrawn from the brass tube as the twist is made, has been found successful by ME readers.*

*Suitable brass tube is obtainable from T. W. Senier Ltd, St John Street, Clerkenwell, London EC1. It should be well annealed before twisting.*

## Filing rest

I wish to construct the roller filing rest described in *Lathe Accessories.*

Could you give me the main measurements for its use on an ML7 lathe?—E.R.H., Malvern Link, Worcestershire.

▲ *There is a good deal of flexibility in the measurements for this device, depending very largely on the class and size of work which you wish to accommodate.*

*The angle bracket which forms the main structure could be about 3 in. long by 2 in. wide at the base, and $1\frac{1}{2}$ in. high. Rollers should not be less than $\frac{1}{2}$ in. dia. with flanges $\frac{3}{4}$ in. dia., and should be hardened. The span between the rollers should be arranged to take work of not less than 1 in. dia., or larger if it should be found desirable. The vertical sliding member which carries the rollers should be not less than $\frac{1}{4}$ in. thick, and wide enough to give the required span. To obtain adequate height adjustment, this member could be arranged to overhang the edge of the cross slide of the lathe when it is fitted in position.*

## Worm gear

I have a little problem which I have come up against in making a worm gearing for a lathe cross feed. I have arrived at the conclusion, with the help of your book *Gear Wheels and Gear Cutting* that I require a gear wheel of 2 in. pitch dia., 16 diametral pitch, 32 teeth with a circular pitch of 0.196 in., and a worm of 1.096 in. pitch diameter with a lead of 0.196 in., to mesh with the gear wheel.

Now this is where I am beaten. I cannot work out which change wheels I have to set up on the lathe to cut a worm with a lead of 0.196 in.

I wonder if you would be good enough to send me the gearing set up to obtain 0.196 in. feed per revolution? My lathe is a Myford Super 7 with standard change wheels, leadscrew 8 t.p.i.—E.J.P., Cricklewood London.

# 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.**

## Wind pump for fishpond

I am interested in making a wind pump for circulating water for a fish pond, on the lines of a farm wind pump, but somewhat smaller.—J.D., Wollaton, Nottingham.

▲ MODEL ENGINEER *has published articles on the construction of windmills for pumping and other purposes, but unfortunately the issues have been out of print for many years.*

## Battery TV

I have a caravan. Would you tell me if it is possible to run a small a.c. television set from some sort of generator or a 12 v. battery?—H.E., Solihull, Warwickshire.

▲ *Apparently special types of television apparatus are made for this form of supply, but it is extremely doubtful whether you could adapt a standard form of television set.*

## Beam engine colours

I shall complete a Bassett-Lowke beam engine in the foreseeable future, and I am beginning to wonder how it should be painted. I have never seen a completed model, and the books of beam engines which I have seen are not in colour.

Would you be good enough to suggest to me how the engine should be painted?—J.A.C., New York.

▲ *There is no definitely recognised colour scheme for these engines, but apparently most of them were painted either grey or dark green, and sometimes the moving parts such as the spokes of the flywheel or the centre part of the beam and connecting rod, might be red. This, of course, applies to parts which are not machined, as these would have to be left bright.*

*It is advisable to avoid bright or gaudy colours, and the finish should be dull or semi-matt rather than glossy.*

*Any further information, please?*

▲ *It is not necessary to work to diametral pitch if you are constructing both the worm and the wheel, and the proposed pitch of* 0.196 *in. would be difficult to obtain on a normal screw-cutting lathe without special wheels.*

*You would find it far easier to work to a circular pitch of a size which could conveniently be cut, such as* 0.2 *in.* (5 *t.p.i.*) *and make the worm wheel slightly larger to suit this pitch. The worm wheel can be gashed with a* 16 *d.p. cutter, and then finished with a hob made to the size and pitch of the worm.*

*In any event, hobbing would be desirable for finishing the worm wheel. The hob could be made of tool steel or (for a one-off job) mild steel subsequently case hardened. It should have four to six teeth, not excessively wide, and preferably cut on the slant.*

## Wet liners

What are "wet liners"? How are they made, or where can they be bought? How are they inserted into the holding material?—H.H.R., Liverpool.

▲ *The term "wet liner" defines a sleeve forming the actual cylinder of an engine, and also the inner wall of the water jacket, as distinct from a similar sleeve inserted in the water jacket, which already has its own inner wall; this is known as the "dry" liner.*

*While the methods of manufacturing either type are generally similar, details may vary. A great deal depends on the particular size and type of engine. The usual method of manufacturing is to machine the liners from cast iron or high tensile steel tubes.*

*Some liners are pressed or shrunk into the cylinder blocks, but many are made a relatively easier fit, and resilient packing rings are employed to seal the top and bottom of the water jacket.*

*Several of the small engines described in ME have been fitted with "wet liners," including the* SEAL, SEAGULL *and* SEALION *engines, and the water-cooled version of the* KIWI MARK II. *The details have been fully described in the articles on these engines.*

## Steam trials

After four unsuccessful attempts to raise steam on my 3½ in. gauge *Juliet*; and one very unsuccessful attempt to raise steam on my brother's 2½ in. gauge, I have given up.

My method of trying to raise steam on all occasions has been with a foot pump connected to a small pipe in the chimney extension. This gives the same effect as if the train was in motion, but on all occasions I get to the point when the water boils, and then the whole thing seems to loose its heat. As much as I try nothing will bring the water back to boiling point; my brother's *Juliet* was just the same.

My other attempts have been with a vacuum cleaner motor which is much too fast, and with an Army blower motor, which is much too slow.

My brother, who travels round the exhibitions, tells me that at one place someone connected a small electric motor into the electric light and in less than five minutes his model was running.

If such a motor can be bought, can you supply the name and address?—H.B., Huyton, Liverpool.

▲ *It is advisable in using a foot pump to have an air reservoir between the pump and the jet in the extension chimney; a non-return valve should be fitted so that some pressure may be built up.*

*Pumping must be maintained until the engine has raised enough steam to work its own blower.*

*Try using charcoal, broken up to the size of broad beans, and previously soaked in paraffin. As soon as steam is raised, start feeding steam coal or anthracite or a mixture of the two.*

*From your letter, it sounds as if you are removing the auxiliary blower too soon.*

*Rotary blowers driven by an electric motor of about* ⅛ *h.p. are ideal for steam raising. They can often be obtained from Government Surplus stores. Bond's of Euston Road, N.W.*1, *also stock them.*

*With a rotary blower, do not use a fine jet in the extension chimney, but an orifice about* $\frac{3}{16}$ *in. diameter.*

## Problem in S. Rhodesia

I am having difficulty drilling holes in the lathe 28 in. deep. I have been using a "D" bit, and it continually breaks in the hole. I have tried putting clearance, but without avail. The holes are ½ in. dia., and I have a 6-in. lathe.—D.H., Salisbury, Southern Rhodesia.

▲ *Undoubtedly many problems are involved in drilling holes* 28 *in. deep. Where this problem arises, specially made drills are employed, based on the D principle, but with side clearance as on twist drills.*

*Forced coolant supply is essential, not only to keep the drill point cool, but also to expel chips which are otherwise bound to pile up and jam the drill.*

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**SIRENA . . .**

*Continued from page 328*

plug should be inserted in the body and held with a 5 BA nut on the threaded part. While the plug is still in the body, it is drilled up the centre with a No 46 to connect up with the other cross-holes.

The cock can now be dismantled, and the four $\frac{1}{16}$ in. dia. holes on a 15/32 in. dia. circle to meet the cross holes can be drilled. Counter-bore the upper part of the holes 3/32 in. for about 3/32 in. depth to provide a seat for the pipes. The $\frac{3}{16}$ in. × 40 nipple are silver soldered into position at the same time as the 3/32 in. copper pipes, whose length can be determined by taking a piece of wire to the respective boss on the cylinder.

Four small plugs, required after the passages have been drilled, are also silver soldered in at the same heat. The small 5 BA hexagon boss at the bottom of the plug to carry the lever can be either filed or machined while it is held in the body. The hexagon is to enable the lever to be mounted at the most convenient angle when the body is in place in the stand.

At the ends of the pipes are small banjos, silver soldered in place and held to the cylinders with the 5/32 in. × 40 hexagon headed studs. The $\frac{1}{16}$ in. wide groove need be only a few thou deep, as the No 57 hole is drilled right through and allows exit from either side. The centre No 55 hole provides access into the cylinders.

Small thin copper washers may be needed as packing to give a steam-tight joint between banjo and cylinder boss. Aluminium washers should not be used as they tend to corrode by electrolytic action when in contact with brass. As the brass also becomes pitted effective sealing afterwards is not easy.

Make the stand for the drain cock from a piece of ⅛ in. gauge mild steel angle. It is threaded ½ in. × 26 to take the threaded part of the body. The small fit in the photograph was filed so that an open-ended spanner could be used to tighten the cock into place.

The small lever is secured to the plug by a washer and a small 7 BA screw in the end of the plug, which should be tapped as shown. After silver soldering the pipes and so forth in the body, you may like to lap plug and body with a slight trace of brass polish, such as Brasso. Do not use any coarser abrasive paste, and take particular care to wash off all traces of the brass polish with a good bath in paraffin.

★ *To be continued on September 28*

# 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*

## SECOND BOOK ?

SIR,—MODEL ENGINEER of August 24 contained the hundredth article in " Locomotives I Have Known."

Each fortnight I anticipate with sorrow that you may have exhausted the supply of articles, but still they come, and I sincerely hope that they will still continue to do so for some time although we know that the supply is unfortunately not limitless.

I hoped that all the articles not already published in the book *Locomotives I Have Known* will without exception be published in a companion volume, perhaps as the *More Locomotives I Have Known*, so that the whole series will be put into a permanent form.

In the first book 66 articles were reprinted. This leaves a further 34 (to date) to be published in permanent form. In addition I would like to see the article of May 18. The Drawing Board by the Window reprinted in full in the second book as a preface.

What do other readers think ?

Birmingham. W. FINCH.

## TICH, 1896

SIR,—Every reader of MODEL ENGINEER is familiar with *Tich* by LBSC.

An illustration of 1896 shows two full-size locomotives of this type working in the yard of Sir W. G. Armstrong, Mitchell and Co. of Elswick on the Tyne when the company—now part of Vickers-Armstrong —was occupied with the construction of the world's most powerful ships and guns.

The gun shown is of the " 110 ton " type (the weight of the barrel), and is on two trucks; the artist seems to have omitted the chains and wire ropes used to secure it.

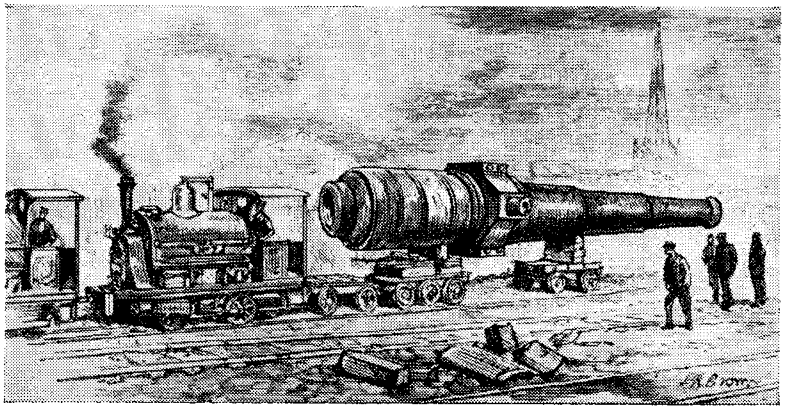
As the barrel weighed 110 tons, and each truck and chain would be about ten tons, and the little bogie about four, we have a weight of 124 tons being moved. No doubt each of these little engines would move about 100 tons in a normal train; in getting an abnormal load, such as this, round a curve a great flange resistance must be allowed for.

Observe a feature very seldom, if ever, seen on models of these industrial locomotives: the guard over the guide bars. Grit and dust settling on the bottom bar would score it into ruts, and a lump of scrap iron, if it fell between the crosshead and the stuffing box, would cause a disaster. The steel guard is made to lift so that the driver can oil the motion work on each side.

From the proportion of the cylinders, the engines seem to be " twelve inch " ones, small enough to go inside a factory and alongside the machines on which the work is produced. If they are carefully fired with good coal, there is no need for them to be a nuisance inside a shop.

The engraving comes from *The World of Wonders* (Cassell, 1896).

H. H. NICHOLLS.



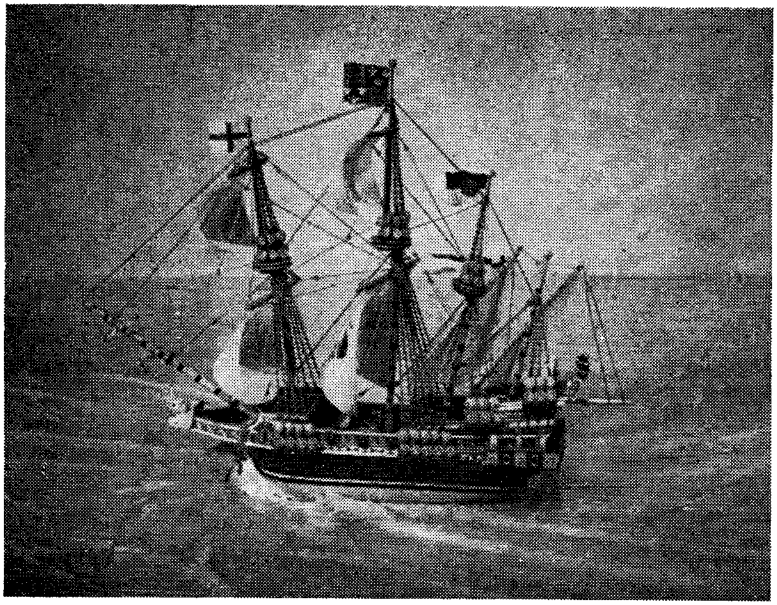
*Here is* TICH *hauling a* 110-*ton breech-loader from Elswick on the Tyne in* 1896, *when Armstrong, Mitchell and Company were turning out ships and guns for an Empire with dominion over palm and pine*

## MICROMETER

SIR,—As no comment has yet appeared in Postbag on Mr A. W. Edwards's interesting letter of June 22 about the history of the micrometer, perhaps I might be permitted a few observations.

Moore and Wright in their catalogue give credit to James Watt for its invention in 1819. They go on to say that a model of Watt's intrument is to be seen in the Science Museum, South Kensington, although when I was there recently I could not discover it on show. From the illustration in the M & W catalogue it would seem to bear little resemblance to the workshop tool of today as we know it.

Brown and Sharpe—whose record of development in the field of precision measuring tools is outstanding—give credit for the idea on which their micrometer business was based to a tool that J. R. Brown and Lucian Sharpe saw at the Paris Exhibition of 1867 the " Systeme Palmer," originally patented in France, 1848. A replica of this little instrument is on exhibition at South Kensington, with interesting range of micrometers lent by the B & S Manufacturing Company showing the gradual development of the tool that we know. Palmer's instrument, later by some years than James Watt's, embodies features still in use: graduated thimble, for fine increments; graduated barrel, for coarse increments (complete turns); and means for compensating wear on measuring points. The micrometer



*Which soap or detergent makes the best foam? This ship was photographed on a painted ocean against a background of wall-paper. The foam is suds*

screw is exposed, a feature which evidently persisted until 1885.

It would seem that, like many other inventions, the micrometer cannot be truly ascribed to any one man.

I will add a brief comment on another subject: Mr D. H. Downie's article on the building of a twin-head grinder in ME of July 20. Mr Downie says that most lathes face high in the middle. If, assuming that the saddle is properly clamped to the bed in taking a facing cut, this applies to the machines under Mr Downie's jurisdiction they are out of alignment and should be corrected, as all recognised alignment charts specify that facing should be dead flat to slightly hollow (perhaps 0.001 in. in 10 in. diameter) and *never* convex—clearly to ensure good contact on the assembly of mating faces.

Hanwell, W7. F. SEWARD.

## TIDE OR SURF

SIR,—A printing engineer whom I know has a roomful of very fine models of ships, ancient and modern. My photograph was taken several years ago when he was with *Reynolds Illustrated News*.

Mr Westbury's articles on photographing models reminded me of the picture as I used artificial lighting. The sea was colour-washed paper, with a few soapsuds for foam, and the cloud was a wall-paper background.

I wonder if he has seen the article in the current number of *Popular Science* (USA) in which a small cylinder, the size of a filter tip of a cigarette can give out a ½ in. spark indefinitely so long as it is tapped. It is being manufactured and sold in small lawn mower engines and Chrysler cars are trying them. No hint of them has yet been seen over here.

Tonbridge, Kent. F. H. W. COX.

*Mr Westbury has already written an article on the "spark pump." It will appear shortly.*—EDITOR.

## GOLIATH

SIR,—Mr H. C. Bateman [Postbag, August 10] has been betrayed by his memory. It was not the *Albion* which Penn's engined, but the *Goliath* of the same class.

Maudslay's engine the *Albion*, which was launched in 1898 and completed in 1901. See *Jane* and also *British Battleships* by O. Parkes.

Worcester Park, Surrey. A. H. S. COCKS.

## FORMER CHAIRMAN

SIR,—Thank you for the complimentary remarks about my locomotive *George V* in this week's ME.

May I put the record right by saying that I am no longer chairman of the North London Society? This position is held by Mr Harry Brookes; and my Christian name is not "George" but "Geoffrey"!

Golders Green, London. G. CASHMORE.

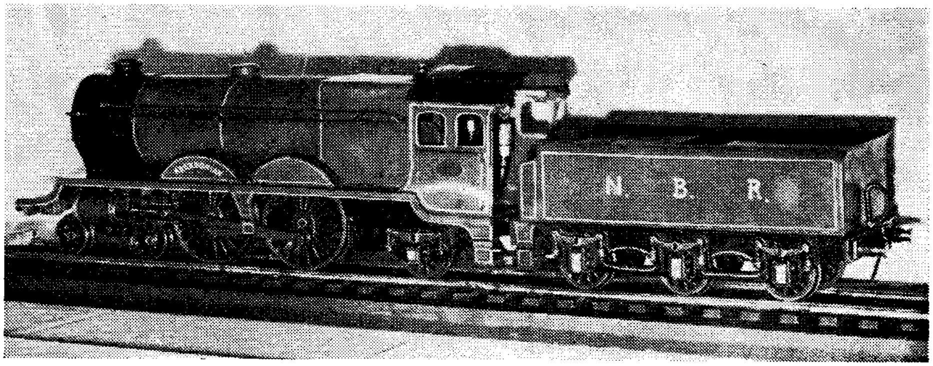
## PAINFUL MEMORY

SIR,—In reply to Mr Sibbald's query, the second Atlantic, No 869, ran for a few weeks under the name *Dundonian* but was soon rechristened *Bonnie Dundee*. I would be surprised if she reached Carlisle under her original name, as the engines in their early days were employed north of Edinburgh.

I well remember when No 869 failed on the Turnhouse-Saughton bank in 1923 through a burnt superheater tube. Unfortunately my form master knew nothing of engines, and I suffered the usual painful retribution for being late, with a little extra for making up silly stories!

Northern Command, York. R. S. VINNING (LT-COL).

*For Lt-Col Vinning the Atlantic* BONNY DUNDEE *(Dundonian) is a locomotive of painful memory. It once made him late for school, and the form master did not read* MODEL ENGINEER



## ARNOLD HILLS

Sir,—Inspired by George Woodcock's interesting article *Buses on the River*, Mr H. C. Bateman has paid a deserved tribute to Anrold F. Hills, the great philanthropist and Thames shipbuilder [August 10]. Surely he is mistaken, however, in saying that Hills met his death in the Canning Town works, when his car, a Thames, was crushed by a works locomotive ?

Arnold Hills died at his home at Penshurst, early in March 1927, within a few days of his 70th birthday; he was born on March 12, 1857. Despite severe physical disablement, he was of strong mental capacity, and will long be remembered for his strenuous efforts to maintain the building of warships on the River Thames. At the launch in 1911 of the British battleship *Thunderer*, he addressed his guests while he was prone on his invalid chair. His introduction of the 48-hour week, to which Mr Bateman refers, is characteristic of his upright and generous, almost benevolent treatment of his workers.

The mention of his car, a Thames, recalls another aspect of his work. When shipbuilding on the river declined, Hills entered the commercial motor industry, and the once-famous company of which he was chairman (the Thames Ironworks, Shipbuilding and Engineering Co. Ltd) manufactured motor coaches and other vehicles under the name "Thames" a great many years before the name was adopted by its present world-renowned builder. I recall a stage-coach type of Thames motor vehicle which attracted considerable interest in June 1911; I believe this freak survives.

Hills's home at Penshurst was Hammerfield, the former home of James Nasmyth.

Westminster, London. CHARLES E. LEE.

## ALL ALONE

Sir,—It was with surprise and gratitude that I read in MODEL ENGINEER for July 13 a second "Smoke Ring" about lone wolves.

I am most grateful to you for trying to help me, but in my special position we have the language problem to contend with; as you know, Portuguese is the language here. This means that the circulation of MODEL ENGINEER would be limited to those who can understand English.

In spite of my handicap, I am getting on all alone and my hobby gives me much satisfaction. Of late I have had but little time; modelling is essentially a hobby for the winter where I am concerned.

Next time I come over to England I will, of course, look you all up at Noel Street.

In the meantime, my kind regards, and my best wishes to Mr Oliver Smith.

Funchal, Madeira. J. H. S. DODWELL.

## WHICH GOOCH ?

Sir,—I see that the interesting model illustrated on page 131 of MODEL ENGINEER for August 3 is fitted with Allan straight-link valve gear. Beattie made considerable use of this gear, but as it was not invented by Alexander Allan until 1859 it could not have been fitted to an engine built in 1853.

If 1853 is the correct date, and the design was by John Viret Gooch, it is most probable that the Gooch valve gear was used, though it is, of course, possible that Allan's gear was applied later.

There is some doubt about who actually invented the Gooch gear. It is generally attributed to Daniel Gooch of the GWR, but there is a doubt whether it was not actually invented by John Viret Gooch.

Rustington, W. Sussex. K. N. HARRIS.

## HOME FROM NATAL

Sir—Having the good fortune to enjoy a trip back to England during 1960, and to meet Martin Evans and Edgar T. Westbury (besides spending too much cash on your publications !) I went in search of my beloved traction engines in the area of my childhood, where my relatives still dwell.

May I particularly mention Mr John Conner of Charleston farm at Boynton, near Bridlington in East Yorkshire, who was most courteous and hospitable and had two engines, the Fowler No 154629, which he hoped to repaint, and magnificent six-ton Garrett No 33295 of 1918 with twisted brass columns supporting the canopy, and exquisite paintwork embellished in the true showman's style.

The colour transparencies which I took are grand and have been greatly admired out here in Natal.

I believe that Mr Edwin Forth of Staxton, East Yorkshire, has a good collection of data and photographs. I did not manage to find him.

ME for June 29 brought me great surprise as Hunmanby in East Yorkshire has contained my relatives for hundreds of years and I spent over a month there on my visit.

T.M. of Hunmanby who requested information on testing Allchins may be the Mr Muller who used to give me a lift on one of seven or eight Burrell's when he was a driver with the ploughing Hunmanby firm of Parker's, whose threshing sets were a delight to behold some 30 years ago.

The steady rocking, the humming from the blower of the thresher, the slap of the long flat belts (which came off frequently) and the hot-oil-coal-firing smell—ah, nostalgia !

With hearty good wishes and thanks for an excellent magazine. I wouldn't miss it !

Glenmore, Durban. R. J. ECOB.

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## EXHIBITION PREVIEW

*Continued from page 313*

scroll work on the upper part of the standard. But the antique was somewhat out of harmony with the "contemporary" style of the lower part.

A small model of an English cottage spinning wheel, by S. Pickard, recalled the craftsmanship of an earlier age, and was attractive but hardly convincing. In distinct contrast was the very modern model of an electric car racing track, by J. Wylie, entered in the same class.

The art of ornamental turning was well illustrated by the set of chessmen in ivory by H. V. Yeatman. Only by very close inspection can the painstaking and skilful work devoted to this type of work be appreciated; it belies the general idea that the application of a mechanical process necessarily destroys craftsmanship.

Among engineering scale models, the Royal Enfield Constellation motor cycle by H. W. Hooper was the latest product of a prolific constructor who has exhibited several such models over a number of years. It was of his usual high finish and workmanship.

In contrast, C. H. Toogood, another frequent exhibitor, showed a model of the earliest known mechanically propelled vehicle, the Cugnot steam carriage of about 1770, in 1 in. scale. It was carefully and faithfully portrayed, especially in the boiler and engine parts, but the finish was rather heavy-handed.

Fidelity and careful detail work were present in the scale model Axminster carpet loom, of the Brinton Gripper type, by W. R. Bayliss. It embodied a very considerable amount of mechanical arrangement, and, so far as could be ascertained, should be quite capable of actual work. The figure of the operator gave a good idea of the size of the machine, but as usual in such models, was of dubious value in respect of realism; very rarely indeed is it possible to make human or animal figures, as appurtenances to models, really convincing. ■