7-20 April 1978 First and Third Friday Volume 144 Number 3582 40p

(USA & CANADA — $1.75)

Model Engineer

MAP

HOBBY MAGAZINE

Whatever happened to British tether racing?

Model Engineer

Founded 1898

Incorporating Mechanics, English Mechanics, and Ships and Ship Models

Volume 144 Number 3582

7 April 1978

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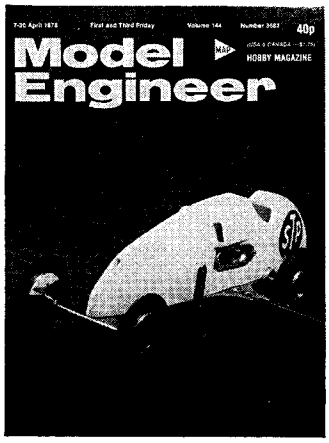
Second-class postage rates paid at New York, U.S.A. Registered at the Post Office for transmission by Canadian Post. American enquiries regarding news stand sales and advertising should be sent to MODEL ENGINEER, Eastern News Distributors Inc. 111 Eighth Avenue, New York, N.Y. 10011, USA.

Enquiries regarding Hobby Shop Sales to Bill Dean Books Ltd., 166-41, Powell's Cove Boulevard, Whitestone, New York 11357, USA. Telephone: (212) 767-6632.

MODEL & ALLIED PUBLICATIONS LTD

Editorial and Advertisement Offices:
P.O. Box 35
Hemel Hempstead
Herts, HP1 1EE

Tel:
Editorial 41224
Advertising 42501/2/3



This 10 cc. Super Tigre G60RV powered car illustrates the development of tether racing.

NEXT ISSUE

Hot Air Engine Report.

The Editor is pleased to consider contributions for publication in "Model Engineer". Manuscripts should be accompanied if possible by illustrations and should also have a stamped addressed envelope for their return if unsuitable. While every care is taken, no responsibility can be accepted for unsolicited manuscripts, photographs, art work, etc.

Subscription department:
Remittances to **Model & Allied Publications Ltd.**, P.O. Box 35, Hemel Hempstead, Herts. HP1 1EE (Subscription Queries Tel: 0442 51740). Subscription Rate £11.50, Overseas Sterling £14.40, U.S.A. and Canada $24.00, Airmail $48.00. Annual Subscription includes a copy of the Model Engineer Exhibition Guide published in mid-December and the Annual Index.

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Also published by MAP: Aeromodeller; Model Boats; Radio Control Models & Electronics; Model Railways; Scale Models; Military Modelling; Woodworker; Battle.

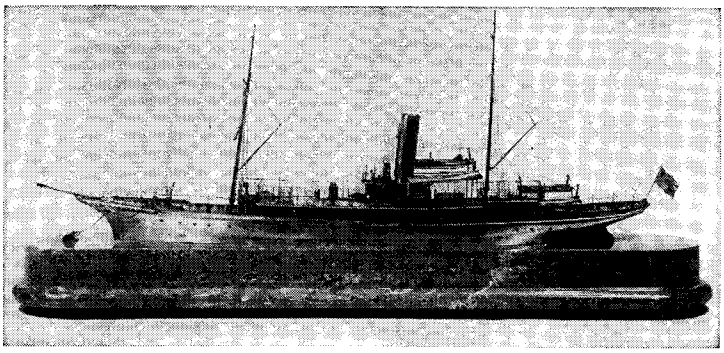
Model Engineer is printed in Great Britain by Blackfriars Press Ltd., Leicester, for the proprietors and publishers, Model & Allied Publications Ltd. (a member of the Argus Press Group), 13/35 Bridge Street, Hemel Hempstead, Herts. Trade sales by Argus Distribution Ltd., 12/18 Paul Street, London, E.C.2, to whom all trade enquiries should be addressed.

M.E. QUERY COUPON
APRIL 1978

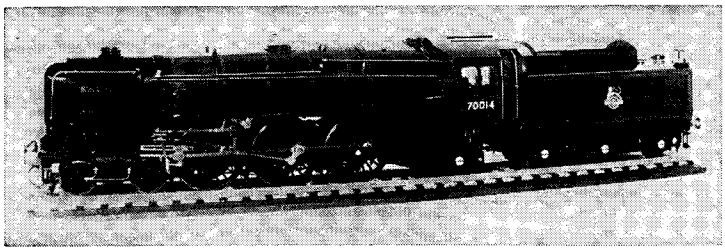
At the Brighton & Hove Engineerium

Monday, April 24 at 2 p.m.

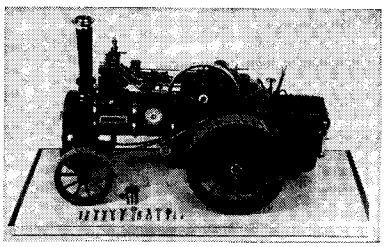
Fine Historic Steam Engines, Locomotives and Ship Models



Sterling silver waterline model of the steam yacht "Amalthaea, R.D.Y.C.", made by R. and S. Garrard, hallmarked and dated London 1909, measurements over plinth 14 in. by 32 in. (35.5 cm. by 81.3 cm.).



5 in. gauge model of the British Railways Class 7P6F 4-6-2 Pacific locomotive and tender, No. 70014 "Iron Duke", 14½ in. by 74 in. (36.8 cm. by 187.8 cm.).



Exhibition standard ¾ in. scale model of the Allchin single cylinder, four shaft, two speed general purpose agricultural traction engine "Royal Chester", built by A. M. Tyrer, Hastings, 8¼ in. by 12½ in. (20.9 cm. by 31.7 cm.).

Illustrated catalogue (£2.25 post paid) available from our London office or from the Engineerium. Entry by catalogue only—admits two. All sales subject to the conditions printed in the catalogues.

On view Saturday and Sunday, April 22 and 23, from 10 a.m. to 5 p.m. and Monday, April 24, from 10 a.m. to 12 noon

For further information, please contact Jonathan Minns at the Engineerium:

The Brighton and Hove Engineerium, off Nevill Road, Hove, Sussex. Tel: Brighton (0273) 559583

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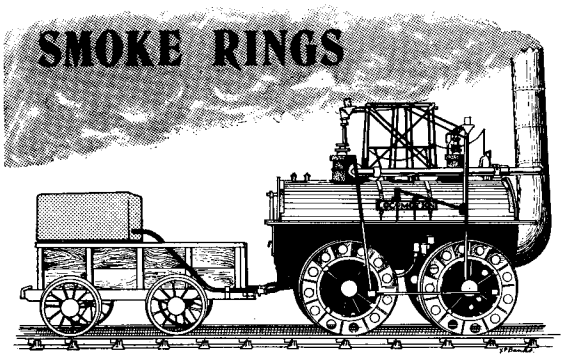


Exhibition with a difference

The Royal National Eisteddfod is to be held at Cardiff this year during the first full week of August (7-12) and the organising committee is on the lookout for models suitable for a model engineering section. Although there would naturally be a preference for Welsh model engineers to support the event there is no geographical restriction. However the need is for either professionally made models or amateur to near "Museum Standard" and must be of a subject relevant to the industrial aspect of Wales. This could mean architectural models, for example, working machinery, or biological models. If anyone feels he could help, please contact Mr. Peter Cambridge, Design Council, Pearl Assurance House, Greyfriars Road, Cardiff CF1 3JN. Telephone 022 395811.

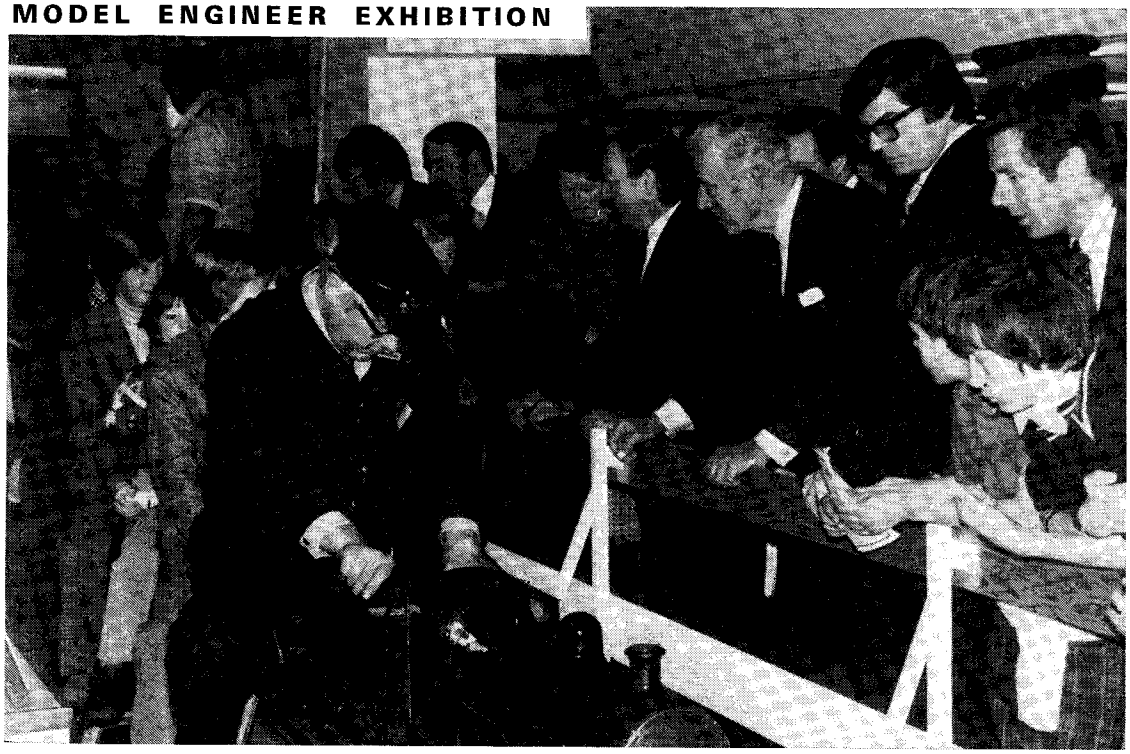
Are the clubs at fault? I think not

Since I wrote the bit in "Club Chat" on 3 February about the evening classes at Norwich closing due to lack of support, I have heard from a Mr. C. D. Thomas, who lives in that area. Mr. Thomas tells me that in the nine years that he has been interested in model engineering he has never known about these classes and has seen no reference to them in the local paper. In these circumstances it is no wonder that the classes were not very well supported, but whose responsibility is it to ensure that full information is given? Surely the people most likely to be interested are those just starting, possibly without equipment and not belonging to a club. I spoke recently to a Birmingham reader who told me that in that city they were considering an extra evening because of the large number of people enrolled. If it reaches a point where you have to be at the college early to guarantee the use of equipment, I believe a lot of enjoyment is taken away. But it must be preferable to no classes at all. I have also received notice that the Dundee S.M.E. has closed, also for lack of support. This club, after forming in 1944, reached a membership of over 80 but in the past 20 years or so the interest has waned. Why? Perhaps television has a great deal to do with it. Charles Nicholls, who wrote to me from Dundee, suggested that anyone in the area wishing to pursue the hobby could join the Perth S.M.E.E. But as this club, in Pitheavlis Castle, is 22 miles away, it is hardly conceivable that people unwilling to attend the Dundee club would travel that distance to Perth. Mr. Nicholls tells us that hobby classes in schools in Dundee were just not supported.

While we are on this subject it would be interesting to foresee the number of visitors to Loughborough University in July. Many readers attending the M.E. Exhibition visited the M.A.P. stand and picked up a leaflet describing the residential course in model engineering the University is arranging from 23 to 29 July. For the beginner and expert alike this course sounds remarkable value for £69 which includes accommodation and meals, and of course, the "student" has access to machinery which for most would be otherwise denied. The one big question for the family man must be "what about the wife and kids?" Loughborough University has thought about that with an array of courses and interests to suit the whole family. Some forty or so subjects including antiques, pottery, languages, painting and drawing, jewellery making, wine and beer making, should provide a holiday with a difference. Whether or not this will go some way to establishing new interest in our hobby can only be supposition, but time will tell. If it succeeds, then other universities would be well encouraged to follow suit. Why not write to The Centre for Extension Studies (BR), University of Technology, Loughborough, Leicestershire LE11 3TU, or telephone 0509 63171 extension 249 or 213?

Fancy a trip to France?

M. Jean Villette ("Smoke Rings", No. 3577) has written to tell us that the first 7¼ in. gauge public railway in France is to be opened on 13 May and will be open all the week-end (14th and 15th). The track is in the Botanical Gardens of Metz in Eastern France but, according to M. Villette, easily reached by motorway from the coast. The track at present is about 560 yards long and the locos are narrow gauge to one-third scale. There is also a temporary 5 in. gauge track being laid for the occasion to make an interesting meeting. M. Villette (45 Rue Thorez, F – 54310 Homecourt, France) has offered to arrange hotel accommodation for visitors intending to bring a 7¼ or 5 in. gauge loco but would appreciate an early inquiry so that necessary arrangements can be made. His telephone number is (28) 22 27 72. Visitors to I.M.L.E.C. in 1973 may recall that M. Villette was placed fourth. He also intends to be at Metz with his "Royal Scot".



AROUND THE CLUBS with Laurie Lawrence

Part II

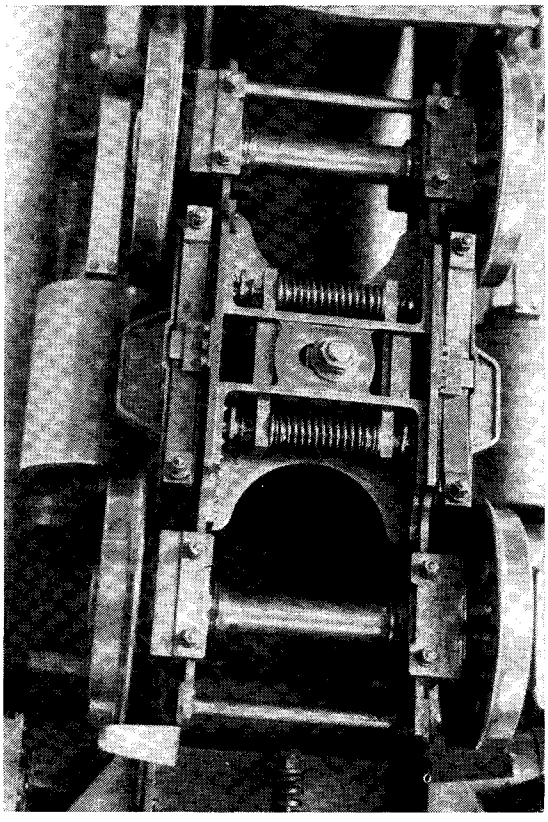
From page 312

HARROW AND WEMBLEY S.M.E. were next in Club Row and they too had a display of "wheels going round". Tools formed a large part of their exhibits and there was a showcase with very good examples of members' work. The Quorn tool and cutter grinder has become deservedly quite popular with model engineers and there was a very well-made and finished machine shown. On this stand was the first staking tool I have seen made to George Thomas's design. Ron Poulter, who is a gauge 1 enthusiast, showed the 0-6-0 4F *Project* locomotive which was designed largely for the beginner in gauge 1 steam; the engine has a single cylinder. There were not many traction engines on the Club stands but Harrow had a 1½ in. scale model on show; it appeared well used. I often think Clubs should put up more photographs of their models *at work* so that the general public can have a better idea of what we do with them when we've made them! And of course, encourage them to join in.

The three locomotives on the stand are worth special mention; we have seen hundreds of 5 in. gauge *Speedy*'s around but it is rare to find this G.W.R. 15XX modelled in other gauges. I know of one 7¼ in. and one 2½ in. gauge and on this stand was a 3½ in. gauge 15XX. At this size it looks diminutive, but the builder had the proportions right; the "top hat" and chimney were good and the awkward taper of the boiler appeared correct. The model was not quite complete and needed outside steam pipe covers. The next locomotive for mention was a very unusual model of an outside framed old-time G.W.R. 2-2-2 and it bore the name *Aries*. I'm not sure, but I think the painting should have been the (very) old Western's Wolverhampton green which was a little more blue than the Swindon treacle of 100 years ago, but this engine looked the part all right.

Lastly we come to Phil Hains' *Mountaineer*. Phil is a chap who likes to do his own thing as well as being gadget conscious, of which more later. He has taken the 3½ in. gauge design and spread the gauge to 5 in. which improves the riding qualities and also gives Phil a bit of extra room to pack in those extra items which he is fond of doing. The engine is well made, of course, and is pleasingly panelled and lined out. Phil has accepted an invitation to run on the S.M. & E.E. track.

Last in line in Club Row was the stand of our



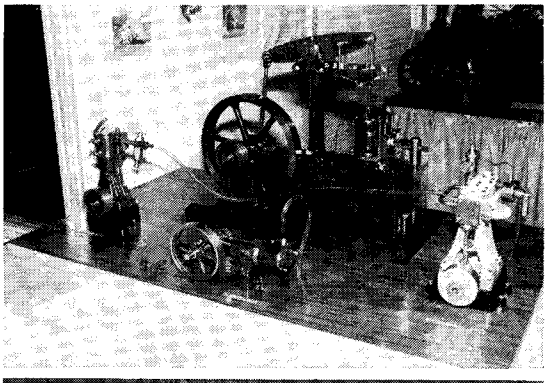
Left: Earl Mountbatten of Burma watches his grandsons on the track. Geoff Cashmore is driving his "George V". Above: Mack Gower's L.M.S. 4-6-0 bogie.

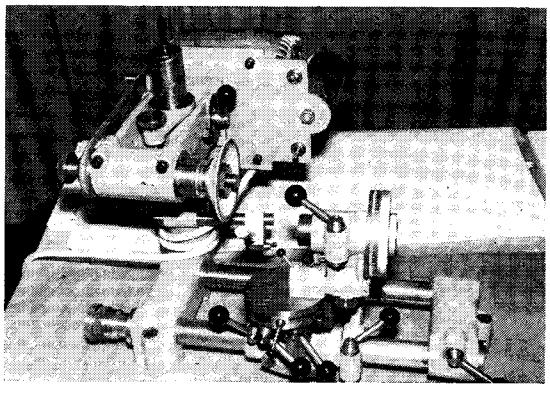
old exhibition comrades, the North London Society. They have a happy knack or flair with their stand of always making it attractive. And somehow they always manage to produce something of exceptional interest. I have privately thought in the past that they have wiped the S.M. & E.E. eye on a few occasions! The exhibits ranged over wide interests; L. C. Mason, who is a frequent and respected contributor to *M.E.*, is a member there and he had a cased collection of sparking plugs covering 60 years; they ranged from a normal car-type plug down to a really weeny one, made by himself, with a 4 BA thread. There was a collection of model internal combustion engines of 55 years ago. I do not have the technical knowledge to describe them but the comparison with their smaller modern counterparts was obvious. Lathe accessories and tools were much in evidence but photographs of these items do not do them justice—it is difficult to photograph highly-finished steel! For example, T. E. Morris's lathe accessories, i.e. a 5 in. sine table, machine vice, vertical slide with geared spindle mounted on it using Myford change wheels, slow-speed spindle for mounting on the lathe bed and geared from the headstock, which was for various purposes including making multi-start and long lead threads, were so well finished I needed dark glasses when peering through my viewfinder!

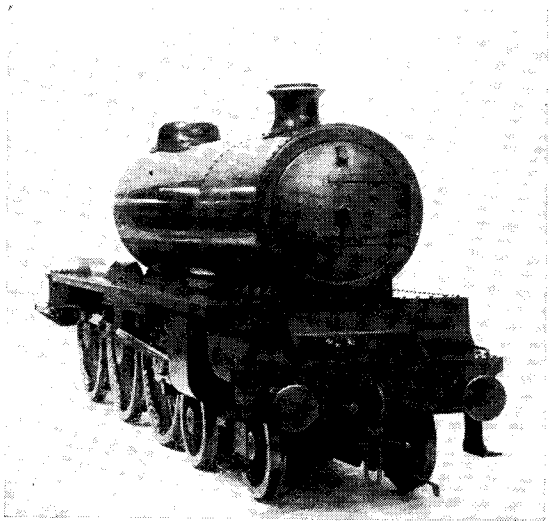
Almost in the same finishing street was Cyril Drayson's compound slide, with $4\frac{1}{2}$ in. two-way movement, made from two top slides. An unusual model was Terry Hammer's aircraft carrier U.S.S. *Shangri-La*; the scale was 1/16 in. to the foot and it still produced a sizeable vessel about 5 ft. long. It had electric motors driving each of the four screws but I'm told it is now a static model due to the high freeboard making it somewhat unmanageable. I wonder what 14 lb. of lead in it would do? Some stationary engines were part of their display and included several small engines and a substantial exhibit of a Stuart Turner *Sirius* engine driving two water pumps for two water tube boilers. The arrangement looked suitable for a large steam powered boat or ship model.

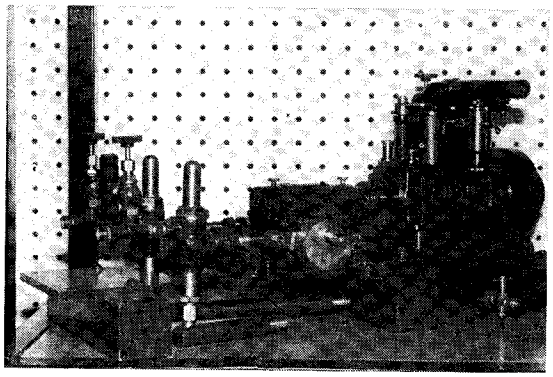
Readers will appreciate that I have had to leave out a lot in my account of the contents of the various Stands; what I have tried to do is give a representative idea of each Society's effort. There is no doubt that Club Row was very popular with visitors who crowded the Gallery.

Harrow & Wembley steam engines and a Quorn tool and cutter grinder.









Mack Gower's "Jubilee", top, and a Stuart Turner Sirius. Both on North London Stand.

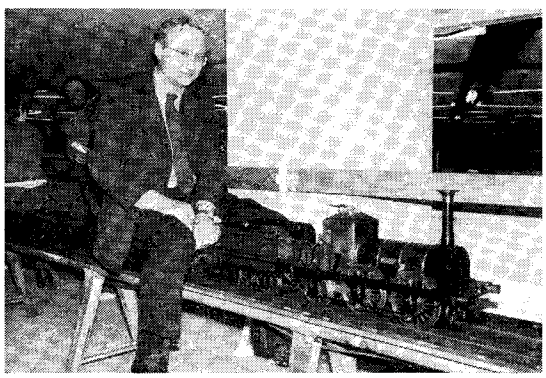
Two of the late LBSC's locomotives were on show, *Tich* and its wagon, and the 4-4-2T, *Olga*, but the star of the locomotive section must surely have been Mack Gower's $2\frac{1}{2}$ in. gauge L.M.S. 4-6-0. This small model of the old three-cylinder *Jubilee* was quite remarkable for the correct scale detail incorporated. The stewards very kindly took the engine out of the showcase for me to photograph it and at the same time told me that Mack Gower had started his project some 15 years ago. Apparently at odd moments he gives the parts a wipe over with *Jenolite* and this has given all the steelwork a silvery dull lustre finish free of blemishes. My doubts about it photographing decently disappeared when I saw my prints which I hope our Editor will be able to reproduce here.

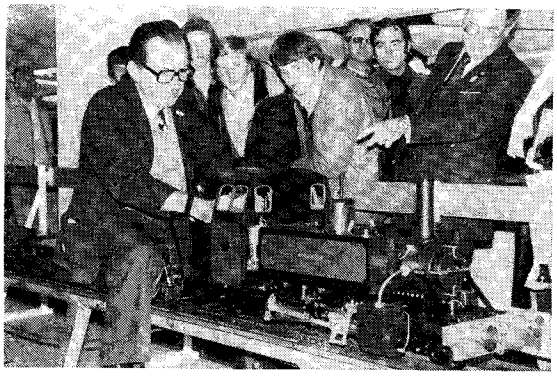
There were a good number of overseas visitors and the Harrow and Wembley Society laid on an open day for them at their track, and a member's workshop on the Sunday, and I'm told about 50 overseas visitors went. Frank van Cleeve, who comes from Waynesburg, Pennsylvania, U.S.A., told me they had a fabulous time.

Round the corner, continuing on from Club Row, was the S.M. & E.E. portable track with Bill Carter and myself as the full-time stewards (except when the odd half of Guinness called Bill away and a wee drap of the malt called me—terrible dry atmosphere in the Centre it is!). I explained last year that the Exhibition's new location scuppered our old staffing arrangements and we have now to rely on other Societies for rather more support, and I am very pleased to say we had that generous support. Ted Moon of North London was particularly helpful and looked after the Station for most of the time and Bill, who was in charge, had very few worries about keeping a service on the track going for the ten days. We had a stud of 18 locomotives plus two visitors who also did stints of passenger hauling. The old favourites were there in force and we gave a welcome to four newcomers: J. Turner's 5 in. gauge G.N.R. 2-8-0 from High Wycombe which trundled our three bogie cars up and down the track like the proverbial bag of feathers; also Alan Bray's L.N.E.R. B1 4-6-0 which performed in a similar untroubled fashion; a *Rob Roy* and an L.N.E.R. Pacific.

Perhaps the biggest surprise for onlookers was the performance of the two diminutive $3\frac{1}{2}$ in. gauge *Rob Roy* 0-6-0Ts. These belonged to Peter Wardropper of the Society and Mike Foreman of North London and they handled their loads quite happily for each $2\frac{1}{2}$-hour stint. Not having much adhesive weight the rail was sometimes sanded for them during peak times because the rail gets rather oily after a day or two. One of the trade exhibitors, Morris and Ingram Ltd., very kindly gave us a couple of aerosols of cleaning fluid, as used for cleaning airbrushes, for rail degreasing. We found the fluid quite effective, but with so much rail to clean, we had to reluctantly concede it would not

David Neish (Guildford) with his 5 in. gauge "Lion".





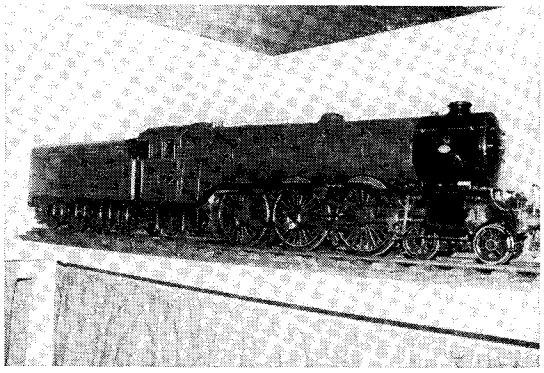
Phil Hains on his "Mountaineer".

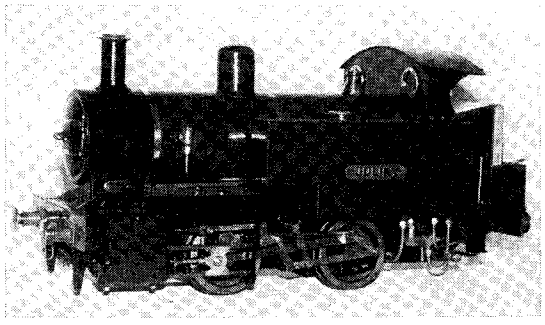
have been an economic proposition for our particular purpose.

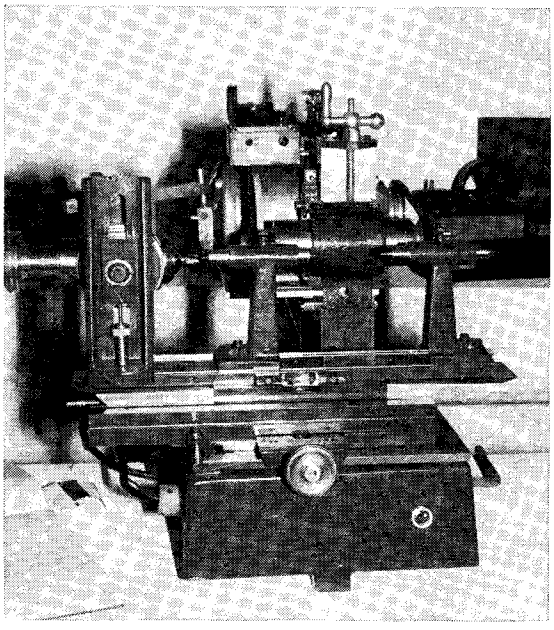
Incidentally, our sander is about 50 years old or more and it is an old Bluebell tin (might have been Brasso) with a metal screw cap. This cap has a lug brazed off centre and a small hole drilled near the edge. The "sander" is filled with very fine *dry* bird sand and all we have to do is place the lug against the ride of the rail, up-end the container and walk away with the sand trickling out behind on top of the rail. It is simple and so effective that in 50-odd years nobody has found a better one. Chingford member Johnny Dabson's 3½ in. gauge L.N.E.R. Pacific, which has not run on our track before, was assisted by sanding and then did its stint in exemplary fashion.

The portable track "attracks" (forgive me!) crowds of live steam fans and an inevitable and enjoyable part of our occupation is a chat over the fence whenever occasion requires. A regular visitor is the ever-smiling Andrew Todd from Wrexham who is building a model *Paget* locomotive (some day we might get him to talk or write about it) and Andy, with a large grin, handed me a little thing he had made—a model cabinet plane, a couple of inches long and finely made. I could not resist putting it in front of my lens with a new ½p piece to show how small it is. I hope our Editor can find room for this photograph. Two more visitors from Fife in Scotland claimed attention on the subject of injectors; one of them had some very nicely made high-speed steel taper reamers for injector cones. They had been ground to the specifications of a South African contributor and were triangular in shape at the business end, i.e. three cutting edges. Peter Dupen and I looked at them closely and we suspected a question would follow; it did. Our visitors said his reamers cut like billy-o but chattered, why? We delicately explained they would benefit by having lands or small flats along each cutting edge.

Another visitor from further afield, Klaus Oesterwind from the Ruhr in West Germany, also had enquiries about injectors. He was given some information on the spot and by now should have received a packet of further information which I hope he can put to use. Yet another visitor ex-







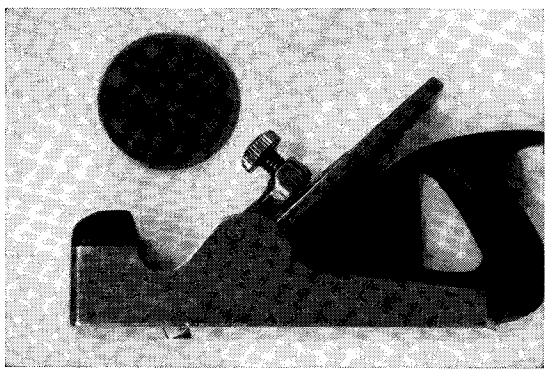
Top: Johnny Dabson's 3½ in. Pacific from Chingford.
Centre: Fred Matthews' "Juliet".
Bottom: L. Joyce's Clarkson type cutter/grinder.

pressed some disappointment with his injector performance and it appeared that there was some inadequacy in the supply of steam and water to his injector; again more information was given to him and I anticipate hearing from him that things have improved. The giving of information and fruits of experience is not all one way, we listen and learn as well. So I come to Phil Hains of the Harrow and Wembley Society whom I mentioned earlier. Phil brought over his *Mountaineer* for a run on the track; this is a most useful and effective locomotive and, as is usual with Phil, has some gadgets. He produced an answer to a problem of mine which I had come up against nearly 20 years ago. His *Mountaineer* has an injector, the casing of which contains a model arrangement and disposition of the cones of a *Gresham and Craven* live steam injector. It is made to fit scale $1\frac{1}{4}$ in. dia. pipes and this injector with its sliding combining cone works very nicely indeed. I tried it, of course. My own model Great Western injector, although somewhat crude on the outside, had scale cones and a hinged part in the combining cone; what a labour that was. However, it would work perfectly for a couple of minutes or so, then knock off and could not be induced to re-start until it had been thoroughly cleaned even though there was no trace of dirt or anything else. I admitted defeat and discarded it. Phil's answer was so simple—water treatment. He uses a compound called Boiler Disencrustant in very small quantities in the feed water and this serves to keep boilers clean.

Lastly I must mention our other visiting locomotive which David Neish of Guildford had in the loan section of the Exhibition. David's 5 in. gauge *Lion,* alias *Titfield Thunderbolt,* also helped with the passenger hauling and this quaint old-timer got plenty of admiration from the crowd alongside the fence.

Further along from the track enclosure was the S.M. & E.E. workshop forming part of a large area which included the Society's stand with exhibits thereon. There was fortunately plenty of room for visitors round the workshop which was just as well because there was much to see and chat about. We could not manage continuous demonstrations of lathe work; this item got off to a bad start, or rather did not get off; there was no power available for a day or two, but when we were switched on the usual turning demonstrations were given with only a few breaks by various members. During the second week, George Thomas sat in a corner of the workshop and chatted to visitors about workshop topics in general.

Andrew Todd's miniature block plane.



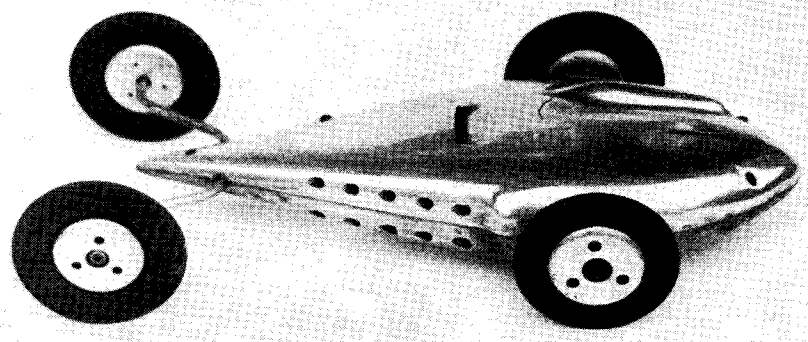
Don Gordon, a marine enthusiast, has been trying to stimulate more interest in what I define as genuine marine model engineering and he was given (or may have taken!) space in the workshop to spread his ideas. He was demonstrating how to build a ship model using modified scaled-down conventional building methods. His idea was to show a mock-up specimen hull formed from bent-up tinplate frames, angles, channels and plates; he normally uses brass foil. He also showed a model power plant comprising boiler, steam engine and a diminutive pair of paddle wheels of the feathering type which alone contained over 300 parts. All of these were to $\frac{1}{4}$ in. scale and will be incorporated in his model of the P.S. *Cynthia* being built from a small outline drawing in F. C. Hambleton's book. Don was not allowed to do much work on the specimen hull because he was usually engaged in animated conversation with interested visitors.

Ivan Law is our milling expert and there is little he does not know about the capabilities of his Dore-Westbury vertical miller on which he ran demonstrations for the whole period of the Exhibition. Ivan had been persuaded to make some gears for a large traction engine and some of these could be seen on the stand. He also made a dog clutch out of steel bar and even the more experienced and critical of our members were impressed with the accuracy of manufacture. The joint in the clutch only showed as a hair line. I don't think people leaning over the rail talking to and watching Ivan fully appreciated how well things were being done, although he describes the operations clearly. The gear-cutting was a repetitious job but again showed the versatility and capability of the machine.

Professor Chaddock is our i.c. and hot air engine specialist, he is also a mine of information on a wide variety of model and engineering subjects, so it is natural that his counter was popular. Aside from the hot air engines set out on part of the bench to test and demonstrate about which, I am told, he will be writing, he had a star attraction which we have seen before and was worth seeing again. A substantial frame was fixed to the bench top and on this was mounted Tony Wal-

Continued on page 379

ONCE UPON A TIME....



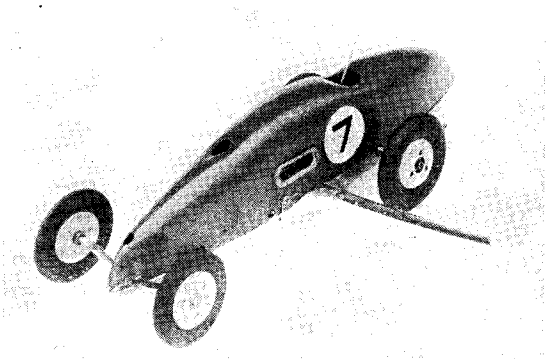
by Tony Higgins

At the Model Engineer Exhibition last January, a new section, Class M, was formed to cater for the model racing car entries. Of these not one was British. In this article Tony Higgins reflects upon the history of tether/rail racing in the hope that the spark of interest may be re-kindled.

TO UNDERSTAND THE RISE and fall of model Tether/Rail cars it is necessary to take a trip down memory lane and onto the parking lot of a Los Angeles suburb around 1935. It was here that Dick Hulse (first member of the American Miniature Racing Car Association) and the late Ray Snow (designer of the Hornet 60) began running model cars tethered to a central pivot, or even held by hand with three or more running simultaneously around their "drivers". These cars were powered by converted aircraft engines, ranging in size from 4 to 10 cc., and giving speeds in the region of 30 m.p.h.

It wasn't until 1938/39 that sufficient interest was apparent, mainly in Southern California, to warrant the formation of a national organisation to draw up rules and regulations governing the cars. The "Model Midget Association" was proposed by Dick Hulse. This in turn became the "American Miniature Racing Car Association" (AMRCA). Engine size was fixed at a maximum of 10 cc. and serious competition began.

Up until this time the cars had run on wire or cable tethers varying between 30 and 90 feet long which somewhat restricted the air of realism, hence rail car racing evolved along with expensive and elaborate tracks. Similar in layout to the tether cars, i.e. cast aluminium alloy chassis, single-cylinder spark ignition engine, independent front and/or rear suspension, front or rear wheel drive, fully enclosed transmission, cast or formed alloy body, length around 18 in. and weight up to 10 lb., these cars ran simultaneously around an oval track, the first of which was opened in Los Angeles on 3 September 1939. Designed by Russell Dooling, the track comprised 15° banked straights and 45° banked turns. Seven steel rails were bolted to the one-inch thick pine track with a Masonite running surface. Two lugs one side of the car, usually just behind the front and rear wheels, supported a ball

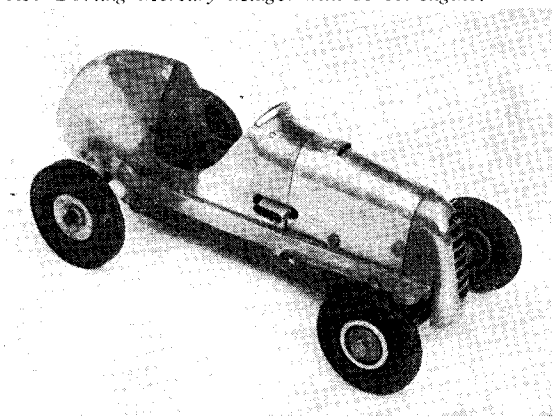


Left: Front wheel drive using Dooling 61. One wheel was used for the drive, the others being clear of the track. Top: YJ powered European record holder by the late Bill Bennett. Speed at Mote Park reached 167 m.p.h.

race keeper which hooked around the rail, maintaining the car in contact with the track. Typical of the pre-war cars run in this manner was the Dooling "Mercury Midget" first offered for sale in the autumn of 1939 at 23.50 dollars. A favourite engine for this car was Reginald Denny's "Dennymight Airstream", priced at 17.85 dollars — an expensive hobby even in those days.

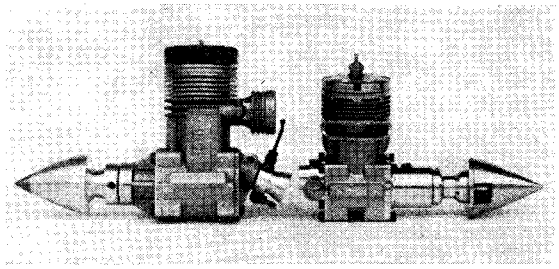
By the early 1940s speeds had risen to around 70 m.p.h. for the top tether cars, with the hub of activity still centred in Los Angeles. The brothers Tom, Russell and Harris Dooling were producing car kits and conducting intensive research into high-speed model engines. Dick McCoy was developing his famous "60" and Ray Snow was in production with the first classic racing engine, the Hornet 60. In the mid 1940s it was common to see cars like Papina Industries P-3 competing against Dooling Brothers' Proto at 90-100 m.p.h. Dick McCoy's Red Head 60 series 18 engine now entered production with Duro-Matic Products, while Dooling were perfecting the Model 61 engine alongside their Arrow racing car.

A39 Dooling Mercury Midget with 10 cc. engine.



The basic design of the cars had now changed. Gone was the enclosed drive train, twin beam chassis, clutch, floating/sprung axles and ash-tray tyres. Instead we saw full length alloy spans, short rigid axles, standard four-inch diameter tyres, magneto as well as coil ignition, and engines that performed consistently at 16,000 r.p.m. and over. It is interesting to note that all these "hot" engines were originally designed for the model cars. In fact it wasn't until 1946 that aeromodellers appreciated the potential of the relatively heavy car engine when a standard Hornet 60 carried a diminutive 19-inch wingspan model aircraft to over 100 m.p.h. for the first time in the history of control-line speed.

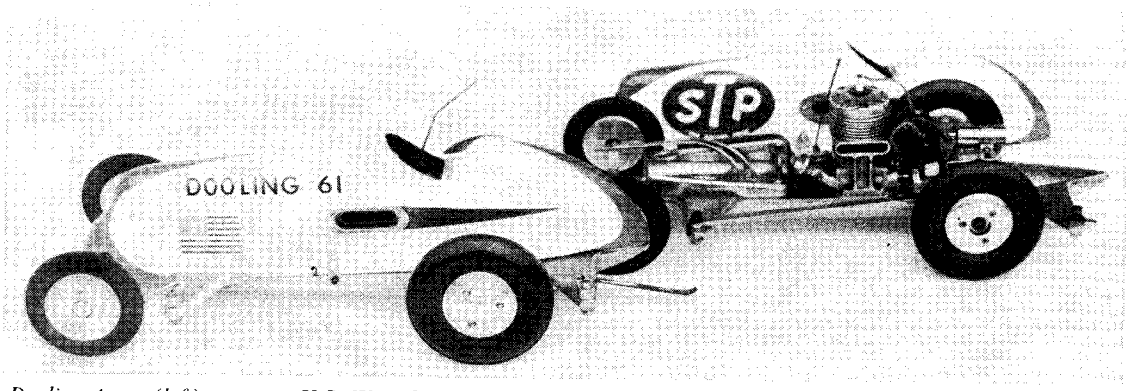
By 1948 the model car craze was nearing its peak. Speeds were in the region of 120 m.p.h. with stock equipment, the best of which was probably the Dooling Arrow car powered by the Model 61 engine. Re-worked specials on exotic fuels were turning 140 m.p.h. plus on the tether and although model aircraft engines had begun dispensing with spark ignition in favour of the new Hot Point Glow Plug, the cars never changed. In fact, thirty



Italian OPS 60 (left) holds car and aircraft speed records at 183 and 211 m.p.h. respectively. On right is Dooling Special—186 m.p.h. with aircraft.

years after it was designed, the Dooling 61 still performs better on spark than glow, regardless of fuel used. The number one engine was undoubtedly the Dooling, nominally rated at 1.5 b.h.p. at 16,000 r.p.m. on straight 70/30 alcohol/castor fuel. It set standards for design, manufacture and attention to detail that very few production engines achieve today. The McCoy 60 series 18 had faded from the car scene but the series 20 began dominating control line speed and continued to do so for the next twenty years. The Hornet 60 in its standard form produced 1 b.h.p. at around 15,000 r.p.m. but the arrival of Dooling and McCoy engines inspired the manufacturer of the Hornet to produce the "R" Big Port conversion and once again a model aircraft, powered this time by the Hornet R, broke the 150 m.p.h. barrier for the first time.

By now, however, the cost of building and maintaining a banked model Autodrome was



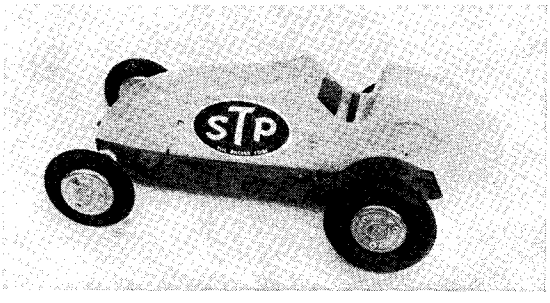
Dooling Arrow (left) was once U.S. West Coast record holder (125 m.p.h.). Right is a modified Arrow.

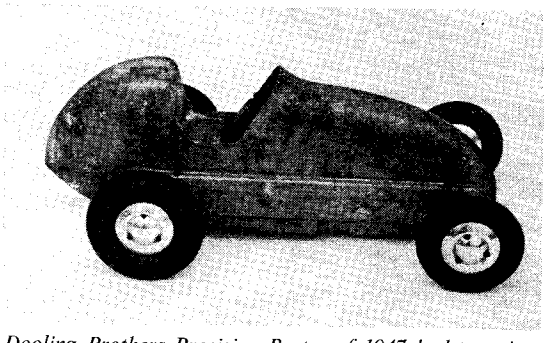
becoming prohibitive and the writing was on the wall for the rail car branch of the hobby, so contestants and spectators once thrilled by the sight and sound of up to seven 10 cc. cars howling around together at 100 m.p.h. began to drift away and by the mid-1950s it was all over for the rail car racers.

Perhaps the most attractive car of all made its appearance at this time. Built exclusively for tethered racing, the "1234" powered by the faithful Dooling was considerably heavier and stronger than the Arrow. It changed the two-lug cable bridle attachment to the now familiar pan handle and the pattern remained much the same for the next fifteen years.

The Hornet engine had ceased production shortly after introduction of the "R". Dooling Brothers, now heavily committed to the aerospace industry, found less time available for the model cars and although their experiments, which culminated in the Model 61, had enormous potential in the full-size engine field, this side of the business was phased out. Initially available at 35 dollars, the last price for the 61 was 100 dollars and this was direct from the factory in the 1960s, selling to the racing car fraternity and not being advertised at all. The final outcome of this engine was the Yellow Jacket 61 made by Bruce Underwood of Columbus, Ohio. Based on the Dooling, Underwood's "YJ 61" in its various forms represented the ultimate in model racing engines. Capable of revving to around 25,000 r.p.m. and powering the miniature cars to 160 m.p.h. plus, it out-performed all until the Italian OPS engine entered the scene in 1968 with tuned expansion chamber exhaust systems, Zimmerman disc valves, Schnuerle porting, A.B.C. technology (aluminium alloy piston, brass liner chrome plated) and really massive construction. Model I.C. engines entered a new era.

Papina P-3 from a kit, reached 100 m.p.h.

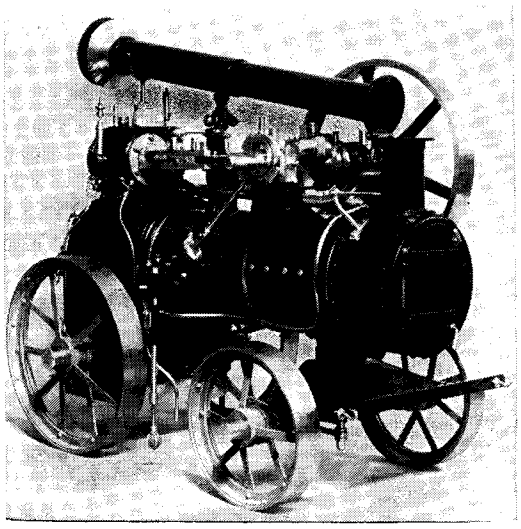


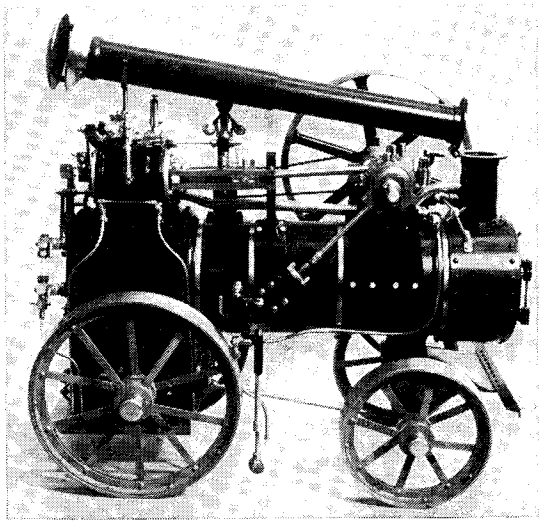


Dooling Brothers Precision Proto. of 1947 had two-piece magnesium body, independent front suspension and heavy duty bevel gears. With a Hornet engine it reached over 100 m.p.h.

Of the hundreds of tracks once in use throughout the U.S.A., England and Europe, probably no more than twenty exist today. There are less than five hundred active enthusiasts but these tend to be fanatics and it would appear that thanks to their tenacity the low point in the hobby's history has passed and interest is on the upswing, although it is unlikely to see the intense activity of the late 1940s again.

For those of you who have equipment or a desire to build and run the cars again, the author can be contacted c/o the Editor. S.A.E. with enquiries would be very much appreciated.





THE MARSHALL PORTABLE ENGINE

Part X

by Ron Kibbey

From page 215

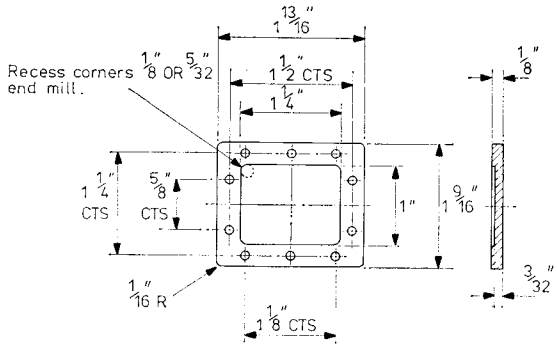
THE PISTON ROD dummy gland is made from a gunmetal casting available at the suppliers, and this piece, when finished, can be used as a "jig" for drilling and tapping the two 8 BA holes in the guide bar support. The location should be by a short length of 3/16 in. dia. silver steel in the piston rod bores.

The guide bars are quite straightforward. I made mine from some $\frac{1}{4}$ in. gauge plate I had in stock and filed up the outer profiles to the dimensions shown. They are not subsequently hardened in case distortion took place. Unhardened gauge plate makes a very good mating surface with the bronze slippers and, of course, provides a very flat well-finished surface. Silver steel square bar would also be good but if bright mild is used, some care must be taken to ensure the flatness and finish of the three surfaces used.

Before proceeding to the Front Motion Bracket, I have recently realised that Bill did not give details of the valve chest cover and no dimensions for the spacing of the screws or studs securing the cover and chest to the cylinder. The iron casting for this part is now available and a detail drawing of the cover is included herewith. Here again Bill specified iron because he visualised it having a polished natural finish. When drilling and tapping the chest and block for this cover, bear in mind the correction to the hole coding in Part VIII.

Castings in gunmetal for the Front Motion Bracket are now available at the suppliers. In the absence of a casting at the time, I went about it the hard way "hogging out" from a block of M.S. The elongated hole to clear the connecting rod has not been cast in, but it will be a relatively simple job to mill or drill and file out to the sizes quoted. Here again, the important feature of this part is to get the faces and shoulders of the guide bar support bosses true in relation to one another and to the centre of the $1\frac{7}{8}$ in. radius machined foot (which is, of course, the centre of the boiler barrel). To assist in marking out and clamping for subsequent machining, the first step is to clean up the faces of the casting to the $\frac{1}{4}$ in. and 1 in. widths but do not overlook the fact that the $\frac{1}{4}$ in. width starts to taper out to 5/16 in. beyond the end of the elongated hole.

Next, carefully mark out the vertical centre line of the bracket and the position of the abutment faces of the guide bar lugs. If the casting is now clamped to a vertical slide on the lathe with this vertical centre line horizontal then, by the use of the vertical slide index and the boring table index, the centre about which to fly-cut the $1\frac{7}{8}$ in. radius can be determined. Take it gently with the fly-cutting since there will be about 1 in. overhang from the nearest clamping point and the neck is not all that robust. For clamping purposes, I would suggest that two $\frac{1}{4}$ in. dia. holes are drilled on the centre line at each end of the connecting rod slot and clamping bolts and washers used to secure; this will leave the marked out datum centre lines



VALVE CHEST COVER
Mat^{L}.- CAST IRON

visible. These $\frac{1}{4}$ in. dia. holes subsequently opened out to $\frac{3}{8}$ in. dia. will provide the ends of the slot at the later stage.

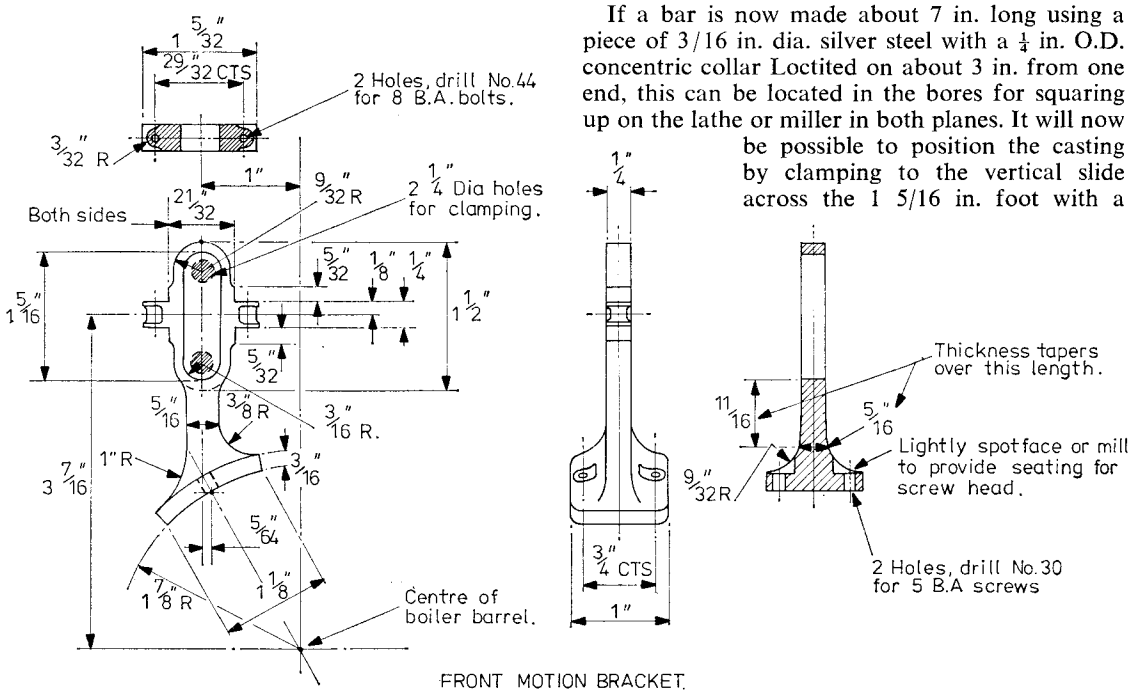
It is important the initial cleaning up of the $\frac{1}{4}$ in. and 1 in. widths creates parallel faces because, for end milling the lugs, it will be necessary to clamp across the inner 1 in. wide foot in a vice mounted on the vertical slide. When finally assembling the motion on the boiler shell, there will be enough problems resulting from geometrical deviations in the boiler shape and these can be dealt with much easier if the components mounted on the boiler are geometrically accurate.

Turning next to the Governor Bracket — the governor details will not be covered yet awhile, but since this bracket also provides an outrigger bearing for the slide valve rod, it will be required in order to set up the cylinder and motion on the boiler. The production of bronze castings for this component is now in hand.

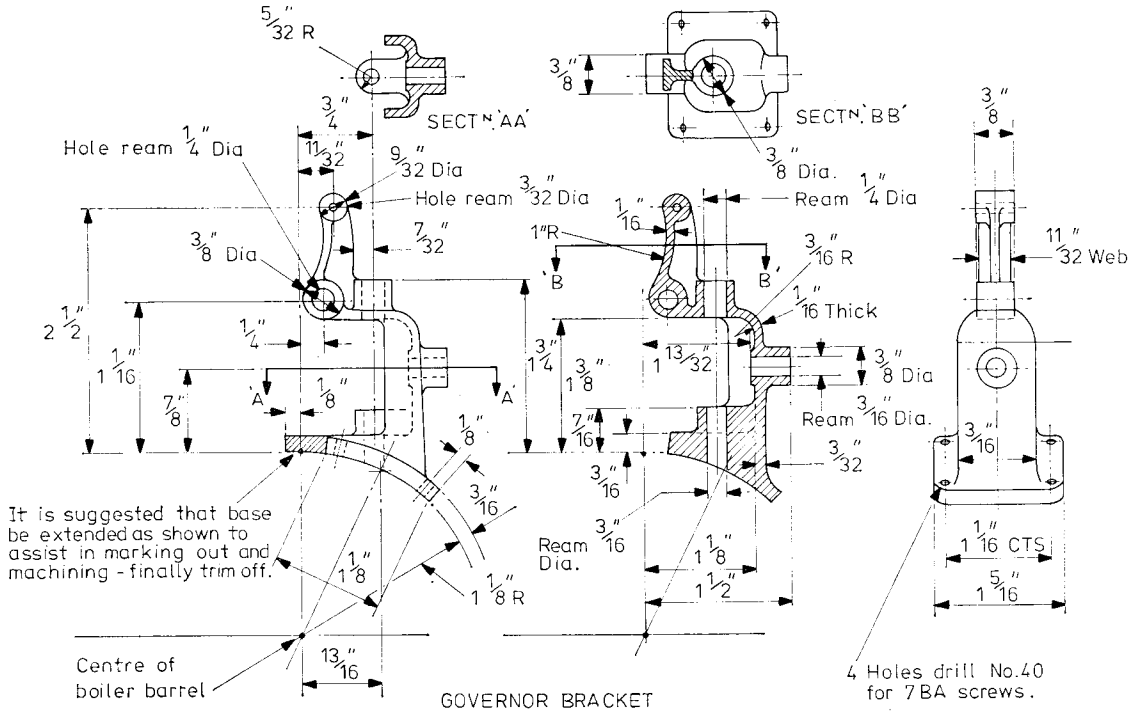
At the time I built, castings were not even round the corner, and I was forced to fabricate and to this end, Bill Huges gave me all the necessary dimensions. Although the actual steel fabrication was difficult, it did somewhat ease the machining of certain features, and certainly affected the methods used. I can only, therefore, advise on how I would machine a casting and cannot draw from actual experience.

The first thing required will be some sort of vertical datum from which the axes of the important holes, and $1\frac{7}{8}$ in. foot radius can be obtained. This datum can be obtained in both the side and end elevations by using the centre line of the main governor bearing diameters (see section through bracket detail). The first stage of machining will be to clean up the end faces of the foot to the 1 5/16 in. dimension and the end faces of the bosses for valve rod and governor valve rod, and keeping the main datum axis bosses central between these pairs of faces. Having next found the best position in the casting for the vertical bores by some rough marking out, these can be drilled and reamed in line, with the bracket held by the edges of the foot in a vice on the vertical slide.

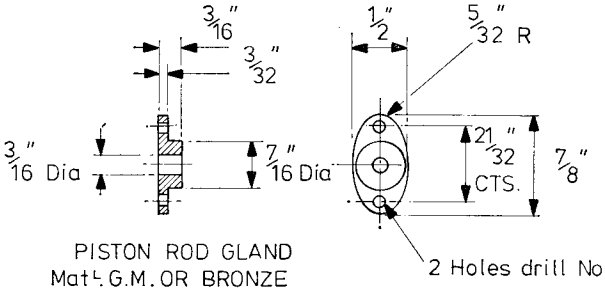
If a bar is now made about 7 in. long using a piece of 3/16 in. dia. silver steel with a $\frac{1}{4}$ in. O.D. concentric collar Loctited on about 3 in. from one end, this can be located in the bores for squaring up on the lathe or miller in both planes. It will now be possible to position the casting by clamping to the vertical slide across the 1 5/16 in. foot with a



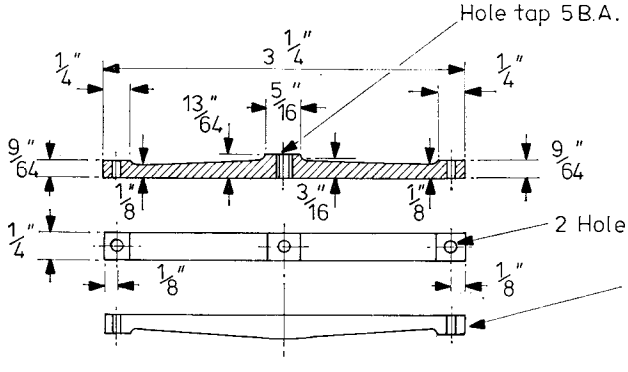
FRONT MOTION BRACKET.
Mat^{L}. BRONZE OR GUN METAL CASTING.



GOVERNOR BRACKET
Mat^{L}.-BRONZE OR GUN METAL CASTING.



PISTON ROD GLAND
Mat^{L}. G.M. OR BRONZE



NOTE :
Lower guide bars are identical with upper except centre land and tapping is omitted.

GUIDE BAR 2 OFF EACH
Mat^{L}. M.S, SILVER STEEL OR GAUGE PLATE

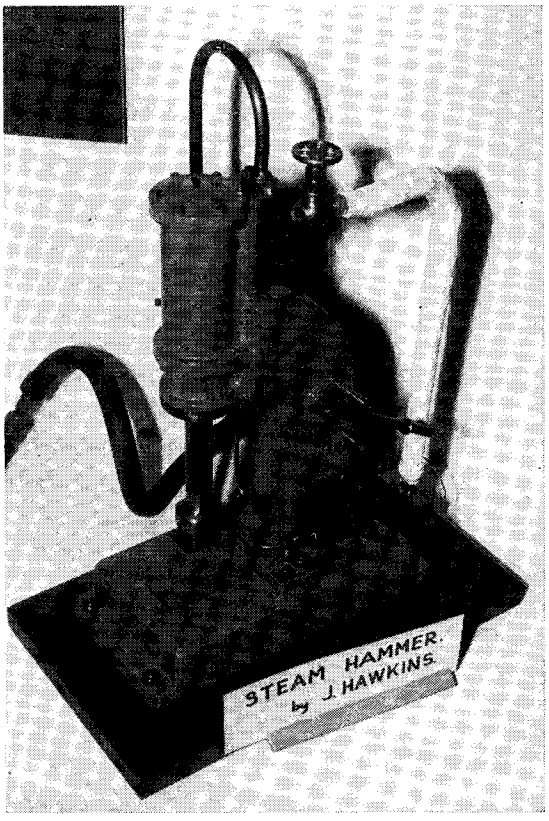
suitable packing normally 15/32 in. thick under the two outer bosses which can also be clamped for additional support. By use of the vertical slide index and boring table index, the centre of the $1\frac{7}{8}$ in. radius can be brought coincident with the axis of the lathe for fly-cutting the inner foot. The extension shown cast on the foot takes it beyond the centre of the $1\frac{7}{8}$ in. radius. This gives a positive measuring point from which the position of the two upper holes for valve rod bush and governor valve spindle can be determined in the vertical plane. It will also (in conjunction with the rod in the vertical bores) enable the true position of the governor driving shaft bore to be found.

It will be seen from the above proposed methods that I much prefer to use the lathe index readings to find the centres for drilling or boring, rather than relying on accurate marking out, which, in this case, would mean glueing the casting to a segment of wood to find the axis of the boiler barrel. It seems foolish to have a machine which is indexed in thous in all three planes and not take full advantage of it.

A concentric bronze bush $\frac{1}{4}$ in. O.D. and 3/16 in. I.D. and 7/16 in. long will be required to be pressed (or Loctited) into the valve rod bore. All other bushes can be left at this stage and fitted when the governor mechanism is dealt with.

As with the motion bracket, any time and care taken to ensure that the true geometry of this bracket is achieved will pay dividends on assembly on to the boiler shell. *To be continued*

AROUND THE CLUBS—*from page 372*



shaw's 1/5 scale model of a 1915 Gnome radial aero engine, last year's Duke of Edinburgh trophy winner. This was set running swinging a 24 in. dia. two-bladed propeller. Professor Chaddock said later that it had been affected by oily plugs and it was put on one side on show. Instead, John Loudon's seven-cylinder Gnome aero engine, a similar machine to Tony Walshaw's one, but of less output, was put in the frame and set running.

A few years ago, Jim Ewins demonstrated the photo-etching of brass plates and he repeated the demonstration this year. The prepared samples were placed in a tray mounted on a simple mechanism which very slowly rocked the tray containing the etching solution to agitate it and in due course, out came some accurate small reproductions of name and number plates. Some samples of Jim's work were displayed and also the large master drawings from which the small etchings had been reduced.

The rest of the S.M. & E.E. stand was devoted to a show of static models and tools plus the usual enquiry counter. The members' work covered a range of quality from at least good to the very best and this ensures that nobody is frightened away by an inordinately high standard but is given encouragement and example to try to do well. Tony Walshaw's nine-cylinder aero engine was put on the stand after its trial run in the workshop. A simple and plain but very useful workshop appliance was Neil Hemmingway's stoutly made broaching machine of about 10 in. capacity or traverse. Tools and lathe accessories are fairly popular with the members and Bill Carter's rotary table to George Thomas's design, modified to fit his Drummond lathe, was shown. Brian Arridge has tremendous ambition and presumably plenty of muscle and he showed parts of an S.A.R. $3\frac{1}{2}$ in. gauge one-inch scale *Beyer-Garratt* 2356; only the boiler and centre portion frames were there and it is clear that this locomotive will be a very hefty job. The boiler diameter was about 9 in. and had 60 tubes of $\frac{1}{2}$ in. dia. and some room left for the superheater flues.

The above were only a small selection of the many models and tools on this stand and it seems that they were sufficient attraction to visitors as I understand that some 60 new applications for membership were made to the stewards. And on that healthy note, I leave you.

MATTERS ARISING

George Thomas continues with his comments on some of his previous articles

Part II *From page 340*

IN THE ARTICLE on "Boring Tools" (Vol. 143, p. 673) I remarked that I had been unable to find tool-bits 5/32 in. dia., and that is still true, but I find that James Neill Ltd. ("Eclipse") now offer tool-bits of all kinds in metric sizes including 4, 5 and 6 mm., round or square, and these are available in either H5 or VH types of steel. The 4 mm. dia. comes in lengths of $2\frac{1}{2}$ in. and, being one-and-a-quarter thous over 5/32, the holes in the bars would need to be opened finally with a 4 mm. drill.

As two different types of steel have been mentioned, a few words about cutting tools and bits might be useful to some of our readers. So far as "Eclipse" bits are concerned there are three grades, two of which, H5 and VH, are mentioned above. For the average model engineer the H5 bits are perfectly satisfactory for most purposes but for turning hard or very tough materials and, in particular, boring G.M. castings which rapidly destroy the fine edge of a tool, the VH grade could be very useful and is to be recommended. The letters VH, which signify "vacuum hardened", could also be taken to mean "very hard", though I would substitute a different adjective! The material is a high-carbon, vanadium, cobalt steel which is substantially harder and about 65 per cent more wear-resistant than H5 *but* it is also more difficult to grind and while this is hardly a disadvantage when shaping up small boring-bits, I find that to grind up a new 5/16 in. square tool which might involve the removal of a large amount of material, takes time and patience and ends with a glazed wheel. The makers recommend the use of a soft wheel; I use a medium-soft (grade K) which is best for all normal purposes. I find that a fairly coarse wheel cuts more freely, probably because it has a more open structure and the grains are renewed more readily.

Cleveland MoMax Cobalt tool-bits also are very hard and equally difficult to grind. They are available in round and squares. I have often been asked if I use tungsten carbide tools and the answer is a qualified "no". T.C. has revolutionised production machining and most modern machine-tools are built to meet the special requirements of high speed (and power) and great rigidity. In general, the special properties of T.C. are of little use to us except, perhaps, to turn a chilled iron casting which would have been far better returned to the foundry. In any case, few, if any, of us have the means for keeping these tools in proper condition; ordinary grinding wheels will not touch them. Green grit wheels (green silicon carbide) will grind them, but the finish obtained is usually far from good; these tools need to be finished on a diamond lap. Contrary to what one might reasonably expect, but for well established reasons, a highly finished and very keen edge on a T.C. tool will stand up to very much more work than a poorly finished edge such as one might obtain from a green-grit wheel. By all means keep a T.C. tool by you for use in emergencies but don't rely on them or expect miracles from them. If you do try grinding one remember that the front clearance should not exceed about 3° and the top rake should be kept to a minimum—in other words, the total included angle of the tool should be as large as possible. In view of the low mechanical strength of the sintered material of which the cutting edge is composed, T.C. tools will not stand up to interrupted cuts and the machine must not be stopped while the cut is still in progress—the tool must be withdrawn before stopping the machine.

Cross-slide Dials on the Super-7

I have met several cases where the friction-setting dials on the Super-7 were really too stiff to turn without incurring the danger of disturbing the slide setting. This danger is always present in some degree where friction dials are used and more especially when the feed-screw bearing is as it should be—perfectly free to turn but without end-play. I recently met a case where the dial was extremely difficult to turn at all and it appeared to be due to the high rate of the spring, which is a curved spring-steel washer, coupled with the fact that the working space for the spring, which governs the compression, is dependent on a number of tolerances, two of which are end locations on conical surfaces which are difficult to maintain to close limits. I dealt with this one by gripping the spring, which is of .020 in. material, in a pair of pliers and thinning the material over the "hump" on the side of a fine grinding wheel. I regard this treatment as a "roadside repair" but it certainly improved the action very considerably.

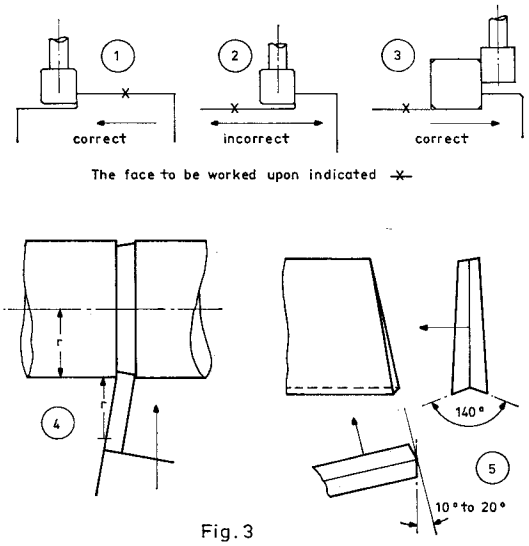


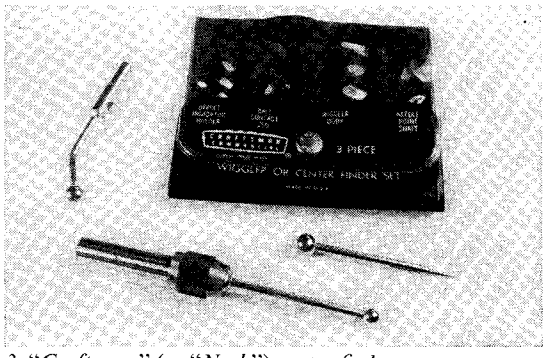
Fig. 3

In view of the fact that the working space for the spring is likely to vary somewhat, I think that it would be better if the spring were made of thinner material, thus reducing the rate. A similar spring in .012 in. material would have a rate only about one-quarter of that of the .020 in. spring. P.B. or even hard-rolled brass shimstock about .015 in. to .018 in. thick would, I feel sure, give a satisfactory action.

Wobblers

When I wrote about edge-finders I was not aware that they were still available commercially but this matter has since been put right as a number of readers have kindly sent me details of several commercially produced articles. One reader sent for my examination a wallet containing a complete outfit (of U.S. origin) which included an e-f and a sticky-pin and were sold under the trade name of "Craftsman", (3). It tested this outfit and will include some comments on its performance. Others include the "Huffam" Precise centre-locator which is provided with a pair of interchangeable probes, one cylindrical and the other barrelled. The "Planet" centre-locator (seemingly retailed also as the "Imp") is available in two different forms having either cylindrical or spherical ends to their stems.

In addition to these there is the "Offen" and the "Oldak" which is another "outfit", but there is no point in describing them as I have no intention of compiling a tool catalogue; the object of the exercise is, I hope, for readers to make their own. Most of the commercially produced e-fs are termed centre-locators but as an ordinary "Verdict" dial gauge and several other tools can be used for this purpose, I think that "edge-finder" or "edge-



3. "Craftsman" (or "Nork") centre-finder set.

locator" is a more descriptive term. The shanks all seem to be $\frac{3}{8}$ in. dia. and most are screwed at the end to fit Clarkson-type collet holders, but for reasons given in the original article I prefer a plain $\frac{1}{4}$ in. shank.

I had considered making an e-f for many years before I actually got around to the job and one point on which I had to come to a decision was the shape of the end. It was apparent that if there was any eccentricity in the device or its mounting, a cylindrical end would give rise to certain errors when used on a flat surface (Vol. 143, p. 948), but this would be almost entirely overcome if the end were to be made slightly barrel shape. In order to eliminate completely any errors arising from eccentricities the end should be spherical, but for some reason undefined I prefer the barrel. Unfortunately, the barrel-shaped end is not suitable for two uses which I had in mind, viz. working off the diameter of a rod or from a very shallow step where only the extreme end of the probe can be used. As the ill-effects of eccentricities would be in proportion to the length of the cylinder, it was decided to go ahead with a cylindrical end and to keep the length reasonably short. Of course, had it occurred to me, I could have made two probes as Huffam have done but, at the moment, I am perfectly satisfied with the accuracy I am obtaining from the short cylinder.

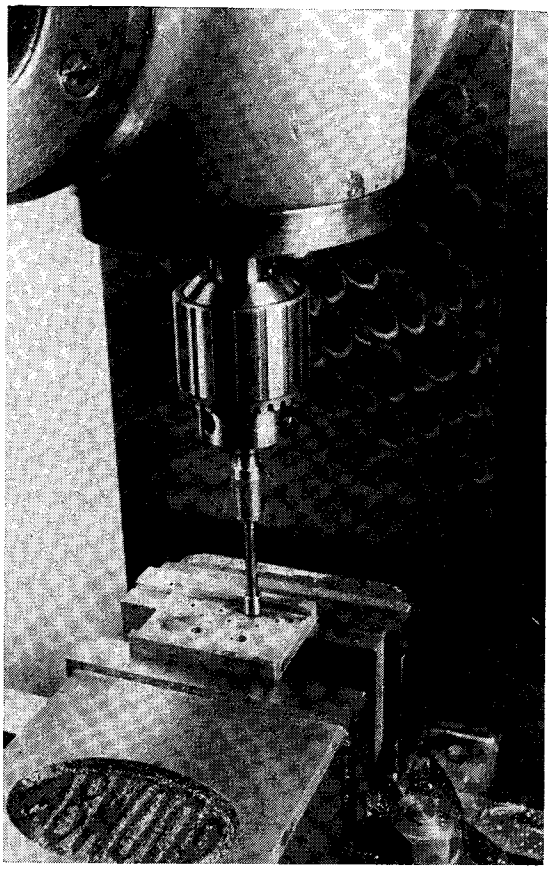
V. Huffam, in their literature, make the following statement: "When the datum face is in the vertical plane, the direction of spindle rotation should be such that the centre-locator stem will run-off downwards. If run-off occurs upwards, it is difficult to read accurately." It should be mentioned that all their illustrations show the device mounted in the spindle of a horizontal milling machine, which is the equivalent of using it in the lathe. All my experience has been with using it in a vertical position where there was no question of running up or down. In view of the maker's remarks I have tried mine in the lathe, running it against a vertical surface in both directions, and I was unable to find any difference in the results

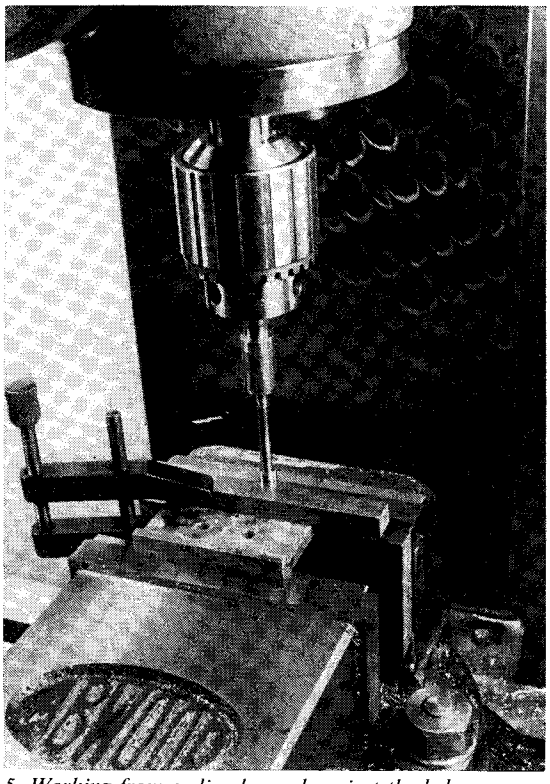
either way within a tenth of a thou. They describe also the "Light line" method of working which was referred to by Mr. D. W. Bailey in his letter to "Post Bag" (16.9.77) and which I have tried, but my own preference is for the run-off method.

When using the e-f for locating from a shallow step the procedure to be adopted will depend upon whether the work to be done, probably the drilling of holes to co-ordinates, is on the lower or the upper level, see Fig. 3 (1, 2, 3). If holes are to be drilled in the upper portion as indicated by a cross in (1), the whole operation is quite straightforward, the work being moved to the left until the step is correctly located, and thereafter further to the left for the drilling.

In the case where the holes are to be drilled on the lower level (2) this procedure is not satisfactory because, after having located the edge, the screw will have to be reversed and so backlash errors will be introduced. There is a subtractive method of working which would overcome this trouble but if there are more than one or two holes to be drilled I consider the method to be tedious

4. Edge-finder working from small ledge. Wrong method for locating holes on lower surface.



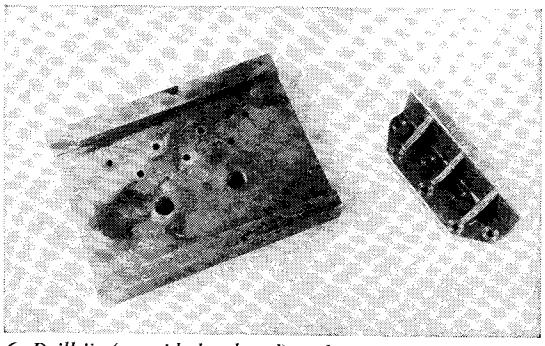


5. Working from a slip clamped against the ledge.

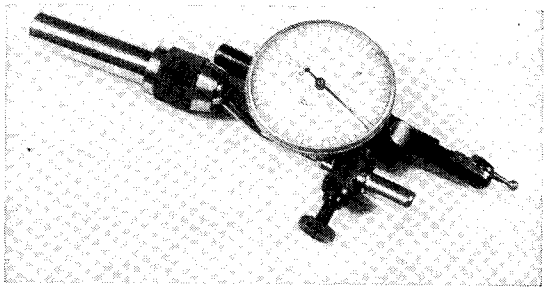
and liable to mistakes. The best way is to locate from a small piece of straight material having two square edges which is clamped to the work with one edge firmly in contact with the step (3). It will be clear that the movement of the table is always in the one direction (see photos 4, 5 and 6).

The "Craftsman" outfit consists of a holder with spring jaws and three items which can be snapped into it, namely, a cranked rod to carry a "Verdict" type D.T.I. which is extremely useful for some purposes (7); a "sticky-pin" (and I thought that mine was original!) and finally an edge-finder which is called a "wiggler" in U.S. parlance. There is, additionally, the usual form of knurled closing nut similar to those on a pin-chuck. The grip on a 5/16 in. ball was, however, quite powerful without any assistance from this nut, much too powerful for an edge-finder, and there was no means of adjusting or modifying it. The first two items are good but I found the e-f to be very poor. The probe was, in my opinion, too long and the end, which was spherical, was $\frac{1}{4}$ in. dia. so that the correction for half diameter instead of being .100 in. was .125 in.—a fruitful source of arithmetical errors. (See *Post Script* at the end of article.)

I first took a number of readings against a hardened and ground surface with my own e-f and

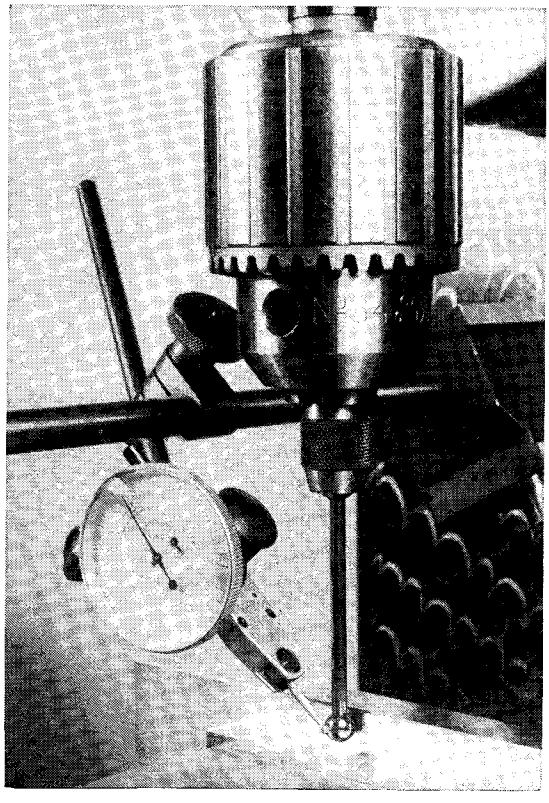


6. Drill jig (cyanide hardened) and component.



7. "Verdict" indicator on "Craftsman" offset holder.

8. Testing "slip point" using tenth-thou. clock.



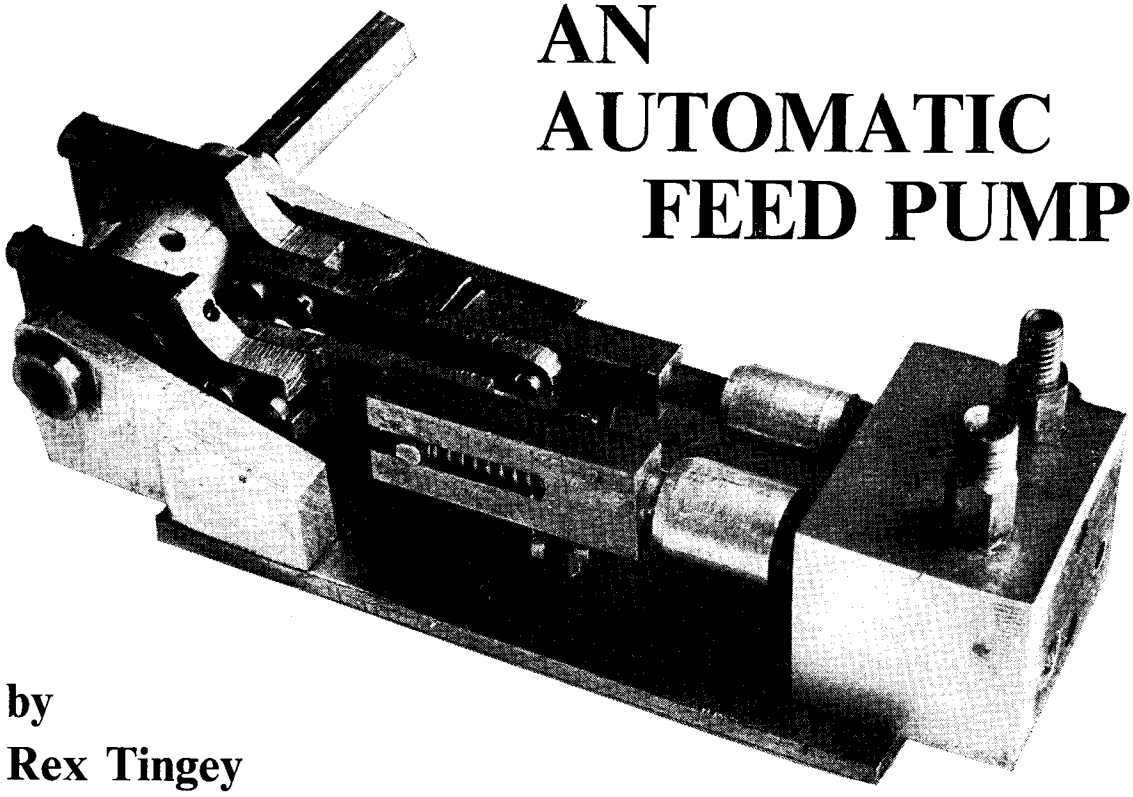
then substituted the "Craftsman" which ran off fully .002 in. later than it should have done so that it appeared to have a starting error of nearly $2\frac{1}{2}$ thous (assuming mine to be .003 in.). I assumed that the stiffness of the joint which took 4 oz. applied to the end of the probe to move it, coupled with the longer stem, caused a deflection of the stem which delayed the run-off. I rigged up a simple test for this, using a very sensitive D.T.I. with a large dial reading 0-2-0 thous per complete turn, graduated in tenths. The test was carried out by setting the D.T.I. to touch one side of the spherical probe and using a parallel held in the machine-vice to apply pressure from the rear, using the cross-slide movement. Any movement of the sphere was shown on the D.T.I. After each forward movement of the slide it was withdrawn again, allowing the sphere to return to its original position—zero. This process was repeated, increasing the movement each time, until the indicator failed to return exactly to zero. When it was pushed to .0026 in. it returned to zero but when the movement was .0027 in. it returned to zero + one-tenth. This was repeated many times with remarkable consistency. (See photo No. 8.)

My interpretation of this result was that the 4 oz. load needed to move the joint was causing a deflection at the probe of .0026 in. and that anything more than this caused the joint to slip. As this amount of deflection looked excessively large I checked it by calculation which gave a figure of .0016 in. which is one thou less than the observed figure and this can be accounted for only as spring or yield in the chuck, spindle and bearings, etc.

An identical test was then carried out using my own e-f which proved to have its "slip-point" after a movement of only .00025 in. to .0003 in., approximately one-tenth of that of the "Craftsman" and right in line with the estimated accuracy which was .0003 in. (see Vol. 143, p. 949). It is interesting to note that the calculated deflection of the stem of my e-f with a 1 oz. load is only .00047 in.—practically nil—and the 1 oz. pressure is causing a movement in spindle, bearings, etc. one-quarter of that due to the 4 oz. load, i.e. .00025 in. as against .001 in. The difference in behaviour of my e-f and the "Craftsman" is most marked; mine moves sideways, gently and smoothly, through about 10°, whereas the "Craftsman" flies up through about 45° quite violently and then, having freed itself from the arresting surface, whirls around in a disconcerting manner. Coupled with this difference in visible behaviour is the undoubted fact that excessive friction in the ball-joint coupled with flexibility of the stem combine to delay the point of run-off and so introduce errors, the magnitude of which can only be determined by experiment.

To be concluded

AN AUTOMATIC FEED PUMP



by
Rex Tingey

WITH THE DESIGN of a boiler for the twin marine engine it was found that the water ran out long before the fuel, and the need for some sort of boiler feed pump was felt. The pump had to run unattended if one was to keep one's feet dry, and the standard by-pass valve, opened and closed by hand, was not a suitable control. The design for the answer, an automatic feed pump, came after a little thought.

Steam, it was reasoned, is compressible, but water is not; steam passes easily through a small hole, whereas water requires force to pass through a similar sized hole, and is metered dependent on the force. Using a combination of these facts it is possible to design a pump which is sensitive to whether it is handling water or steam, and to change its action accordingly. By coupling the action to a feed pump, water level is monitored in an automatic manner.

The Sensing Pump

The sensing pump is a large bore ram pump, sealed with an "O" ring gland, which moves the contents of a small chamber with its travel. The chamber is sealed at the bottom and has a metering aperture at its top; the aperture takes the form of a nozzle with a hole only a few thousandths of an inch in diameter. The drive for the ram is spring-loaded in the forward direction.

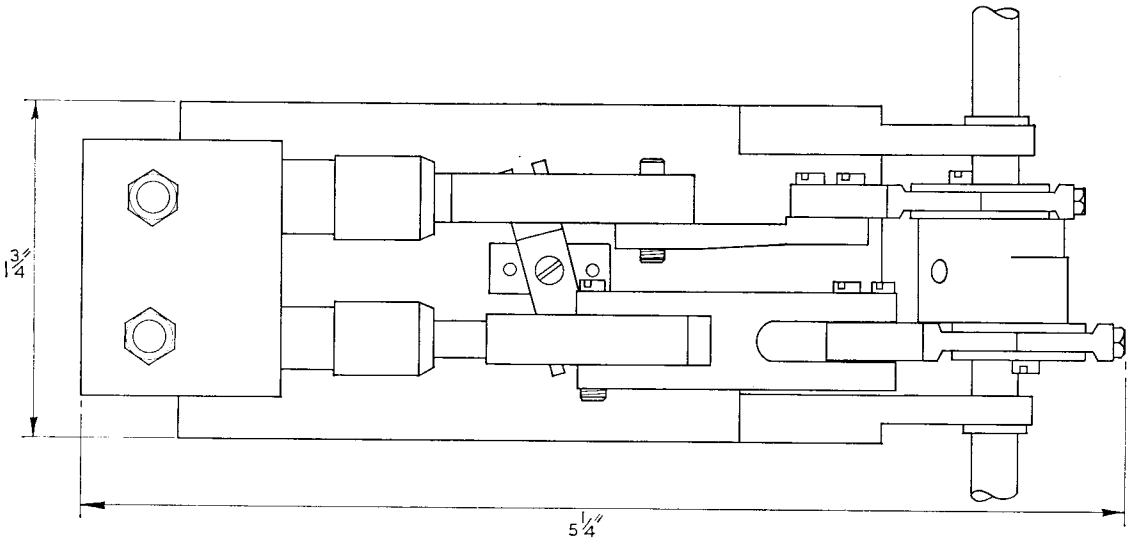
When the ram is reciprocated in the empty chamber with water at the metering aperture, water will be drawn into the chamber, to fall by gravity to the bottom, the air in the chamber being expelled. When the chamber is full of water the ram will tend to be held back against the spring pressure by the force required to meter the water through the aperture, and move with only a small "hunting" movement following a minute intake of water at the nozzle, and a minute expulsion.

However, when the water falls below the level of the metering aperture the minute intake is of air, with air and water being expelled, more aid is drawn in at each short stroke as the stroke lengthens due to the extra tension of the spring, until the ram is working to its full extent again, but pumping air.

In other words the sensor acts as a hydraulic lock.

The Feed Pump

The feed pump is a standard ram pump; stainless steel ram into a phosphor bronze bore, sealed with a silicone rubber "O" ring. It is driven by an eccentric and works into a block with a one-way



AUTOMATIC FEED PUMP — GENERAL LAYOUT

ball valve at the bottom for water intake, and another ball valve for water feed into the boiler. But the eccentric rod only supplies the forward stroke to the pump, and can return, without the ram, along a slot in the ram rod. The ram itself is connected, by a forked lever, to the ram of the sensing pump so that the forward stroke of the pump provides the backward stroke of the sensor.

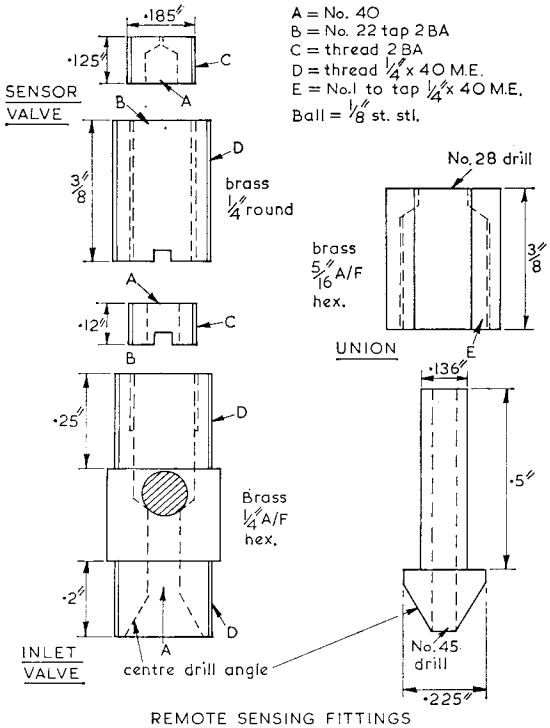
The sensor pump is driven from the same shaft as the feed pump, but from a separate eccentric, 180 degrees out of phase, so that the forward stroke of the rod drives the sensor pump forward and the feed pump ram backward, via the same forked lever. Thus when the sensor ram is held back by water pressure its eccentric rod only causes the spring to exercise, and the feed pump remains in the forward position, held by the forked lever, and no water is fed to the boiler.

The Prototype Pump

The prototype pump was made for the boiler of the marine twin engine, but it would fit snugly between the frames of a locomotive and eliminate the worry of a dry boiler and attendant disasters. The pump was constructed simply and cheaply, with no special castings or unusual materials being required.

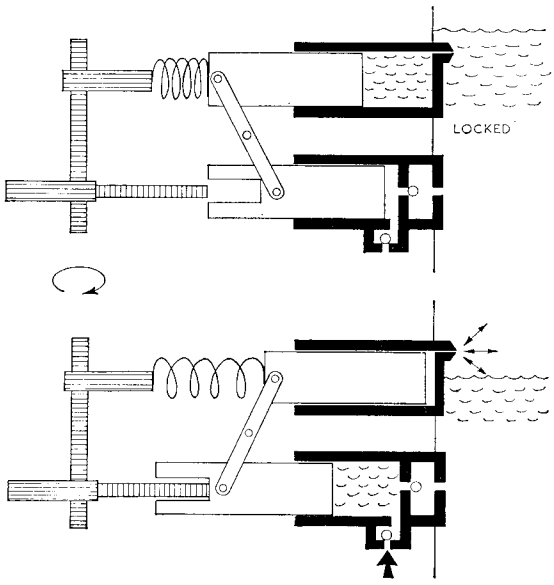
The pump block is of aluminium alloy, and can be bolted onto the pad of a boiler. It holds two cylinders of phosphor bronze to take the rams, held in place with Loctite alone. The clacks and sensing valve are of brass, threaded in place as well as being sealed with Loctite.

The pump bed is a sheet of $\frac{1}{8}$ in. thick mild steel, with alloy bearing plates. The spindle is of mild steel, and has two eccentric sheaves of gun-



REMOTE SENSING FITTINGS

metal, driven by a dural separating boss secured to the spindle with an allen screw. The eccentric straps, rods, ram rods and level are all of mild steel. The stainless steel rams are turned down and threaded into their rods for ease of construction (I try to avoid drilling this material!). The slotted ramrods are operated with phosphor bronze pins



SCHEMATIC DIAGRAM OF PRINCIPLE

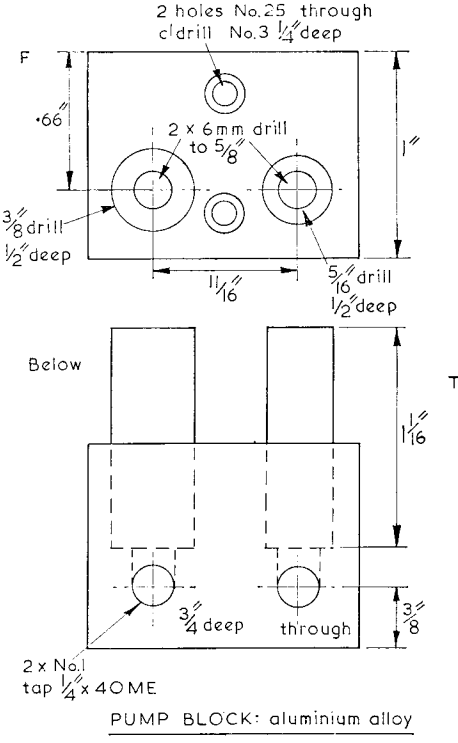
from the eccentric rods, and operate the lever with their own phosphor bronze pins. The lever has a bearing of phosphor bronze.

Adjustment is provided for steam pressure by altering the effective length of the sensing pump rod on its eccentric strap. For extremes of pressure the spring may need to be changed for one of a different gauge. Centralisation of the action is provided both by making the length of the pump eccentric rod adjustable on its eccentric strap and by slotted movement of the lever block.

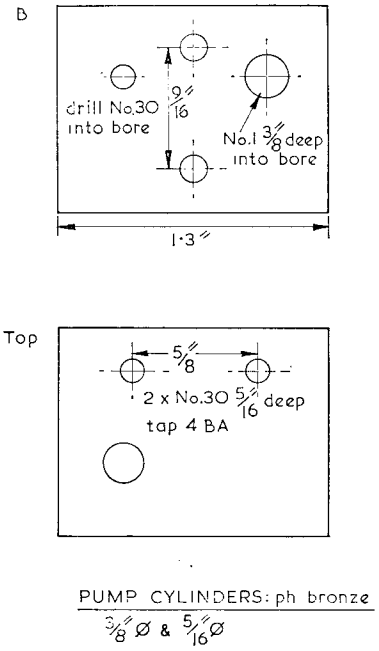
Making the Pump

The pump block is made from a block of aluminium alloy, filing by hand and checking with an engineer's square. The side to face the boiler has to be taken down flat on emery cloth, held on a piece of plate glass, both at this stage and again after drilling. The position of all holes are now marked out and drilled, with the block clamped each time, on the cross-slide of the Unimat, in the vertical mode. Do not succumb to temptation and attempt to drill without clamping; not only will the drill wander but will probably end up bent, and useless. Tap the holes for the sensing valve and clacks, and the two securing screws for the bed.

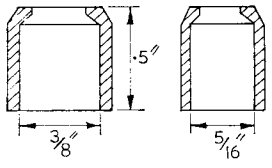
Make the two cylinders from the appropriate diameter phosphor bronze, drilling the bores in the Unimat and leaving the outside for just a clean-up with emery. Phosphor bronze is a difficult material to drill, even in the lathe, it tends to get very hot without any warning when it grips the drill like a vice; either slipping in the 3-jaw chuck or turning the drill in the drill chuck. It has another vice of slyly turning a drill off course so



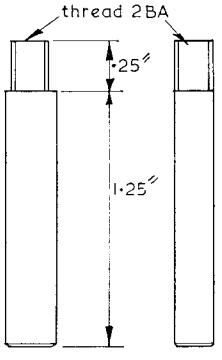
PUMP BLOCK: aluminium alloy



PUMP CYLINDERS: ph bronze
3/8" Ø & 5/16" Ø



CYLINDER CAPS: all alloy



RAMS: st.stl. 1/4" Ø & 3/16" Ø

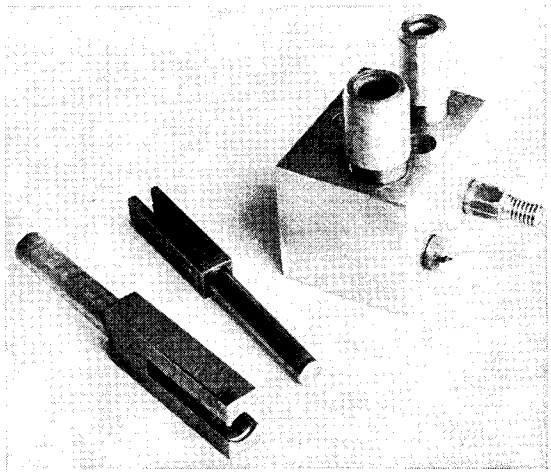
that the bore is crooked. The answers are to use a centre drill as deep as possible, constantly withdrawing it, and to use a soluble oil, very dilute, as a cooling agent. Follow with a drill just slightly larger than the pilot of the centre drill. Then drill out the hole, undersize, using the headstock quill movement rather than the tailstock, and finish by hand reaming to the right size to correct any "dog-leg" in the hole.

Make the valves to go into the block from brass, carrying out all the work in the lathe. I have a second drill chuck so that one can be on the head and one on the tail-stock for making valve fittings from $\frac{1}{4}$ in. round and A/F stock, for holding drills and taps, and keeping all concentric. For the $\frac{1}{8}$ in. balls the bottom of the drilled hole is used for the seat, with the time-honoured tap on a brass rod with the ball in place ensuring a good seal. Be careful that a 2 BA tap does not go in too far and mar the seat. When the valve is made, fit the cap, and test by giving a blow and a suck in water; if it is satisfactory, seal it into position with Loctite 601. It is very much easier to make any pump by this method, rather than drilling and tapping a solid block, as all the work on the valves is so easily carried out on the lathe, and the valve itself inspected and passed before fitting.

Make the rams in the lathe, turning down and threading using RTD tapping compound. Face the ram end and just take off the corner so that the "O" ring will not be damaged, finishing off with emery cloth. Check that they fit the bores and bottom in the block, and fit the correct silicone "O" rings over the rams. Make the caps from dural, turned on the lathe, drilled to fit the cylinders, then parted off to leave the angle left by the drill tip to hold the "O" ring. Loctite the cylinders into the block with 601, and, with the rams and rings in place, the caps are secured with 601, taking care that the rings are left free of Loctite. If the rings ever need changing the caps will have to be wrenched off and remade.

The ram rods are made from the appropriate section mild steel first by turning in the 3-jaw chuck and drilling after carefully centring. Both rods are drilled through No. 22 so that the end can be tapped 2 BA for the rams. The sensing pump rod is then drilled No. 1 for the spring. Slots are then sawn down across the $\frac{1}{4}$ in. and filed to take the driving pins. The eccentric sheaves are turned from gunmetal rod — this is easier to machine than phosphor bronze—parted off, then bored through held $\frac{1}{8}$ in. off centre in the four-jaw chuck.

The eccentric straps are made from flat section b.m.s. After drilling down for the 8 BA screws, saw through and secure the two halves back together; drill to fit the eccentric sheaves. File out



Cylinders and caps assembled on the block.

all the rest by hand, stamp numbers on one side and an eccentric to match. Make the eccentric boss from round section dural and fit the appropriate numbered strap and eccentric, to run in on the lathe using plenty of 3-in-1 Oil.

Whilst running in cut the pieces for the bed and side plates from mild steel and dural flatstock. Put the plates together in the vice and file nicely to shape all round; dural sticks together well for this job. Clamp the two together when marking out and drilling for the bearing, and drill and tap the holes for the securing screws. Drill the various holes in the bed, slotting the two holes for the lever block so that adjustment is present. Turn the bearings from phosphor bronze rod, drilling out 6 mm. to be reamed for the $\frac{1}{4}$ in. when fitted to the bed, running the reamer right across.

Making the remaining parts

Make the eccentric rods, by hand, from mild steel section, drilling the holes for the securing screws and the operating pins, and tapping. After fitting to the right straps, cut the screws down to length. Then, pushing the adjustment right in, file rounded "flats" on the eccentric drive boss so that complete adjustment is possible without binding. Thread $\frac{1}{8}$ in. dia. phosphor bronze rod in the Unimat—not by hand—and cut a length for each to fit the slots. Make similar pins for the ramrods, and fit the four pins, after cleaning up with C.T.C., and using Loctite 242.

Make the forked lever, by hand, sawing then filing the slots to a precise fit on the $\frac{1}{8}$ in. dia. bronze, drill for and fit the little bearing, after turning it on the lathe; it should be a press fit. Make the lever block and drill and tap for the lever screw and two securing screws.

Details of pump fittings, bed, plates, rods, etc., will be given in the next issue of Model Engineer, *out on 21 April.*

A Light Compound Steam Tractor

at 2 in. Scale

Part X

by John Haining

From page 285

AS A YOUNG APPRENTICE going through the shops I used to envy those older ones, to whom the grime and murk of the foundry or clangour of the plating shop had become a thing of the past, on their graduation to the Drawing Office, then appearing to be a most peaceful place where little occurred to disturb the even tenor of the days. How false were my surmises was very quickly brought home to me when I in my turn left the shop floor behind and entered the D.O!

Far from leaving irksome routine jobs behind, a whole array of new ones suddenly materialised, all apparently by custom performed by the newest ex-works apprentice and all equally tedious. Among these tasks was one known as "pipe sheets". This not only included making line sketches on carbon paper pads of every pipe run on a job be it an engine boiler or some other machine but also working out weights of pipes, fittings, brackets, etc., and recording these against the job number, blue stains from the carbon sheets appearing on everything from clothing to lunch-time sandwiches as they stuck to hot fingers.

Perhaps because memories of these "pipe sheets" still linger, the one job on any engine which gives me least enjoyment is that of finalising lists of boiler fittings and drawing up pipe layouts, brackets and all those small details which have to be done to complete the job. Nevertheless, as we are approaching completion of the major part of the little Ransomes engine, this article will deal with the "bits and pieces" still outstanding from the various sub-assemblies, some of which I have had to check on before drawing to suit two-inch scale, because of variations in the maker's specification and drawings.

Heading the list of "tidying-up" jobs is an amendment to the safety valve centre distance as shown on the cylinder drawings. The two tapped holes are shown at $\frac{3}{8}$ in. centres in the top cover boss and while the valves are set very close together, being transversely mounted across the cover plate on the full-size engine, the twin safety valves on the 2 in. scale job are really too small for my liking and as my top cover plate is not yet drilled and tapped the centres can be increased to $\frac{1}{2}$ in. quite easily. Even if the two holes are already drilled and tapped they can be plugged and silver soldered or the boss machined down in height and a plate with the valves screwed in at wider centres fitted over the top. A couple of points affecting the reversing lever and reach rod should also be mentioned here. The quadrant sweeps are proportionally longer than those on the full-size engine and will project slightly to rearward of the side plate bolted to the right-hand (offside) hornplate. As they should not be visible when viewed from the offside, the sideplate is lengthened slightly to extend the full length of the sweep which means that it hangs slightly over the cut out portion of the tender side, as shown on the reversing lever drawings. Another important point is that the plate and hornplate has a cut-out length to allow the reach-rod clevis-end to meet up with the reversing lever. The maker's drawing shows this bend in the rod quite clearly in plan view, together with the slit cut in the plates to accommodate the rod.

There is absolutely no room below the crankshaft for a turret in the accepted position. I included a boss just above the backhead because this boiler is suitable for another engine as well, on which an orthodox turret is required; this boss can be left off if desired, or left in and plugged, as steam for the injector and to the pressure gauge is taken from a manifold which screws into the top of the two bosses on the boiler backhead, this serving both as a turret and to house the top water gauge connection. As on the full-size engine the second shaft is close to the backhead and the water gauge, if fitted directly on the backhead, would be very hard to read. To get over this the water gauge is extended on "stalks" to a position behind the second shaft where it is easy to see.

Even with the short stroke of eight inches employed on the full-size engine, space was cramped to below and behind the crankshaft webs, and as readers will probably remember I lengthened the stroke of the two-inch scale cylinders slightly, which of course has had the effect of making things even more cramped and restricted in that area. Even if the makers had not found it necessary to bring the water gauges out to a position behind the second shaft, I would have done so on the two-inch scale engine to make them visible at all. On the detail drawing of the reversing lever and regulator the transverse back plate running

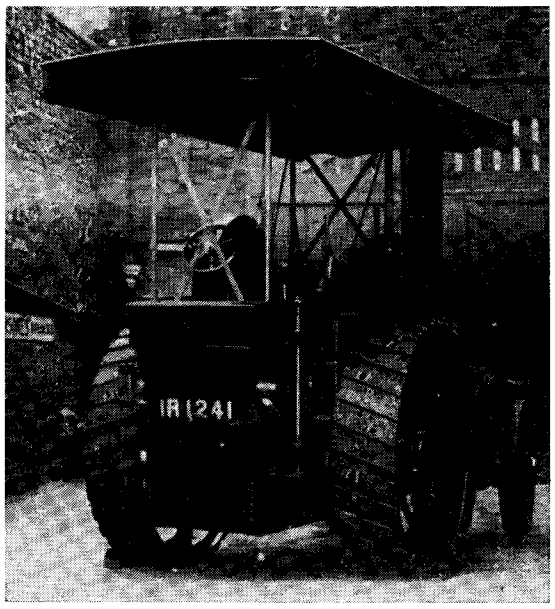


Photo by courtesy of Museum of English Rural Life

across between the hornplates has been positioned at 1 9/16 in. from the crankshaft centre-line which gives just sufficient clearance between the base of the regulator quadrant and the crankwebs.

The lower edge of this backplate will require a small cut-out to clear the remotely positioned steam manifold or "semi-turret" so it is advisable not to bolt the transverse plate permanently in position until the steam fitting is screwed into the top bush on the boiler backhead.

The second motion shaft will need to be partly withdrawn to allow this to be done. The boiler feed pump on the first engine of the class was bolted to the left-hand hornplate; all subsequent engines had the pump positioned between flywheel and foretank, the pump having a square flange secured by four setscrews to the hornplate on the nearside just below the flywheel instead of behind it. The pump draws water from the tender tank only and delivers to a clack valve halfway along the boiler on centre-line on the nearside, so that the suction delivery and return pipes run in a neat horizontal line from clack valve back to the footplate where they curve down and into the top of the tank.

The pump is geared down slightly to run at approximately two-thirds crankshaft speed, the normal practice on the majority of engines where fairly high r.p.m. had to be reduced for greater pump efficiency. The hornplates will require drilling and tapping No. 4 BA marking off from the pump flange.

The pump is a well-tried design, $\frac{3}{8}$ in. bore by $\frac{3}{8}$ in. stroke, and I have used two gears as supplied by Messrs. Muffet; the one on the crankshaft is 1 in. pitch dia., 1.1 in. O.D., 20 teeth, with a bore of $\frac{1}{2}$ in., the larger gear drawing the pump eccentric being 1.5 in. pitch dia., 1.6 in. O.D. with 30 teeth and $\frac{1}{2}$ in. bore.

Both gears are 20 D.P. 20° pressure angle and both will require turning down from their supplied thickness of $\frac{1}{2}$ in. The catalogue code numbers for ordering from the firm are 3-20 and 3-30 respectively. They are supplied without keyways which will have to be cut and are supplied in either steel or cast iron. I am using the latter which incidentally have bosses of .845 in. and 1.25 in. respectively so that a grub screw can be used for the crankshaft gear instead of a keyway, if you prefer it.

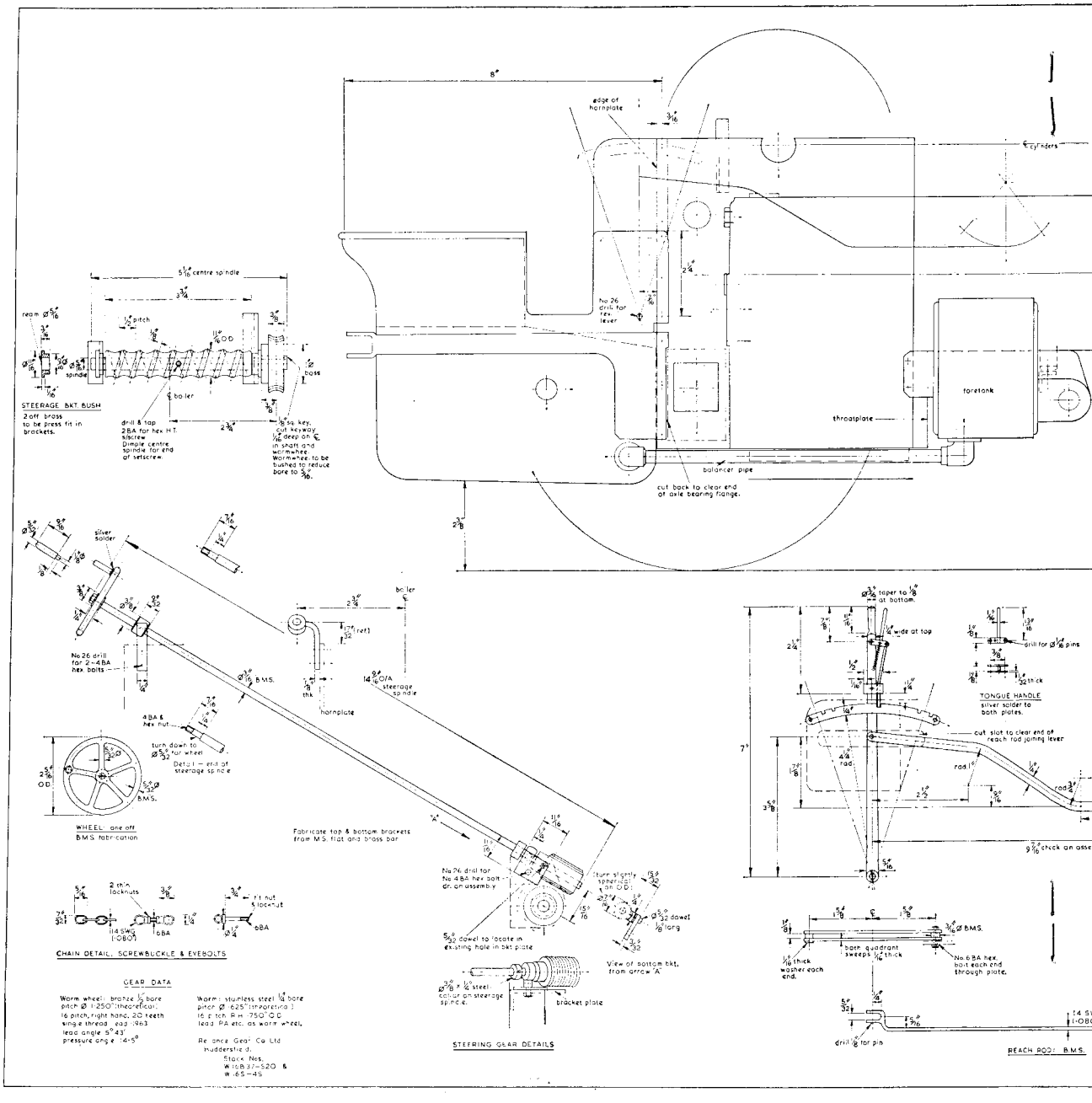
Now a few points regarding the steering gear. First the steering wheel itself, which is straight-spoked and built up from 5/32 in. dia. b.m.s. rod formed around a circular steel former in which a radiused groove is cut, the five spokes of the same material being silver soldered in place. It is easier to hold the boss and rim on a small flat steel plate (about $\frac{1}{8}$ in. or even less in thickness) with the rim and spokes clipped in position first completing the rim joint — the two ends should be chamfered where they meet together so that a strong joint is made which will not stand proud of the rim, and then silver soldering each spoke in turn to rim and hub. The wheel is a press fit on the slightly reduced end of the steerage spindle, retained in position with a nut and washer. A spot of Loctite is not a bad idea before pressing the wheel into position as no key is fitted on the two-inch scale engine.

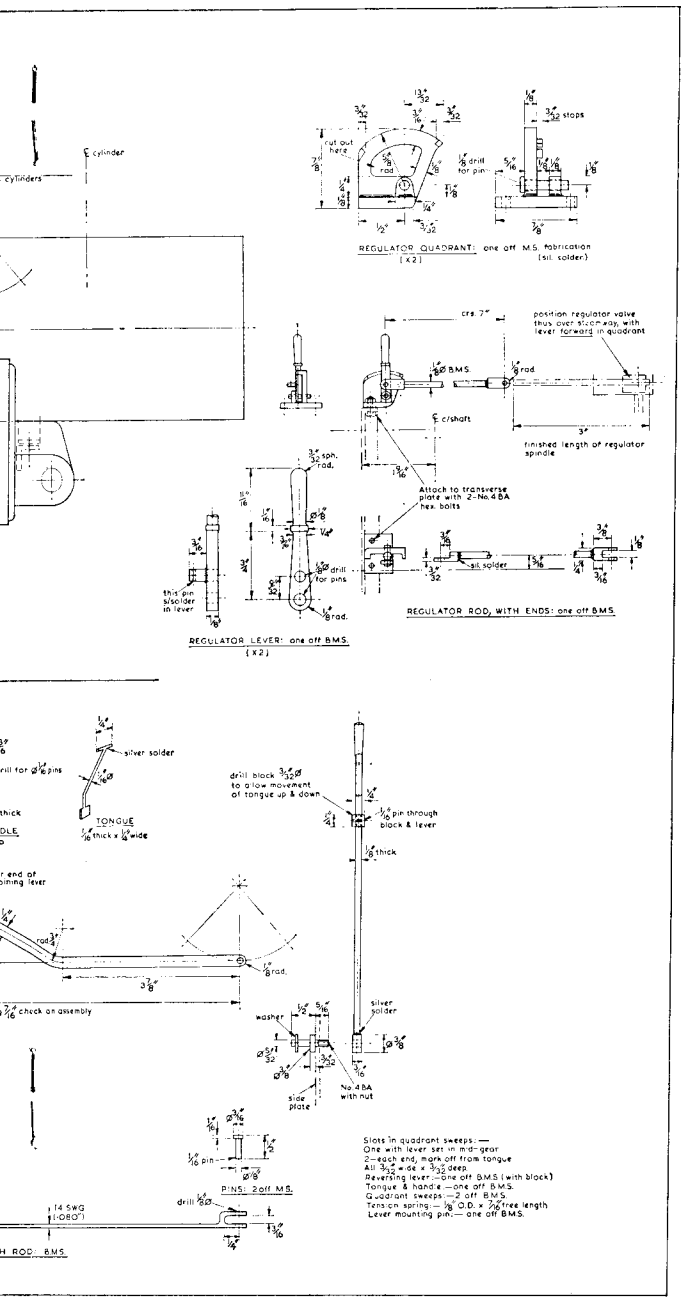
The steerage cross-shaft or wormshaft is a single-start helix very similar to that used on the Aveling and Porter roller with a wide pitch in proportion to its diameter.

The wormshaft is made a separate item from the centre spindle, upon which it should be a fairly tight press fit, the 2 BA setscrew screwed through the wormshaft registering in a dimple in the centre spindle, the whole assembly being fitted to the two front brackets on the foretank after these have had the brass or gunmetal flanged bushes pressed into place—again a drop or two of Loctite should be used to retain these in position.

The 2 BA setscrew should be positioned as near the centre of the wormshaft length as possible as it also has the important task of securing the steering chain to the wormshaft passing through one link of the chain. When setting up the steering assembly insert the setscrew through the *middle* link of the chain length and then wrap the chain around the wormshaft an equal number of times each side of the setscrew so that the chain is led on and off as shown in my sketch.

Set the front axle dead straight and attach the chain ends to the drawbolts which run through the


8"
edge of hornplate
cylinders
foretank
throatplate
balancer pipe
cut back to clear end of axle bearing flange.
STEERAGE BKT BUSH
2 off brass to be press fit in brackets.
5 1/16 centre spindle
3/4
ream Ø5/16
1/2 pitch
Ø3/8 spindle
1/2 boss
drill & tap 2BA for hex H.T. stscrew
Dimple centre spindle for end of setscrew
3/16 sq. key, cut keyway 1/16 deep on ℄ in shaft and worm wheel. Worm wheel to be bushed to reduce bore to 5/16.
silver solder
No 26 drill for 2-48A hex bolts
Ø5/16 B.M.S.
hornplate
14 8/0 O/A steerage spindle
4BA & hex nut
turn down to Ø5/32 for wheel
Detail — end of steerage spindle
WHEEL one off
B.M.S. fabrication
Fabricate top & bottom brackets from M.S. flat and brass bar
No 24 drill for No 48A hex bolt — dr. on assembly
turn slightly spherical on O.D.
Ø5/32 dowel 1/8 long
5/32 dowel to locate in existing hole in bkt plate
Ø3/8 x 1/4 steel collar on steerage spindle
bracket plate
View of bottom bkt. from arrow 'A'
STEERING GEAR DETAILS
2 thin locknuts
1/4 nut & locknut
6BA
14 SWG (1·080")
CHAIN DETAIL, SCREWBUCKLE & EYEBOLTS
GEAR DATA
Worm wheel: bronze 1/2 bore pitch Ø 1·250" theoretical, 16 pitch, right hand, 20 teeth single thread, axial 19e3 lead angle 5° 43' pressure angle 14½°
Worm: stainless steel 1/4 bore pitch Ø .625" approximate 16 p.c.h. R.H. .750" O.D. lead, P.A. etc. as worm wheel.
Reance Gear Co Ltd Huddersfield. Stock Nos. W16B37-520 & W16S-45
taper to 1/8 at bottom
1/4 wide at top
drill for Ø1/16 pins
1/32 thick
TONGUE HANDLE
silver solder to both plates.
cut slot to clear end of reach rod joining lever
4" rad.
rad.
rad.
7"
9/16 thick on axle
Ø3/8 B.M.S.
both quadrant sweeps 1/16 thick
1/16 thick washer each end.
No 6 BA hex. bolt each end through plate.
drill 1/8 for pin
REACH ROD: B.M.S.



two holes in the front axle. A screw-shackle is fitted in the right-hand chain length right against the axle for slack adjustment and should be allowed for when checking length. Just as a reminder, when winding the chain on to the worm-shaft allow enough turns of chain each side to give full lock in either direction and arrange the chain lengths so that turning the steering wheel to the right pulls in the right-hand chain and vice versa—it is easy to get reverse hand steering!

The steerage spindle has plenty of clearance where it passes through the sleeve in the foretank which gives a modicum of latitude when it comes to positioning the top bracket bolting to the top of the nearside hornplate; the spindle is held at the lower end in a simple forged eye bracket attached to the larger nearside front bracket on the foretank and the key dimension which must be adhered to is the centre distance of 15/16 in. from wormshaft to steerage spindle centres. As long as the steerage spindle clears the lower pump drive gear the angle is not critical to a degree or two. Harking back to the article on wheel construction, if anyone is having difficulty in obtaining Vee belting with a flat top, instead of a slight camber, for making up the solid tyres, an excellent article on "Rubber Tyres for Model Road Vehicles" was written by Mr. W. E. Sheppard in *Model Engineer* No. 3545 dated September 1976, and anyone in difficulties could not do better than to follow the procedures laid down therein, rather than using Vee belting which is not quite suitable.

As was customary on engines designed principally for use on the highway, road gears were encased completely and motion covers ran from both sides of the cylinder casting back to the honplates, hiding most of the moving parts.

The circular covers over the crankshaft and second shaft gears are made up in three main pieces; fairly straightforward and without any intricate double radius work, these will be best made up from light gauge copper sheet, but if expense is a problem and weight is not, mild steel sheet may be used to fabricate the set. In this context, a little extra weight will not be a bad thing if we are to use the engine to its best advantage in hauling a load, I always feel, though it is a pity that so much work is hidden underneath covers, particularly the two-speed change gear layout.

Whilst on the subject of covers, the twin safety valves vent into a bonnet bolted to the top of the valve bodies, with a single outlet pipe leading up through the awning. On the two-inch scale engine it will be advisable to make this so that it is resting over the valves but free to slide up through the awning if it is necessary to adjust or check the valve lift.

To be continued

"GREENE KING"

Martin Evans continues with constructional details of a 3½ in. gauge locomotive based on the Southern Railway S.15 class

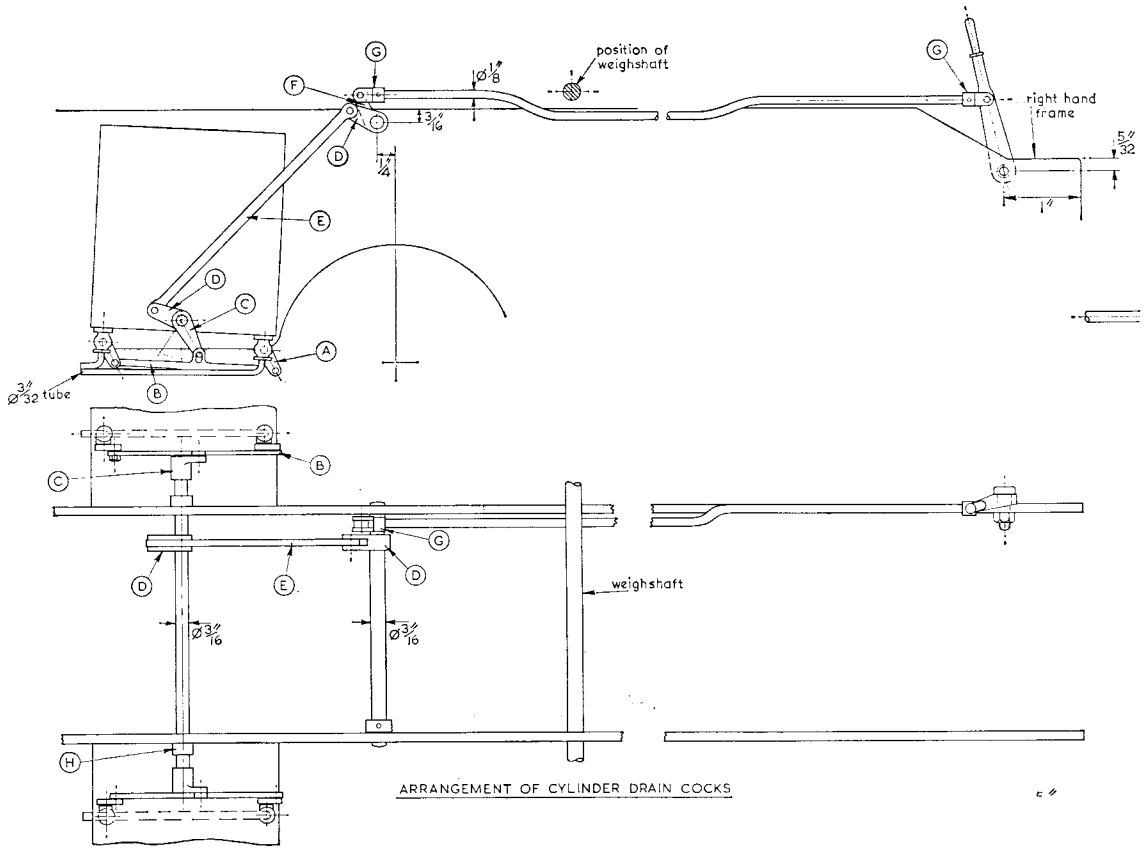
Part XI

From page 211

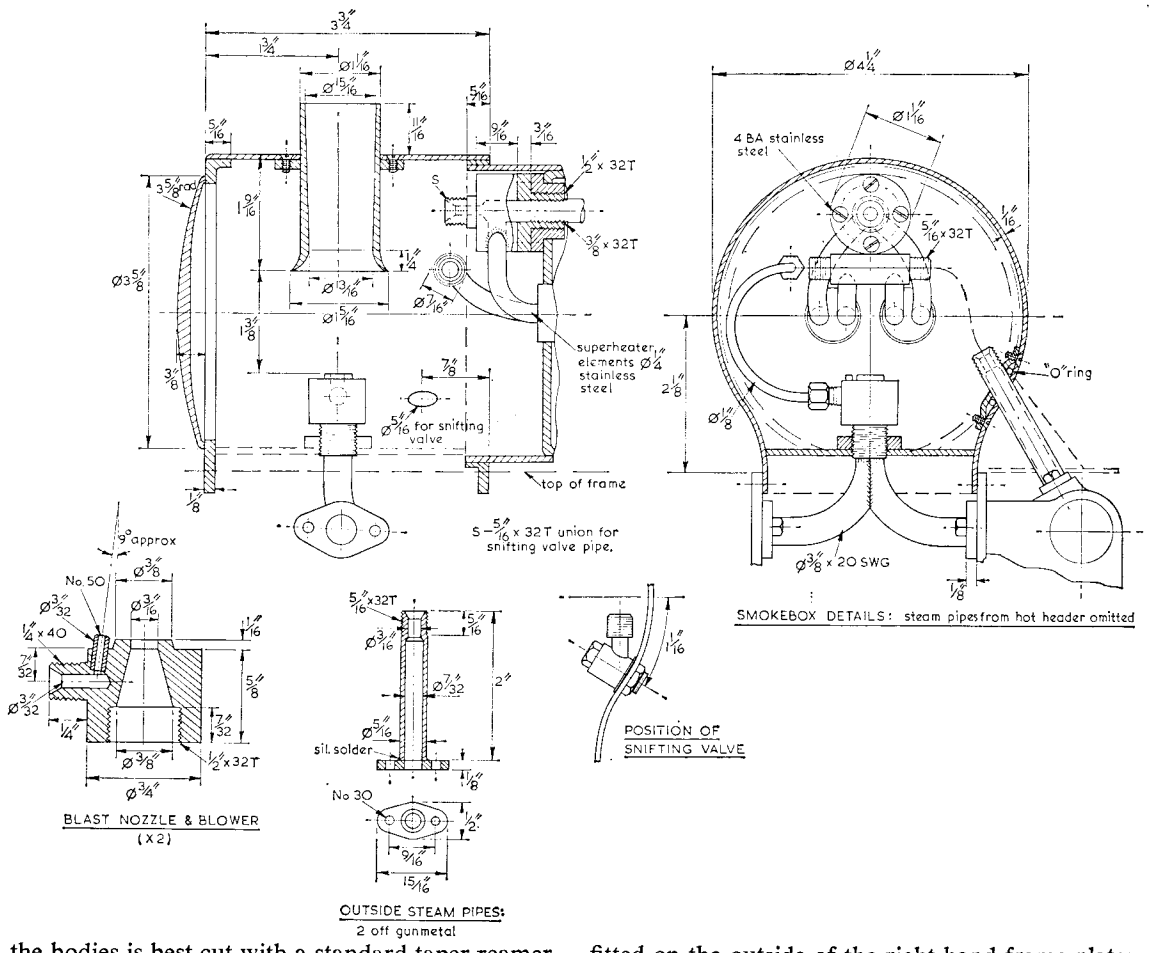
BEFORE COMPLETING the backhead fittings, perhaps we should return to the chassis and tackle the cylinder drain cocks. Drain cocks are well worth fitting to any locomotive above half-inch scale. Not only do they allow the driver to warm up the cylinders very much quicker, at the start of the run, than would be possible if no drain cocks were fitted, but the intermittent spurt of high-pressure steam from the cylinders is just one more realistic feature that we can copy from "big sister".

Some builders prefer ball valves for cylinder drain cocks, but these do sometimes leak, due to tiny particles of "hardness" or other impurities being carried over from the boiler and getting between the balls and their seatings. Plug cocks, on the other hand, although not good practice when used for straight steam purposes, serve well for cylinder drains, for being sited underneath the cylinders, they are kept well lubricated from the cylinder oil.

Those builders who do not insist on making every part of the engine themselves may be tempted to purchase their cylinder drain cocks ready made, as nearly all our casting suppliers seem to offer these in a suitable size for *Greene King*. Actually, as long as the cocks have a thread of 3/16 in. x 40t, their exact shape and overall size is not very important; but for the benefit of those who intend to make them, my drawings show the general idea. The bodies are made from gunmetal or phosphor bronze and the plugs from stainless steel. However, if anyone is a bit scared of the operation of drilling stainless steel with a No. 58 drill, gunmetal could be used for the plug and hard brass for the bodies! The internal taper of



ARRANGEMENT OF CYLINDER DRAIN COCKS



the bodies is best cut with a standard taper reamer. If a hole is first drilled right through with a drill of diameter equal to the smaller end, the reaming can be done quite easily by hand. The same reamer can then be used to set the top-slide of the lathe to the required angle for turning the plugs.

The plugs are furnished with squared ends, on which are soft soldered the cock levers, which are made from brass or nickel-silver (for easy soldering!). Their other ends are threaded 10 BA and fitted with nuts and washers.

The cock connecting lever is made from 1/16 in. bright mild, or stainless steel, its end holes being drilled 3/32 in. dia., for short 8 BA bolts tapped into the cock levers.

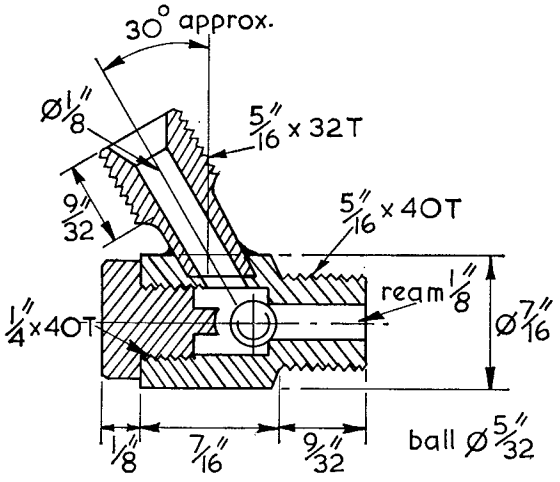
The other levers are made from the same materials, either from 5/16 in. square or from 5/16 in. x 3/16 in. rectangular bar. There are two cross-shafts, both 3/16 in. dia., one located just below the cylinders, and the other located ¼ in. ahead of the centre-line of the rear bogie axle, and 3/16 in. below the top edge of the frame.

To operate the drain cocks, a shaped lever is fitted on the outside of the right-hand frame plate; it has a slight set in it, so as to bring the ⅛ in. dia. connecting rod immediately above the frame. This connecting rod then runs forward alongside the firebox, then inwards and downwards to clear the weigh-shaft; finally up again to connect to the upper cross-shaft just mentioned.

Smokebox

The smokebox is of the wrapper type, bent up from 1/16 in. brass. It is fitted to the boiler barrel by means of a turned ring, nominally 1/16 in. thick and 5/16 in. wide. A miniature "throatplate" is then required to fill in the back, below the barrel. The smokebox is held down to the frames by five 6 BA hexagon-head screws on each side, through the holes already drilled in the top of the frames. These are arranged in groups in front of, and behind the cylinders, so that they are accessible without disturbing the cylinders.

For the petticoat, a gunmetal casting would be convenient, though this component could be made from thick-walled copper tube 1 1/16 in. o.d. or

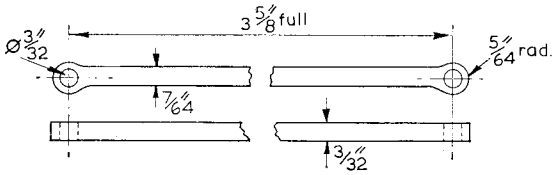


SNIFTING VALVE (X2)

the nearest larger, the "bell" at the bottom being spun in the lathe, after thinning out and annealing. Note that the inside of the petticoat is tapered upwards and outwards.

For the exhaust pipes, ⅜ in. x 20 s.w.g. copper tube is used. This is bent as shown. It will require annealing several times to get it to the desired radius; the two pieces are then silver soldered as shown. I think the best way to tackle this is to make up a simple jig, a replica of the two frame plates set exactly the same distance apart as the engine main frames. After silver soldering the two pipes on the centre-line, the oval flanges are machined and filed to shape, and silver-soldered in position. It is then quite easy to adjust the overall width over the flanges so that the assembly fits nicely between the actual engine frames. To keep the blast pipe in position and at the same time to seal off the open bottom of the smokebox, a brass plate, about 3/32 in. in thickness, is fitted as shown. This could be angled and riveted to the smokebox wrapper, or silver soldered to it. In the latter event, care will have to be taken to avoid distortion.

There has recently been some correspondence on the subject of the fitting of the main steam pipe to the regulator and the method adopted for fitting

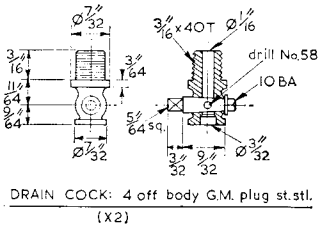


CONNECTING ROD E one off b.m.s. or st.stl. (X2)

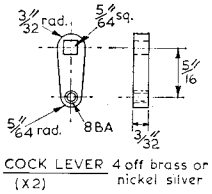
the "wet" header, to which the superheater elements are silver soldered. The method always specified by the late LBSC is shown here. It involves internal and external threads of the same pitch on both the steam pipe, the bush (which in this case is silver soldered to the smokebox tube-plate) and the flange to which the "wet" header is to be bolted. It is said that it is almost impossible to screw this flange in, as the threads of the steam pipe, nine times out of ten, do not quite line up with the threads of the bush. But this assumes that the steam pipe cannot be turned until the threads *do* line up! The "secret" of course is to thread the other end of the steam pipe a shade oversize (where it screws into the regulator body) and to coat these threads with plumbers' jointing or something similar. It will then be found possible, having screwed the steam pipe right home, to unscrew it just enough to ensure that the threads at the smokebox end do line up with those in the bush.

To find out when this happy situation occurs, it pays to turn up a short stub of steel with the required thread screw-cut on it, and use this as a "gauge", the steam pipe being shifted until the gauge picks up the two threads without any forcing. Incidentally, to screw the steam pipe in or out a triangular or square file of coarse cut can be temporarily jammed into it. I need hardly add that this adjustment to the position of the steam pipe should be carried out when it is first inserted, on assembly of the regulator. If left until later, it will be found much more difficult to turn, owing to some drying out of the jointing material.

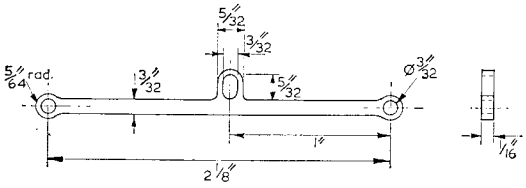
The fitting of the outside steam pipes to the cylinders is somewhat unusual. The idea is that a large enough hole is made in the smokebox to enable these pipes to be easily inserted from the outside, *after* the smokebox has been bolted down, and of course without disturbing the cylinders. It



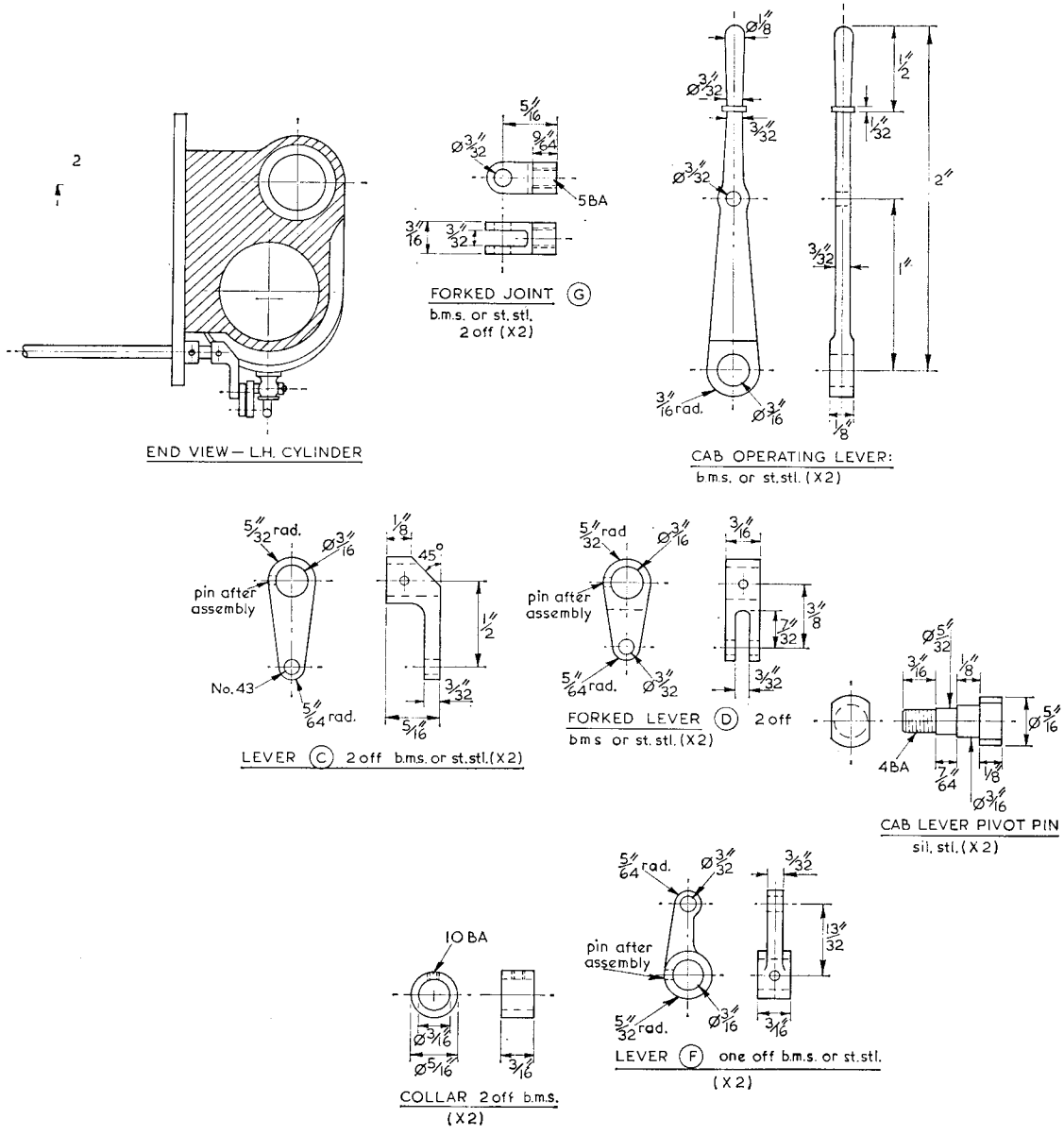
DRAIN COCK: 4 off body G.M. plug st.stl. (X2)



COCK LEVER 4 off brass or nickel silver (X2)



COCK CONNECTING ROD: 2 off b.m.s. or st.stl. (X2)



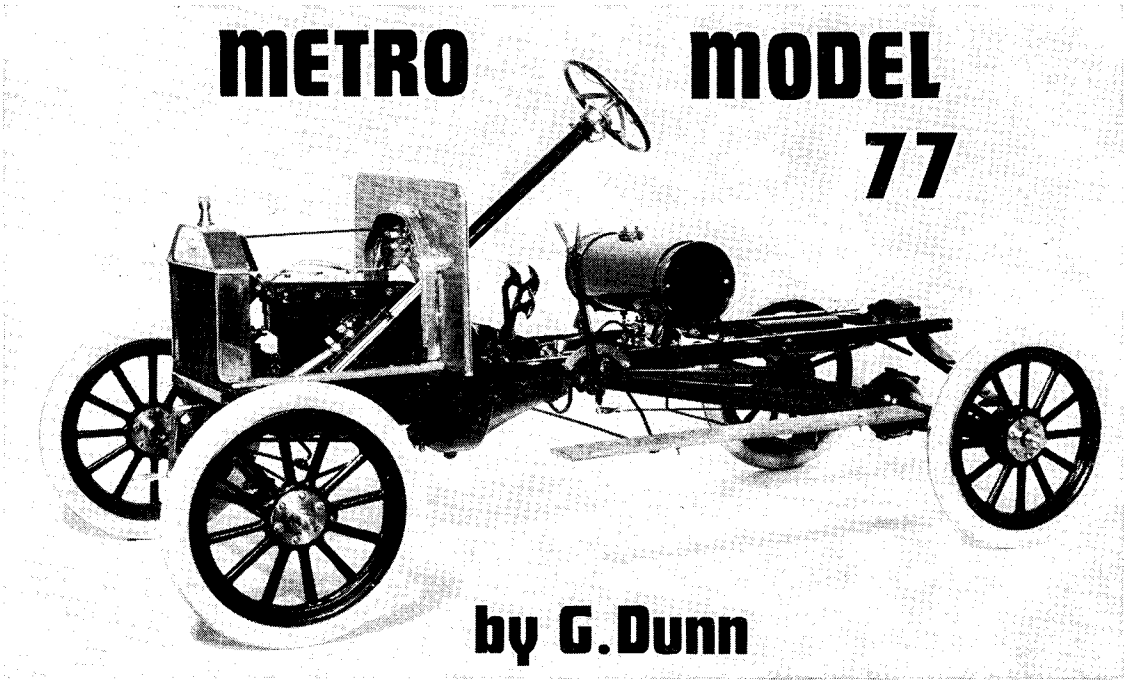
will help here if the holes in the smokebox are drilled and slightly elongated by inserting a solid rod of slightly larger diameter than the steam pipes themselves and forcing this over to approximately the angle that the steam pipes will take up when located over the flange in the top of the steam chests.

After the steam pipes have been inserted, and their bottom flanges bolted down on the cylinders, an oval plate is prepared and fitted on the inside of the smokebox, with an "O" ring of suitable size between the two, to ensure that the smokebox is air-tight. This plate can be held by four small countersunk screws, the upper two being filed off flush with the surface of the smokebox, the two lower ones being hidden by the steam pipe cover.

These outside steam pipes are turned from 5/16 in. dia. gunmetal. This is necessary so that sufficient thickness can be left to form the usual female union fitting at the top, $\frac{1}{4}$ in. dia. copper tube being used to connect to the "hot" header.

The pipe to the snifting valve (3/16 in. o.d. thin-walled) is taken from a 5/16 in. x 32t union on the front of the "wet" header. *To be continued*

METRO MODEL 77



by G. Dunn

Fully working chassis of a 1912 Model T Ford by Bill Broadley.

IN ITS SIXTY-NINE YEARS of existence, Bradford Model Engineering Society has held many exhibitions, but last year, to celebrate the Queen's Silver Jubilee and its own seventieth anniversary, it exceeded all previous efforts.

For the first time, the society went into partnership with the Bradford Metropolitan District Council and obtained the backing of the National Breakdown Recovery Club, the result being Metro-Model 77. One effect of this collaboration was that the exhibition was able to be held in the premier hall of the city, St. George's Hall, right in the city centre and adjacent to the unique transport interchange and with ample car-parking.

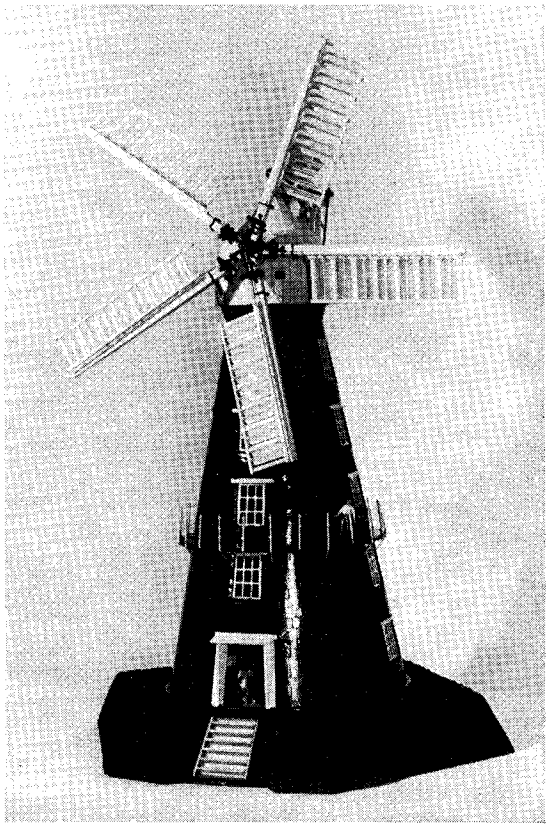
The result was an attendance of almost 10,000 during the week 27 August to 3 September to an exhibition which had taken a year's hard work to prepare and which suffered a severe blow in the sad death of Bill Hughes, the chief judge. However, the three remaining officials, Messrs. T. D. Walshaw of Kendal, Louis Raper of Failsworth, and Vic. Smeed of Rickmansworth, the well-known former editor of *Model Boats*, carried out their very difficult task in a manner which satisfied everybody by its thoroughness and accuracy.

There were over 170 exhibits in eight classes and with so much excellent work to be seen it is somewhat invidious to select some for special mention.

The locomotive section was particularly strong, ranging from a 7¼ in. gauge "B.1" to an "O" gauge N.Y.C. Hudson and including a most unusual subject, a 5 in. gauge Ransomes & Rapier steam carriage by Roger Spalding of Bradford. This is a vertical-boilered unit as built for an Indian Prince towards the end of last century and despite its curious appearance, does an excellent stint of passenger hauling. The Amos Barber Memorial Trophy which commemorates our illustrious founder, went to J. H. Hatherley of Sheffield for a beautifully finished *Speedy* whilst the judges' prize also went to Sheffield, to Mr. G. D. Wainwright for a 5 in. gauge L. & Y. *Pug* complete with purpose-built driving truck with brakes, water tank and coal space.

It was very pleasant to see the judges give special commendation in this section to an exquisite miniature, an "O" gauge New York Central R.R. 4-6-4 "Hudson" by R. Bonsor of Rochdale made entirely of scrap and paraffin fired. Walter Ashworth's well-known *Duchess of Shipley* covered a few more miles without moving as it ran all week on compressed air to demonstrate the valve gear of its four cylinders.

There was a wide range of road vehicles which would surely have delighted Bill Hughes. The prize went to J. R. Sykes of Huddersfield for his 3 in. scale Foden six-ton end tipping wagon seen at Wembley the previous January. In this section was

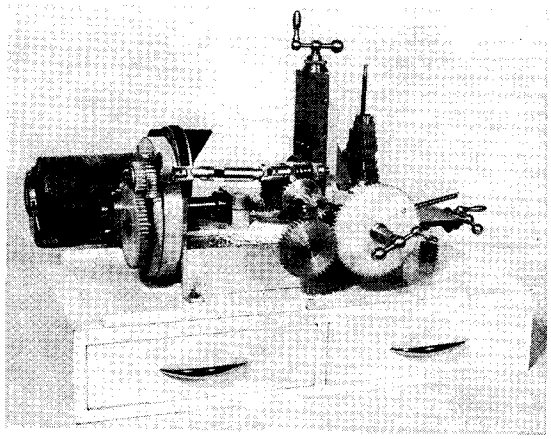


J. F. A. Gray's five sailed Alford Mill.

the *working* model to one-fifth scale of a 1912 Model T Ford chassis by Bill Broadley of Bradford. The engine is exactly to scale and the correct epicyclic foot-change gearbox is fitted. When the body is finished this will be a model to savour, the workmanship is superb. There were many traction engines including a *Royal Chester* by R. Stephenson of Wakefield and a Wallis & Steevens *Simplicity* roller by Trevor Sutcliffe of Bradford which has done a great deal of work this summer including helping to repair the vandalised track of the Yorkshire R/C Car Racing Club. The latter had a stand on which they showed their activities and which has led to increased membership and many more spectators at their meetings.

Mr. Stanley Norton of Pudsey represented the rapidly growing interest in horse-drawn vehicles with a North Monmouthshire wagon drawn by a Shire horse carved from a solid block of mahogany. Non-rail vehicles are moving a little away from the inevitable traction engines and, to me, this is a happy development.

Tools and equipment were well represented and the prize went to L. T. Scott of Batley for a gear-cutting machine based on an *M.E.* design. He also



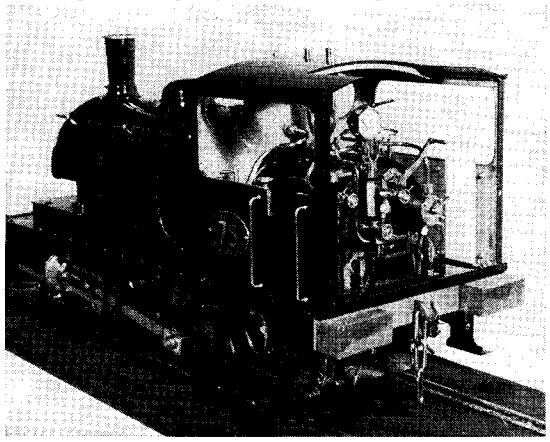
Gear cutting machine by L. T. Scott.

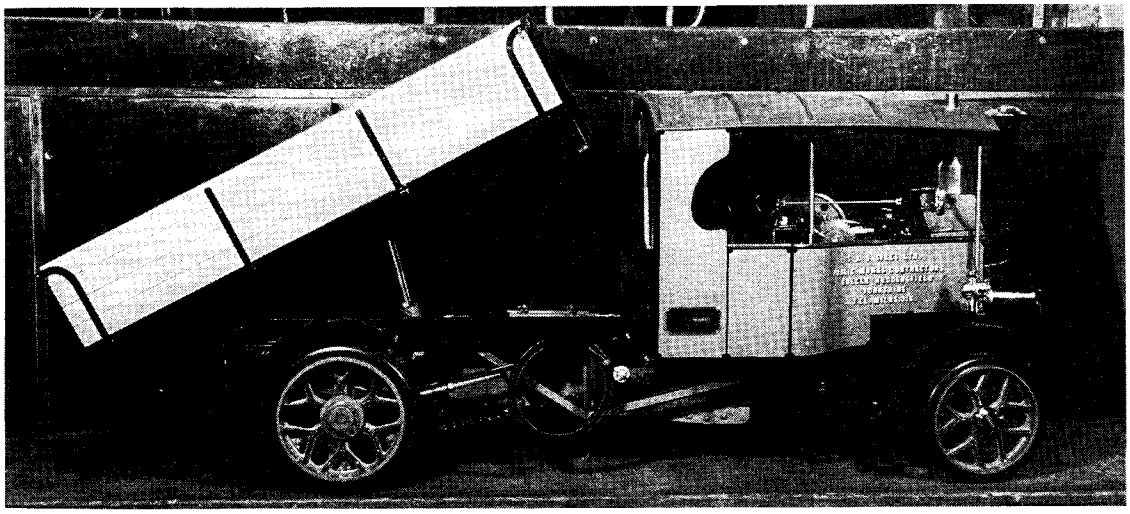
showed a "Quorn" and operated these machines throughout the show. Walter Ashworth of Bradford showed his jig-saw made from scrap and Arnold Throp of Sheffield showed a wide variety of his jigs and fittings.

In the miscellaneous section, John Gray showed his fairground models but took the prize with his remarkable model of Alford Mill in Lincolnshire with its five sails, 1400 model bricks in its structure, and working machinery. Stationary models were few in number but excellent in quality and P. Thompson of Sheffield took the prize with his model of an oscillating engine of 1851 by B. Hick. D. Williams of York showed a complete steam plant consisting of boiler, Stuart 10 engine, generator, and all accessories. Several well-known types of engine were running on compressed air throughout the week. J. J. Walker of Tamworth showed a remarkable experimental engine based on time paths and with the valve gear operated by an electric motor to test the theory.

A remarkable publicity gimmick were the R/C robots developed by Mike Gray of Bradford which

5 in. Aspinall "Pug" by G. D. Wainwright.



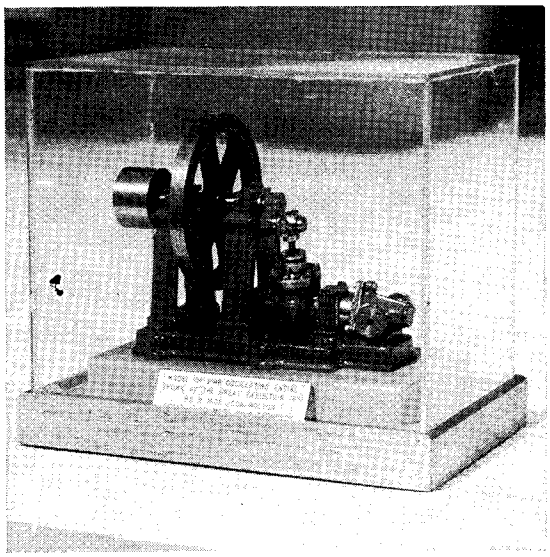


A 3 in. scale six ton end tipping Foden steam wagon by J. R. Sykes.

appeared in the city and also on television, gaining many visitors. These walking wonders require a bit more development and when their talking is also perfected they could rival the more famous Daleks! Also on the publicity side was the fair organ built by Paul Allan of Keighley. This is difficult to decide whether it is model or full-size as it is over eight feet long by six feet high. It uses a standard 48-key frame and music books, but instead of keys has photo-electric cells and the tones are electronically developed. It sounds absolutely superb, being tuned exactly to the correct fairground tone and the décor is modernistic. Any showman would give his ears for it. On full power it is audible for about two miles!

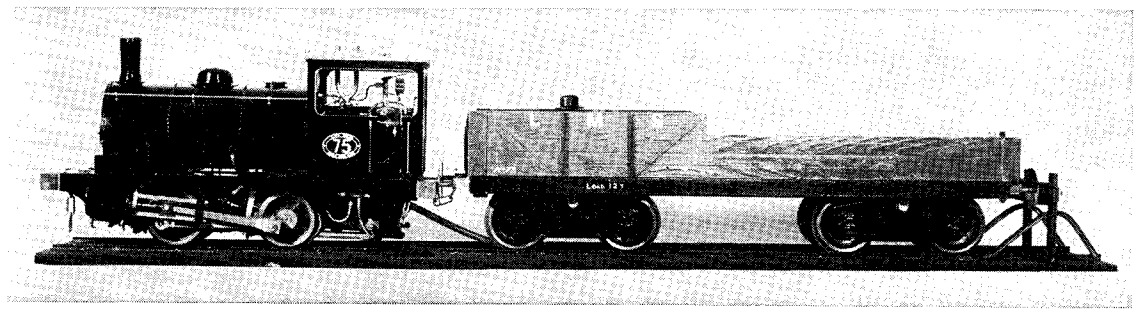
The society used the well-tried system used at our own competition nights to decide the best model on show. All visitors were invited to vote for their choice and the high standard generally can be gauged by the wide selection but, by a handsome margin, Brian Ward of Bradford took the award with his beautiful steam launch *Lady*

Continued on page 401



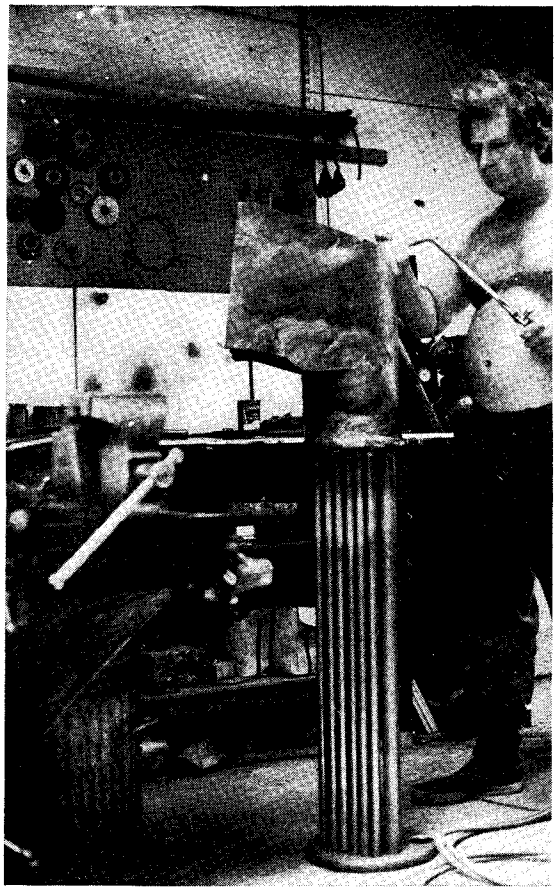
1851 Oscillating engine (B. Hick) by P. Thompson.

G. D. Wainwright's 5 in. gauge L. & Y. "Pug" with driving truck, water tank, coal, and brakes.



PHOSPHORUS-FLUXED SILVER SOLDERS

Report by Keith Wilson



Mr. Wilson brazes a 10¼ in. gauge Britannia boiler.

IN VIEW OF THE interest shown recently in the use of these materials (Sil-fos, Silbralloy, etc.) on small copper boilers, I have made a thorough enquiry into the matter. I have discussed the problem at some length with six firms of boilermakers, and with three firms specialising in the manufacture of the silver solders themselves. The net result, summarised here, is that under the conditions that normally appertain to our use of these small boilers, there is no valid objection whatsoever to their use on grounds of sulphur contamination, and only very limited objections on any other grounds.

Of the six firms of boilermakers, two are "household names" since retired from actual boilermaking. Two deal almost exclusively with small boilers, and two have other interests as well. All six are unanimous (sometimes in very pointed words!) that the materials are perfectly sound for boilermaking. Two of these firms use the materials extensively, the other four do not, solely for reasons of personal choice entirely unconnected with whether or not the materials are suitable.

Of the firms of manufacturers of solders, one has had no knowledge of any trouble with sulphur reactions, and the other two have had trouble under conditions that do not fully apply to our work. These conditions were generally such that continuous 24 hours per day working at high temperatures produced a tendency to leakage after about one year's service. To put this in perspective, it would be necessary for "us" to steam a boiler at nearly 225 p.s.i., three hours per week, using the worst possible coal (Lignite, sulphur content 3.1 per cent) and we would then have a reasonable chance of trouble in a mere 56 years.

I have ascertained that the proportion of sulphur in anthracite is 0.6 per cent; whilst I could not find that for Welsh steam coal, it is clearly of the same order. When one allows for the extreme dilution of the gases by virtue of the amount of air passing through the firebox, clearly it is hardly true to state that "heavily sulphurised gases" are present.

I quote here part of a letter from Messrs. Johnson-Matthey, whose knowledge of these matters is, to say the least, reliable.

"The problems associated with sulphur and phosphorus-containing materials is that at elevated temperatures sulphur will react with the phosphorus resulting in complex brittle compounds being formed. This reaction is mainly dependent upon temperature and also to a lesser degree on the concentration of sulphur. It is also dependent upon the diffusion rate of the sulphur into the material. The information that we have shows that the rate of sulphur attack on phosphorus-bearing materials at room temperature is extremely slow so that it is of no consequence. The reaction becomes significant at temperatures above 200°C such that a joint made with a phosphorus-bearing material and subjected to this temperature continuously under a sulphurous gas could result in a leak after approximately one year of service. The time factor is obviously a function of the size and

length of the joint. If the joint were purely a fillet, then failure could be relatively rapid."

Readers should note the words "above 200°C", "continuously" and "could".

The temperature of "wet", i.e. non-superheated steam at 100 p.s.i., is about 164°C. Allowing for, say, a 20°C drop across the thickness of the firebox plate, it will be noted that this is below the significant temperature. (It should also be noted, by the way, that these materials are *not* suitable for the firebox end of a superheater; for that matter neither is Easy-flo. Nothing but brazing, bronze welding, or true welding is suitable here.)

The pressure of "wet" steam at 200°C is about 227 p.s.i.; I think well outside our range.

I have access to records of boilers made using these materials going back at least to 1949; boilers in regular use, no trouble. I quote again from the J.-M. letter:

"You will see from the above remarks that we would not be surprised that a boiler manufactured with phosphorus-containing materials had been giving good service for many years. You will also appreciate that as manufacturers of brazing alloys we must cover the possibility that designs have not covered such factors as these." (Boiler design so as to obviate hot spots, etc.). "We also have to cover other applications such as copper gas pipes where leakage due to attack from clean sulphur-containing gases can be extremely dangerous." I assume here that this last sentence refers to pipes containing sulphur dioxide, hydrogen sulphide, etc. under high temperatures such as used in various manufacturing industries.

From Messrs. Eutectic Company Ltd.: "Our feeling is that risks exist in the use of alloys such as Eutecrod 1805 from a theoretical viewpoint, however we have no evidence to support or refute the statements which have been made on this subject. We would therefore take recorded successful joints into any evaluation of an alloy's performance, on this basis 15 hours service per week for 30 years would seem a fair test for any joint."

We come now to the problem of the failure of the three boilers described by Mr. La Roche ("Post Bag", *M.E.*, 16 September 1977) that started the discussion. I have twice spoken to him by telephone; he has been extremely helpful. The boilers had been running for a number of years; I understand that two were built by him or a colleague, and one was bought as part of a finished engine. It is possible, at the time of writing, that this last boiler may not have used phosphorus-bearing materials. Mr. La Roche has described to me the appearance and texture of the solder after failure, and also mentioned that at least one of the boilers was considerably encrusted on the firebox tubeplate with deposits of chalk and scale. Bearing in mind that (a) chalk and scale are good heat insulators and (b) the water in his area is known for its high chalk content, I re-contacted Johnson-Matthey for further information.

The symptom as described as occurring to the silver solder inside one of the boilers that was cut open for examination (many small black particles, complete failure of adhesion with the parent metal such that a pointed object could easily remove the solder from the copper) were consistent not with possible attack due to sulphur, but far more likely to be due to oxidation. Bearing in mind that a deposit of chalk and scale would act as a good heat insulator, then we have almost a certainty that the temperature of the joint inside the firebox was very much higher than expected (I think that it might have gone as high as 400°C, certainly 300-350) and therefore oxidation due to the excess temperature is the real cause of the trouble. This is further borne out by the knowledge that these three locomotives are first-class work-horses and therefore had a good "pasting", so to speak. An informant at J.-M. mentioned the possibility that under such conditions the phosphorus-bearing materials could conceivably be better due to the lack of zinc and cadmium present in the Easy-flo range. However this remark was "off the cuff" and the difference between these types of materials should not be significant.

J.-M.'s letter also mentions that "where coals are being burnt then there is a gaseous phase produced which will be highly concentrated in sulphur. There will, however, be tarry substances that will also be produced that will deposit on the walls of the boiler and to a degree give a measure of protection to attack from the sulphur gases."

An important point here is the temperature that the joints are actually reaching; I would be most grateful to hear from anyone with a more exact knowledge of this.

I mentioned at the beginning of this report that there were certain limited objections to the use of these materials; these objections are made by myself as a boilermaker of some experience.

Under no circumstances should these be used on an unsupported butt joint, such as might be made along the seam of a rolled-up boiler barrel; in fact such a joint should never be used anyway, no matter what materials. I will not even use the "coppersmith's" joint; on the occasions in the past when I have tried it I have had trouble; I invariably use a butt strip. I do not like these materials on the sort of joint that is used in some designs between the firebox outer and the barrel (*Doris* and *Speedy* are cases in point) and I prefer an outer treatment with a bronze or brazing rod, with a "sealing" coat of self-fluxing materials inside.

I find also from experience that self-fluxing materials are safer to use from a health point of view (I have just recovered from a dose of lung trouble due to a bit too much cadmium fume), are easier and simpler to use, are more tolerant of dirt in a joint, etc. The fact that they are cheap is also a factor, but of course there is more tendency to be generous with the materials in this case. As for penetration of a joint, I have actually observed a fillet form itself on the *inside* of a foundation ring. It should not be used with tight-fitting joints; in fact a tight joint such as a reamed hole and force-fitted tube is bad practice anyway. (Sorry, Mr. Martin Evans, but I have made quite a lot of boilers now.) I use the next sized drill (i.e. 1/64 in. clearance) and make sure of a big joint. J.-M. recommend a small but definite gap even for Easy-flo.

I recommend, especially in places where the water is known to be hard and chalky, boiler washouts with a cleansing agent halfway through a season as well as at the end.

The above report was submitted to Messrs. Johnson-Matthey, who replied as follows:

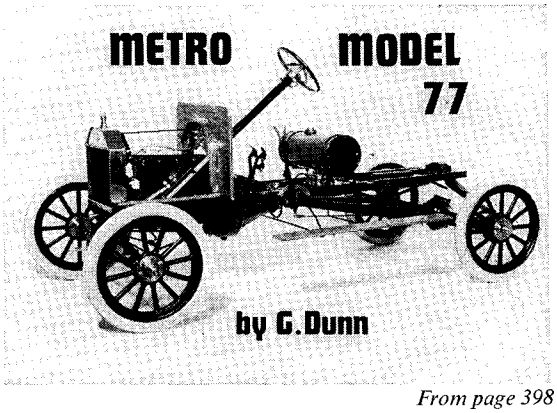
"I have read this report and accept the general conclusions that have been raised. I am quite prepared for you to mention the fact that we have given information and approved the draft (report)."

Their second paragraph deals with the technical point that, strictly speaking, it is not correct to speak of "silver solders". A solder is defined as a material having a melting point of less than 400°C. The alloys under discussion should be referred to as silver brazing alloys. I fear that the name has stuck, however!

Finally, they mention that the remote possibility of Silfos, etc., being better than Easi-flo under conditions that might lead to the possibility of dezincification, is not considered to be a major problem.

The letter is signed by the Technical Manager of the Metal Joining/Technical Services.

Right: Walking, talking Robot by Mike Gray.

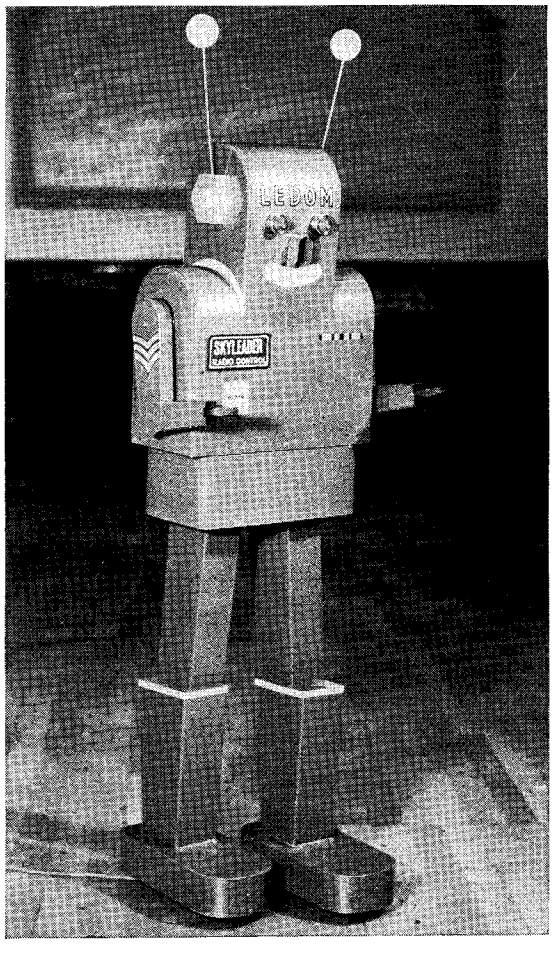


From page 398

of Aire, illustrated in *Model Boats* in July 1977. The trophy was created by Chas. Keeling, well-known in car racing circles and model boating, and will grace Brian's sideboard permanently.

The Yorkshire R/C Car Racing Club has already been mentioned and kept large crowds interested by their models. The home society's "OO" scale railway was in operation throughout the week and there was a show of vintage model railway equipment in "O" gauge by member Jack Ashworth including nine live steamers.

Finally our trade stands. Messrs. Boxfords, Model & Miniature Railways, Blackgates Engineering, Road-Rail Exhibitions of Bradford, The Steam Shop of Earby, and the Yorkshire Dales Railway Society all did excellent business, and Keith Crabtree of Model & Miniature Railways showed his lovely model of the sail-training ship *Winston Churchill* but did not find a buyer!



JEYNES' CORNER

Water lifters

THE INGRESS OF WATER has always caused trouble where the basement or cellar has been sunk into a water bearing strata, and various means to eject it have been used, from buckets in medieval times, manually operated pumps came later, then the hydraulic sump pump, where water pressure was available from mains or roof tanks, while today the float operated electric sump pump is to be universally found.

Before this later innovation became available some fifty years ago, the hydraulic sump pump was to be found at work in the cellars of mansions, and large town houses. The systems varied from a manually operated installation, to a fully automatic float operated system; these were fairly reliable, requiring little attention other than the valve gland being kept in good order and the nozzle or jet cone changed when it became worn. There were several different layouts used; some had the water lifter close to the water, or even in it, others were fitted with suction pipes up to ten or twelve feet long. Some had the water valve operated by a light chain over a grooved wheel with a balance weight, others had rod operated valves; the float in some cases was spherical like the ordinary flush tank. Some were larger and of flat circular form. In most cases the floats were made of tinned copper, and some coated with hot pitch, giving an enamelled sort of finish.

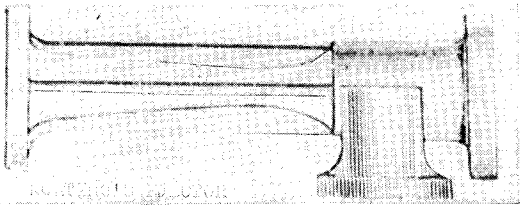
If the strainer in the sump got clogged up from any cause, the outlet pipe was plugged, and the water turned on, and the flow in reverse through the strainer cleared the holes.

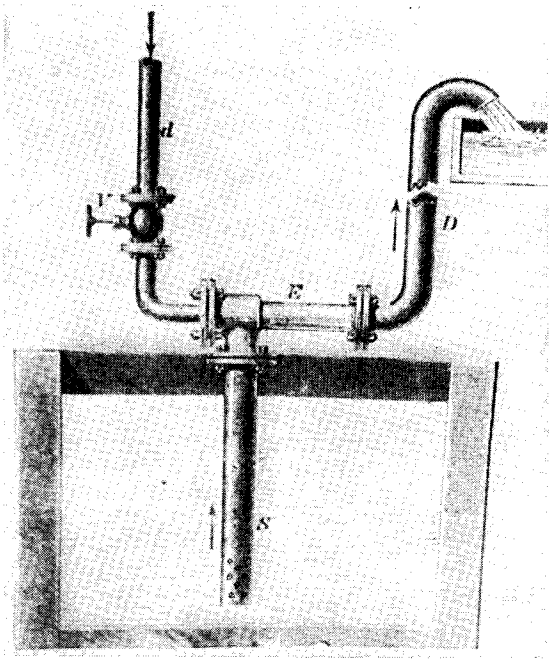
There were three makers of these water lifters that I can call to mind: Korting Bros., Meldrums, and Cortins; all three had more or less the same shape but were to be distinguished by different features. Meldrums had their name cast on the sides, and the venturi part of the tee had a small rib top and bottom. Korting's showed the shape of the venturi externally, and had four ribs, Cortins was plain, without ribs.

Kortings listed four sizes:

No. 1. 200 gals. per hour. $\frac{3}{8}$ in. bore high pressure water pipe, and $\frac{3}{4}$ in. bore discharge pipe.

Korting's Ejector—often used for water heating.





Cortin installation. E-ejector; D-delivery pipe; S-suction pipe; V-high pressure stop valve; d-H.P. supply.

No. 2. 400 gals. per hour. $\frac{1}{2}$ in. bore high pressure pipe, and 1 in. bore discharge pipe.

No. 3. 1000 gals. per hour. $\frac{3}{4}$ in. bore high pressure pipe, and $1\frac{1}{4}$ in. bore discharge pipe.

No. 4. 2000 gals. per hour. $1\frac{1}{4}$ in. bore high pressure pipe, and $2\frac{1}{4}$ in. bore discharge pipe.

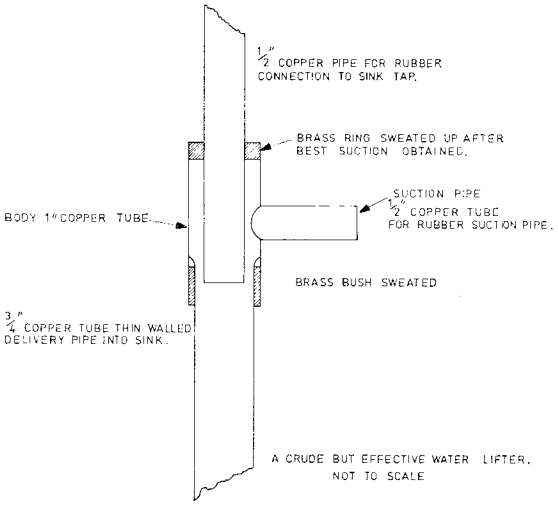
In some cases where the cellars affected by seepage were on a hillside, by fitting a longer discharge pipe the sump could be emptied by turning the water on until a flow had started, when the water could be turned off and the sump emptying continued by syphonic action only.

Most of the float operated valves were manufactured by W. H. Bailey Ltd. of Manchester. Some of the valves were actuated by a light chain round a grooved wheel, and also had a balance weight: others were operated directly by a rod, or indirectly through a vibrating lever. It required some careful installation work to get trouble-free working.

A neighbour owning a washing machine for which spares were not available, constructed a crude water lifter from copper tube, to empty the tub after the pump disintegrated. This worked remarkably well, until the machine was scrapped.

As may be expected, I have had some incidents arising from the installation of sump pumps of the electrical variety; one proved my workmanship was sound, when after a cloudburst I had to get a works fire-engine to pump out the water from the sump pit before I could get down to the pump,

which had continued to run under water, proving my joint wiping, and the watertightness of the totally enclosed motor. I arrived in Liverpool one night to couple up a new electric sump pump in a cinema which suffered from water seepage. The fitters had run a 2 in. pipe from the pump right to the rear, rising all the way. I started up the pump, and it emptied the rather small sump. I was turning away when I heard the pump start up again, and saw the sump was full up again. While I watched, the pump emptied the sump, then after a pause the water ran back in again, and I found that there was no flap-valve (check-valve to steam men), and that the long length of delivery pipe held just about the contents of the sump, so a sort of perpetual motion action was set up. So instead of getting the early morning train out of Lime Street, I had to get the pipe cut and screwed and a flap-valve put in before I could pass it.



CLUB

APRIL

6/7/8 Norwich & District M.E.S. Exhibition, Sports Hall, Wensum Lodge, King Street.
7 The Model Engineers Society, N.I. 7.30 p.m. Meeting at Cregagh Library, Cregagh Road, Belfast.
7 Brighton & Hove Soc. "Arthur's moving pictures yet again", by A. Lynn. Elm Grove School, Elm Grove. 8 p.m.
7 Romford M.E.C. Ardleigh House Com. Assn., 42 Ardleigh Green Road, Hornchurch. Competition night.
7 Rochdale S.M.E.E. Technical college. Mr. K. Crabtree, "Sweet Pea".
7 Harlington Loco Society. High Street. Talk by Harold Gasson—author and ex. GWR fireman.
7 Stockport & District S.M.E. A.G.M. The Parish Hall, Church Street, Cheadle. 8 p.m.
8 M.E.S. of N. Ireland. Monthly meeting. Strathern Hotel, Holywood, Co. Down. 3 p.m.
8 S.M.E.E. Rummage Sale.
8/9 Greenwich & District Narrow Gauge Rly. Soc. 10.20 a.m. to 6.30 p.m. Model Railways Exhibition, 141 Greenwich High Road.
9 to 14 May Ascot Loco Club. Site working party at Heatherdown from 10 a.m. to 1 p.m. Sundays.
9 Basingstoke & District M.E.S. Track construction.
9 S.M.E.E. First day of the summer season.
9 Harlington Locomotive Society. High Street. Public open day. 2 to 6 p.m.
10 Bedford M.E.S. Bits and pieces night.
10 Clyde Shiplovers & M.M. Society. Magazine night—short items by members.
11 Guildford M.E.S. Ex. com. meeting.
11 Romney Marsh M.E.S. Bits and pieces evening. Church Hall, New Romney. 7.30 p.m.
11 Basingstoke & District M.E.S. Model engineering talk at Viables Activities Trust, Harrow Way.
12 Norwich & District S.M.E. 7.30 at The Assembly House, Theatre Street. Informal Evening.
12 Bradford M.E.S. Committee. 7.30 p.m. Eccleshill Community Centre.
12 Cannock Chase M.E.S. Meeting. Lea Hall Club. 7.30 p.m. "Welsh Highland Railway films. Mr. P. Booth.
12 Southampton & District S.M.E. Past, present and future of the Watercress Line by Charles Lewis. 8 p.m. Malvern Hotel.
13 Leyland Preston & District S.M.E. Meeting at Roebuck Hotel, Leyland at 8 p.m.
14 Polegate & District M.E. Bits and pieces.
14 E. Sussex Model Engineers. A.G.M.

Dates should be sent at least five weeks before the event to ensure publication. Please state venue and time. While every care is taken, we cannot accept responsibility for errors.

14 N.W. Leics. M.E.S. Evening steam up and supper N.W. Leics. Miners Welfare Centre, Coalville at 6.30 p.m.
14 Dublin Soc. of Model & Ex. Eng. Visit to Linear Accelerator. S. McKenzie. 8 p.m. at St. Luke's Hospital, Rathgar.
14 The Isle of Man Steam Railway Supporters Assn. N.I. Group. Members night.
14 The Thames Shiplovers & Ship Model Society. Model makers evening plus bring and buy. St. Botolphs Church Hall, Bishopsgate. E.C.2.
14 Kinver & W. Midlands Society of M.E. Driving competition. 7.30 p.m.
15 Gauge "O" Guild. Joint meeting with E. Sussex Gauge "O" Group. Running facilities for all including live steam. Refreshments. New venue. St. Anne's House, 729 The Ridge, Baldslow, Hastings. On the B.2093 off A.21 from London. Times: 2.30 to 5.30 p.m. Prospective members welcome.
15 Romney Marsh M.E.S. Annual dinner. Plumtree Rest, High Street, New Romney.
15 S.M.E.E. Talk. Gt. Eastern Loco Development. Mr. W. O. Skeat.
15 Exhibition of model steam engines in the village hall at Bledlow Ridge, High Wycombe, Bucks.
15 St. Albans & Dis. M.E.S. Exhibition at Hawker Siddeley M.R.S.
16 Worcester & District S.M.E. Public running day. Waverley Street, Dighs, Worcester. 2.30 p.m.
16 Bristol S.M.E.E. Public running at Ashton Court Track. 11 a.m. to 6 p.m.
16 Basingstoke & District M.E.S. Track construction.
17 Wigan & District M.E.S. Meeting.
17 Bedford M.E.S. Informal meeting. Loco building.
18 Chesterfield & District M.E.S. "Hot Air Engines" by Mr. Buck. 7.30 p.m. Canteen, The Bryan Donkin Company, Derby Road.
18 N.W. Leics. M.E.S. Commencement of Tuesday evening steam up. Club track. N.W. Leics. Miners Welfare Centre, Coalville.
19 Bradford M.E.S. Social. 7.30 p.m. Eccleshill Community Centre.
19 Bristol. More railway miscellany by the Rev. Newman, at the British Rail Staff Association Club. The Incline, Temple Meads Station. 7.30 p.m.
19 Guildford M.E.S. Bits and Pieces compt. 7.45 p.m. at H.O. Stoke Park.
19 Tyneside S.M.E.E. Slide show, locos, boats, etc. Montagu Baths, Harehills Avenue, Blakelaw, Newcastle upon Tyne 5.
20 Hull S.M.E. Discussion for the summer programme.
20 Nottingham M.E.E. Brains Trust. 7.30 p.m. at The Friends Meeting House, Clarendon Street.
21 Romford M.E. Club. Ardleigh House Com. Assn., 42 Ardleigh Green Road, Hornchurch, Essex. Talk by Mr. M. Leahy.
21 Rochdale S.M.E.E. Springfield Park. General meeting.
21 Brighton & Hove Soc. From the Workshop. Elm Grove School, Elm Grove. 8 p.m.
23 Harlington Locomotive Society. Harlington, High Street. Public open day. 2 to 6 p.m.
23 Basingstoke & District M.E.S. Track construction.
24 Clyde Shiplovers & M.M. Society. A.G.M.—members only.
25 Romney Marsh M.E.S. A.G.M. Church Hall, New Romney. 7.30 p.m.
25 Basingstoke & District M.E.S. A.G.M. at Viables Activities Trust, Harrow Way.
25 Stafford & District M.E.S. "Look what I've made". An informal exhibition of work by club members. Doxey Arms. 7.30 p.m.
26 Bradford M.E.S. Boating quiz. 7.30 p.m. Eccleshill Community Centre.
26 Friends of Brighton Museum of Transport. "Inland Waterways", an illustrated talk by John Hankinson.
26 Cannock Chase M.E.S. Meeting Lea Hall club 7.30 p.m. Bits and Pieces.
27 The Gauge 1 Model Railway Assn. M.R.C. track night. 6.30 p.m. Keen House, Calshot Street, London N.1.
27 Leyland Preston & District S.M.E. Meeting at Roebuck Hotel, Leyland at 8.00 p.m.
28 Birmingham S.M.E. Annual Dinner and Dance at the George Hotel, Solihull. 7.30 p.m.
28 The Thames Shiplovers & Ship Model Society. A talk on a Port. St. Botolphs Church Hall, Bishopsgate E.C.2.
28 Birmingham S.M.E.E. George Hotel, Solihull. Annual dinner dance.
29 S.M.E.E. Visit. P.O. "Tattershall Castle".
29 to 1 May Fairbourne Railway Ltd. Special holiday opening, trains from 11.30 a.m. steam hauled. Beach Road, Fairbourne, Gwynedd.
29 Cambridge & District M.E.S. Track day open to public 3 p.m. Fulbrooke Road, Cambridge.
29 Gauge "O" Guild. Joint meeting with M.R.C. at M.R.C. H.Q., Keen House, Calshot Street, London N.1. 2 p.m. to 6 p.m. includes "Bishops Hemingway" layout, test tracks, displays, films. Prospective members for 60th organisations welcome.

DIARY

Club Chat... with the Editor

The exhibitions are well under way now and doubtless we will have a few reports in the months to come. The first to be mentioned in this column comes as a result of a bit of arm twisting by proxy, in other words, Pauline Husband, Publicity Officer of **St. Albans & District M.E.S.,** has persuaded our Jim King to twist my arm and give the club's exhibition a mention. O.K., Pauline, mission accomplished. The Model Engineering Exhibition is to be held in Harpenden Public Hall on 25, 26 and 27 May from, respectively, 2 p.m. - 9 p.m., 10 a.m. - 9 p.m., and 9 a.m. - 7 p.m. Tickets cost 25p for adults and 15p for children but if you happen to have a pretty big family a ticket for the lot will cost 60p.

Mr. W. J. Gilles, secretary of **The Association of Model Engineers Northern Ireland,** reports that on a recent visit to Dublin he met Mr. O. Doyle, Programme Organiser of the Irish Railway Record Society, and learned that nearly 400 models in "O" gauge made by the late Mr. C. L. Fry and portraying Irish Railway history, have been acquired by Dublin Tourism and will be housed in Malahide Castle, Co. Dublin. Now that should be interesting to anyone contemplating a visit in the near future.

At **Cheltenham S.M.E.** the A.G.M. on 6 February produced a new Chairman, Mr. P. MacDonald, a new Hon. Sec., Mr. B. Corley, and a new Hon. Treasurer, Mr. C. Howl. Unfortunately we have not been given the new secretary's address but the P.R.O., Mr. R. W. Jones, who lives at 15 Granley Gardens, Cheltenham, Glos. GL51 6LQ, will, I am sure, be only too pleased to pass correspondence over. We have not heard a lot from Cheltenham in recent months and this is due to the reconstruction work being put in there by the club's members. A new track is under way, the final length being about 1350 feet, but completion date, when the old and new circuits will be joined into one, is not expected "for a year or two yet". The meetings, on Monday evenings and Sunday mornings, are held in Dowty's Arle Court cinema and on the track respectively. Wednesday evenings in summer are for track work. The cinema can be found by asking at the patrol office, Main Gate, Hatherley Lane, Cheltenham. The track is 100 yards further on.

The Birmingham branch of the National Children's Home has informed us that the Annual Open Day and Fete is to be held at Princess Alice Drive, Chester Road North, Sutton Coldfield, on 17 June starting at 2 p.m. According to the information I received, the entertainment includes model aircraft, Dog Show, five-a-side football, etc. No mention is made of a railway track but as the information came as a recommendation from Mr. Hugh Sykes, secretary of **Sutton Coldfield Model Railway Society,** I rather think there could be. Admission is 10p.

Still in the same area, we have a rather unusual rally coming up at **Sutton Coldfield and North Birmingham M.E.S.** on 25 June. This is a "non-steam day". I can almost hear the eyebrows going up in horror but for myself I think the event could be very interesting. Mr. C. J. Strong, Hon. Sec., Hon. Treasurer and boiler tester, has just finished a 5 in. gauge eight-wheel diesel loco and is trying to persuade other club members to try their hands at similar models. There are several petrol and electric powered locos around so I should think that the event will be well supported. Petrol is provided and charging facilities are available. Having seen the interest shown at Welling and the M.E. Exhibition in Mr. L. Purple's "D" type, I think the venture will be a success.

Over the week-end 6/7 May, which coincides with the Brighton Festival, the Brighton Museum of Transport is holding a Transport Fair at the open freight yard next to the station. Apart from promoting the museum, the Fair should also help to raise funds towards the opening of the Pullman Car Works at Preston Park, the future home of the museum. As the Vintage Commercial Vehicle Run also occurs on Sunday, 7 May, there should be a good attendance. Although information is not yet available in any great detail, we do know that the Fair will be open from 10.00 to 18.00 on both days and if weather permits a flying display will be included. Some sales stands are available. We will try to publish further details in the next issue but meanwhile, if you require further information about the Fair or the Friends of Brighton Museum of Transport, then please write to Dave Hewings, 12 Highview Avenue North, Patcham, Brighton BN1 8WR. And my thanks for the information go to Mr. G. F. Collins, Hon. Sec. of **Brighton & Hove Society of Miniature Locomotive Engineers.**

On the 24-25 June why not take the tent to Coalville where the **North-West Leicestershire M.E.S.** are holding their open week-end at the Miners' Welfare Centre? The club has been making improvements to the 3½/5 in. track and facilities so visitors should enjoy a good week-end. But camping space is limited so I would check first.

At **Stafford & District M.E.S.** on 30 January the A.G.M. saw new officers elected. For correspondence, the new secretary is Mr. A. Goddard of 21 Trinity Rise, Trinity Fields, Stafford. The club meetings will now be held on the last Tuesday in the month, but still at the Doxey Arms.

Alan Ripley, 64 Lunn Road, Cudworth, Barnsley, S. Yorks. S72 8DS, is the new secretary of **Barnsley S.M.E.** since the A.G.M. on 4 February. This club has suffered from a subsiding clubhouse, which is very painful in the wallet area, but with a bit of help from Barnsley M.B.C. the situation should be rectified this summer. New members are welcome on Wednesday evenings and Saturday afternoons at Dodworth Road clubhouse.

On the 15th of this month at the village hall in Bledlow Ridge, which is near High Wycombe, Bucks., there is to be held an exhibition of model steam engines with a mainly farming theme. Owners can steam up outside if they wish and if the weather is not kind, you can sit and watch the showing of the Steam Plough Club's film "Ploughing by Steam".

They are also changing officers at **Bedford M.E.S.** where, on 13 February, Derek Dix was elected as secretary. His address is 20 Cherwell Road, Brickhill, Bedford MK41 7AR. Telephone is Bedford 66461. Other members are John Crawley, President, Major D. Wells, Vice-President, Eric Boon, Chairman, and David Dean, Treasurer. By the time this is published the last of the series of talks by various personalities

will have been held in the library. By all accounts the four lectures have been well attended and Bedford M.E.S. are to be congratulated for the arrangements.

I have received further news of the **British Columbia S.M.E.** which celebrates its 50th anniversary this year, from 1 to 4 July to be exact. On 2 July the club will be officially opening its new station which is a 5/8 scale replica of a typical Canadian National station of the 1920s. The building will form the club headquarters and serve passengers riding on the 7½ in. gauge Burnaby Central Railway. On the same day the raised multi-gauge track will also be opened with 1¼, 2½, 3½, 4¾, 5 and 7¼ in. gauges. No gauge 1? The length is about 900 ft. with a 200 ft. trestle. Visitors to the track will find it at 4900 Deer Lake Avenue, Burnaby, B.C. Secretary Eric Skinner can be found at 2786 W. 30th Avenue, Vancouver, B.C., Canada V6L IY9. Telephone number is (604) 266 9443.

The **I.M.L.E.C.** event, scheduled for 9 July at Stoke Park, Guildford, could prove very interesting. Bill Perrett, of course, cannot enter his "Speedy" this year so the field is wide open. There are 15 entrants, three of which are reserved for overseas visitors. What we want now are 12 entrants—through club secretaries please if you are a club member—from British readers, and, hopefully, those three from abroad. Rules will follow shortly but a first prize of £50 should encourage a few. What we will do is to reserve the right to select a wide range of locos in the event of a high entry list. This should add to the enjoyment of the day.

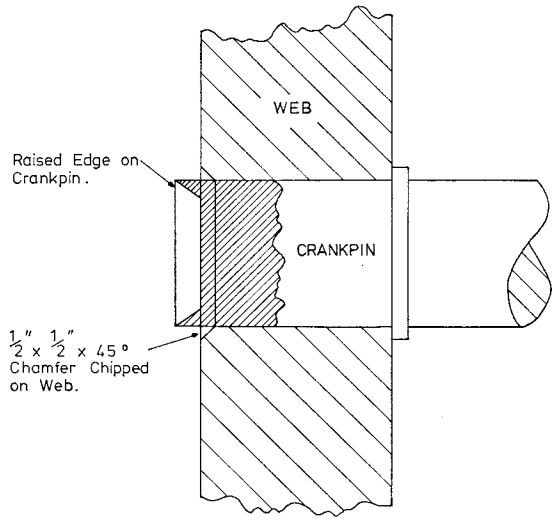
Post Bag

The Editor welcomes letters for these columns. Pictures, especially of models, are also welcomed. Letters may be condensed or edited.

Replacing a Crankpin

SIR,—I enjoyed your recent article by Mr. A. Haworth on "Replacing a Mill Engine Crankpin in Situ". I read it with nostalgia and wonderment, nostalgia for my apprentice days and wonderment for how complicated it all was in Lancashire. (I realise that the details were spelled out for the benefit of your readers.)

I was the last apprentice at Messrs. Schofield & Taylor, the Huddersfield Engine Builders and Millwrights. During the time that they were still active I must have been involved in replacing some twenty crankpins of various sorts. Usually crankpins were replaced because they had slackened in the crank web or disc, in some cases, generally with wrought iron pins, they had worn so unevenly that they would not run cool. On one occasion a crankpin had gone completely crystalline and snapped off, several were cracked and in two cases I can bring to mind the pin and bearings had seized so completely that you could not tell where the bronze finished and the steel began.



DETAIL BEFORE KNOCKING DOWN CRANKPIN EDGE.

We re-bored the worn holes in the webs with portable boring bars; up to about 4½ in. diameter we used the same bars that were used for re-boring Corliss valve cylinders, over 4½ in. diameter we used the bars which we used for re-boring steam cylinders. The small bars were usually turned by hand (I still have in my possession a small hand boring bar), but the larger ones were driven by steam, electricity or a large pneumatic drill. We used Wells Lamps for heating the cranks; the larger sizes of those lamps would give temperatures in excess of 2000°F but they required a lot of pumping both for keeping up the pressure and drawing paraffin out of cans into the pressure vessel.

All our crankpins were made from the same material and we kept in stock lengths of hammered .5% carbon bars in 4½ in., 6 in. and 8½ in. diameters. The shrinkage allowance was the same for all sizes: .001 to the inch on diameter plus .001 in. for cast iron webs and .0015 in. to the inch plus .001 in. for steel or wrought iron webs. When we fitted a new crankpin the back end of the pin was turned in a similar profile to the enclosed sketch and a chamfer about ½ in. x ½ in. x 45° was chipped on the back of the web. When everything was cold the raised portion on the pin was knocked into the chamfer with a 7 lb. hammer; the idea of this was to axially lock the pin even if it slackened, but I can never recall one of our replacements slackening.

Most of the crankpin replacements were done towards the end of and just after the last war when many of the elderly engines had been flogged for several years with minimal maintenance and indicating horse powers far in excess of their nominal size.

Honley, Nr. Huddersfield. Gordon Hobson

Counting the Revs.

SIR,—I have just come across the letter on page 1187 of issue No. 3571, in which Mr. Collins describes how he found that a calculator modified to count revs. failed to count satisfactorily when the speed rose to over 600 r.p.m.

As a dabbler in electronics myself, I feel that I must defend the calculator, and point out that it is far more likely that the switching on the hot-air engine is bouncing at this speed. After all, 10 Hz is unlikely to be difficult for an industry which routinely works in micro-seconds (millionths of seconds).

Also, to return to the original point of Mr. Collins' letter, surely, if he enters +1 before the count starts, won't the count read +2 after one revolution, +3 after the next, and so on?

Wakefield, W. Yorks. K. P. Wood

Boiler Testing

SIR,—May I take the opportunity of appealing through your columns for advice on the testing of model boilers. With the gradual increase in the appearance of mild steel, stainless steel and composite boilers of copper and steel, together with brazed and/or welded joints, the Bedford M.E.S. feel that some rules need to be drawn up to cover the inspection and testing of such boilers. Some of the questions that we feel need to be answered are:

1. For mild steel boilers, what allowance should be made for corrosion, and how does one check for this in the absence of inspection covers? Ultrasonic testing is probably the best way of measuring material thickness, but how many people have access to this equipment?
2. For composite boilers, is it correct to assume that corrosion due to electrolytic action between the dissimilar metals is an even bigger problem? Once again, how does one allow for this and is it possible to fit a "sacrificial" plate?
3. Although stainless steel does not suffer from corrosion welding, this material is a problem and ideally should be done using Argon arc equipment. How can one ensure that satisfactory welds have been made, without extensive testing using sophisticated equipment?
4. What effect does differential expansion have on welded or brazed joints, especially in composite boilers, and could this lead to a fatigue failure in time?
5. Finally, would an initial hydraulic test to 2 x w.p. with subsequent annual tests to $1\frac{1}{2}$ x w.p. as for copper boilers, still be considered an adequate test?

If any reader of M.E. Society can help us in any of these matters, the writer would be very pleased to hear from them.

Bedford M.E.S. J. F. Dawe

Martin Evans comments:

I was interested to read Mr. Dawe's letter on the subject of boiler testing, and although I am not able to answer all his questions, I can say that it is generally accepted that in steel boilers, no plates should be thinner than $\frac{1}{8}$ in., even in $\frac{3}{4}$ in. scale locomotives or traction engines, to allow for possible corrosion.

In the absence of ultrasonic testing equipment, one method of determining the condition of a steel boiler is to drill small holes in it. Although this may sound rather drastic, such holes are easily filled up again, by screwed plugs also made of mild steel. Any possible leakage will soon "take up" in service.

Regarding boilers made of stainless steel, I agree that brazing or welding of this material could easily be unreliable. I have never regarded this metal as really suitable for model boilers of any scale. It is probably at least as expensive as copper, and although it is true that much lighter plates and tubes may be used, this is probably a disadvantage in models up to $1\frac{1}{2}$ in. scale, as one needs as much weight as possible for adhesion.

I would also like to comment on Mr. Tingey's suggestion — that readers might try the experiment of building a boiler using Loctite "and a few rivets" instead of the usual silver soldering or brazing methods. I think that this could be very dangerous. The adhesive might well hold during the preliminary hydraulic test, and perhaps during a steam test, but sooner or later, the continual expansion and contraction of a boiler in service would break the joints, with disastrous results.

Eydon, Northants. *Martin Evans*

French Portable Engine ("Postbag", 3577)

SIR,—A similar engine is to be seen at the Exhibition at Cockley Cley, nr. Swaffham, Norfolk—this engine I understand was brought from France some short while back and it is in quite good condition. I cannot remember the maker's name by the cylinders and motion are also mounted on a separate chassis on top of the boiler barrel, as in your photo.

Cockley Cley is open to the public in the summer season (see guide books of Norfolk for dates, etc.) and is a remarkable and unique exhibition. There is the old cottage with blacksmith's forge, the skeleton of the "Giant of Cockley Cley", a fully constructed Icini village with moat and crude drawbridge, living quarters, food smoking hut, snake pit, etc.; also there is the reputed oldest church in England.

There is also a fine exhibition of old English coaches, wagons and agricultural machines and tools, and to my mind a visit is a day well spent.

I have no connection or financial interest in same—just infatuated with what I have seen on my several visits.

Holbeach, Lincs. Geoff. E. Parker

Meccano

SIR,—Mr. A. V. Smith, in his letter *M.E.* 4-17 November, stated that up to 1937 Meccano sets were designated by letter.

I do not agree, I was playing with Meccano before 1920 and in those days the sets were numbered 00 to 7.

Cringleford, Norwich. J. A. Taylor

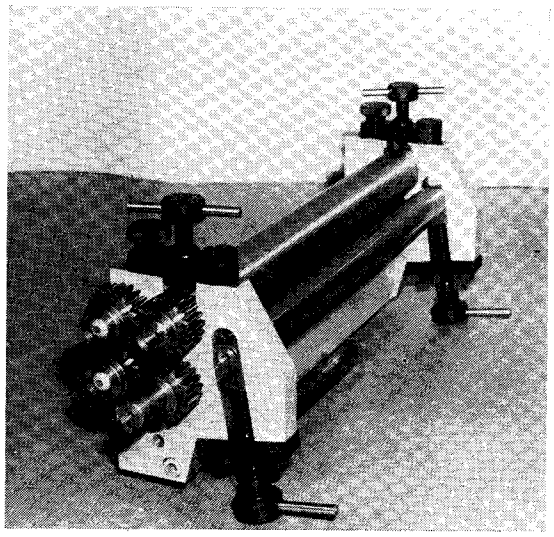
Bending Rolls

SIR,—In February last year, I completed the bending rolls which were described in *M.E.* by George Thomas. I have made the geared form of rolls and a very nice piece of workshop equipment it is too.

The main frame and end plates have been painted and the bright steel latches and straps and pressure screws have been blacked, as can be seen in the photo. I showed Mr. Thomas the photo of the bending rolls at the M.E. Exhibition and he said it was the first one he had seen fitted with gears.

The photographs were taken by Bryan Walton.

Bognor. G. Tyler



The Marshall Portable Engine

SIR,—I note with interest that Ron Kibbey (*M.E.* 3577) states that he is "in no way knowledgeable on the history and detail of portable or traction engines". I would, therefore, draw his attention to William Fletcher's *The History and Development of Steam Locomotion on Common Roads* which was published by E. and F. N. Spon in 1891. Then there are two books by Ronald H. Clark, M.I.Mech.E., *Steam-engine Builders of Norfolk* and *Steam-engine Builders of Suffolk, Essex and Cambridgeshire* (The Augustine Steward Press, Norwich, 1950).

With reference to the Marshall portable engines, I have to hand the firm's 160-page illustrated catalogue of 1904. There was a range of single-cylinder portables and semi-portable engines from 2 to 12 nominal horse-power, whilst the double-cylinder engines ranged from 8 to 40 horse-power. These engines were recommended for driving grinding and crushing mills, brickmaking machines, mortar mills, centrifugal and other pumps, circular saws and other woodworking machines, etc. Prices ranged from £110 to £915 for portable and £106 to £885 for semi-portable engines. Link motion reversing gear, automatic expansion gear, enlarged firebox for colonial use, injectors and screw brakes were extras. There were also "new types of compound portable engines" ranging from 8 to 20 horse-power.

Provision was also made for burning straw in the firebox. In addition the Elworthy system of straw burning could be adopted. A footnote states that "the average consumption of straw or cotton stalks is about four times the weight of that of coal".

Teignmouth, Devon. Ernest A. Steel

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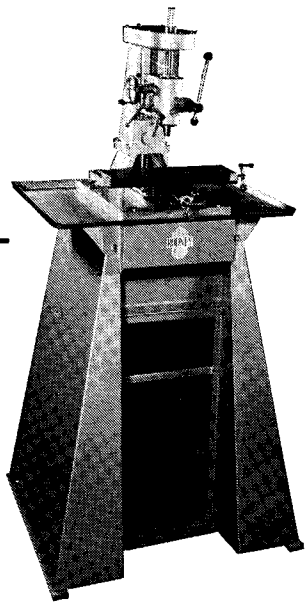

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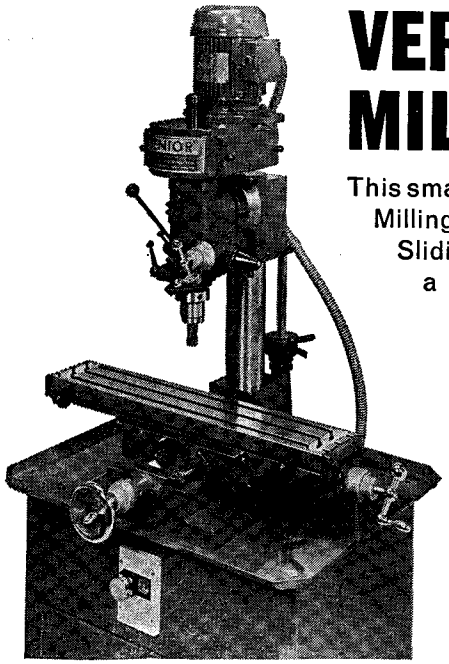

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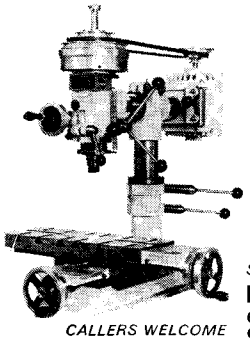

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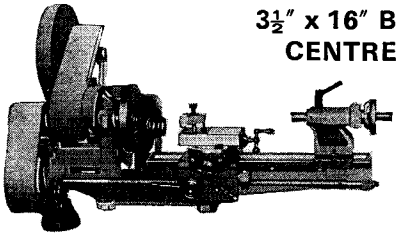

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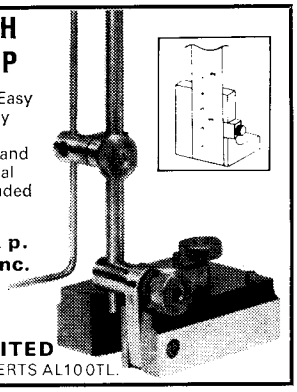

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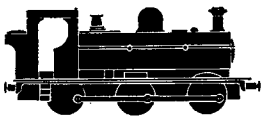

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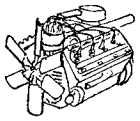

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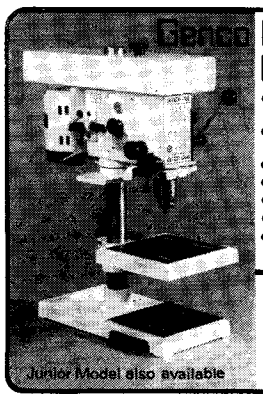

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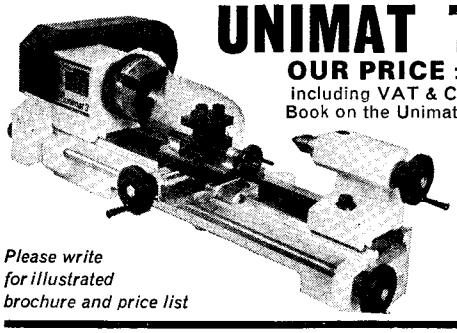

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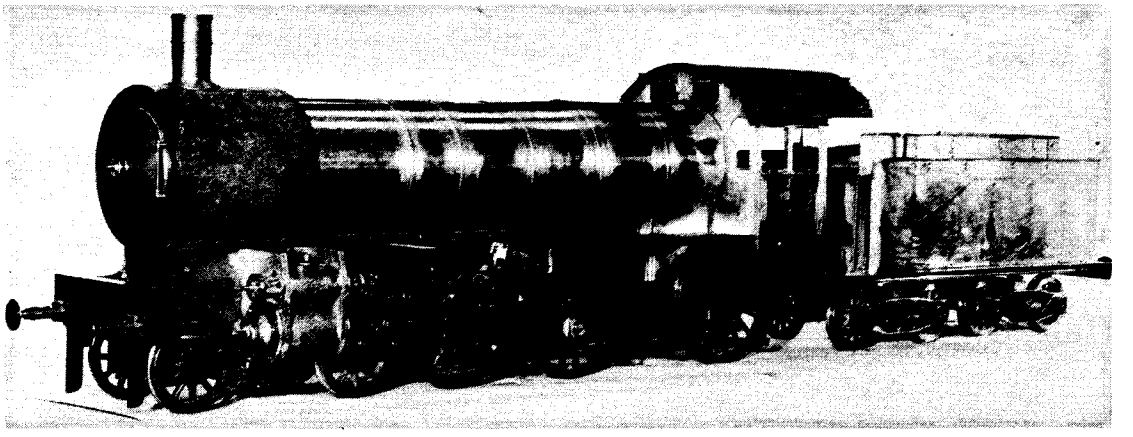

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