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MODEL & ALLIED PUBLICATIONS LTD

COVER PICTURE

The 5 in. gauge "Butch" 0-6-0 tank locomotive which won the recent New Zealand locomotive trials for Mr. W. McGhee. Colour photograph by R. M. Poole.

NEXT ISSUE

Cutting gears on a Unimat lathe.

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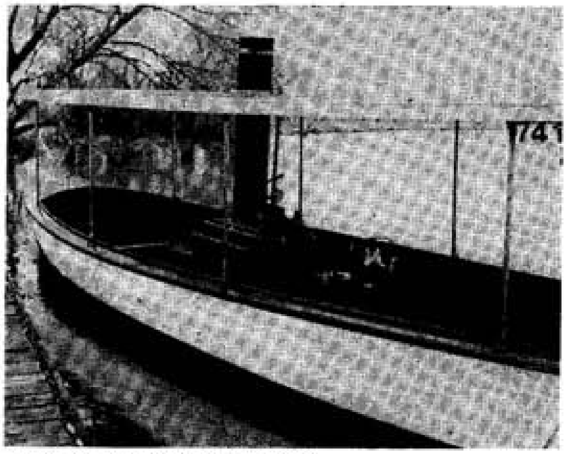
SMOKE RINGS

A Commentary by the Editor



The completed steam launch.

Steam on the river

Reader Derek Burnage recently achieved a lifelong ambition—to bring back steam to the River Ouse at Bedford. With the help of his wife and sons Paul and Stephen, he has rebuilt a derelict 23 ft. launch and fitted it with a steam engine which he recently completed. The engine is a single cylinder, slide valve, working on 90 p.s.i., the steam being supplied by a coal-fired water-tube boiler. The launch has a top speed of 5 knots and will cruise for three hours on 70p worth of coal.

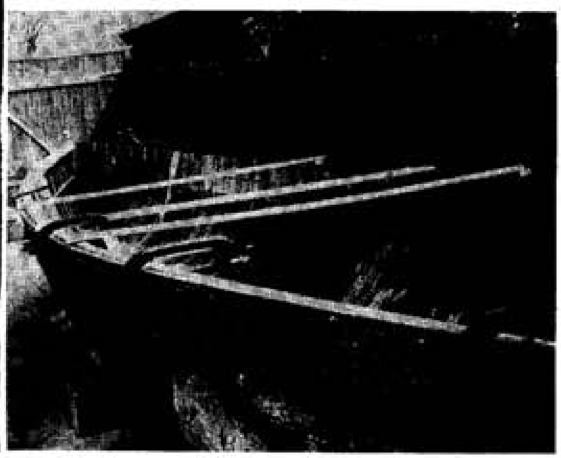
A Society for the Axminster district?

I heard recently from Mr. S. C. Pritchard, who is managing director of the well-known firm of Pritchard Patent Product Co. Ltd., that plans are afoot to form a model engineering society for the Axminster, Seaton, Chard and Lyme Regis area.

The Axe & Lym Valleys Light Railway Association was formed some two years ago as a supporters' club to assist the promoters of a 15 in. gauge light railway which was to be built from Axminster nearly into Lyme Regis with its headquarters at the intermediate station of Combpyne. Unfortunately, this venture failed and recently all the locomotives and rolling stock were sold. A general meeting of the Association was then held and it was decided that, as the Association had some thirty members, it would be a pity to disband completely. As some of the members were model locomotive builders, it was thought a good plan to change the Association to a normal model engineering society to cover live steam locomotives from 3½ in. to 7¼ in. gauge, traction engines, etc.

Negotiations are to take place with British Railways to see if it is possible to acquire the area at Combpyne which includes the Stationmaster's house, which would make an excellent clubroom, and there would be sufficient space for a permanent track, car park and other facilities. The Association would therefore like to hear from anyone in the area who is building or contemplates building locomotives or traction engines and who would be interested in helping to build a permanent track and other facilities, should the site envisaged become available. Those interested should write to Group Capt. Trumble, the Axe & Lym Valleys Light Railway Association, West Drive, Uplyme, Lyme Regis, Dorset DT7 3UP.

Left: The single-cylinder engine.
Below: The hull during rebuilding.

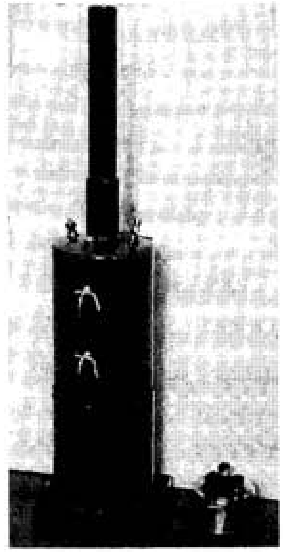


A Simple Low-Pressure Boiler

Part II

by "Tubal Cain"

From page 21



HERE is a tip regarding work hardening. As it comes from the brazing the copper is all annealed and soft, and very easy to bend (e.g. when fitting to the firebox). If, when you water test, you apply and release the test pressure half-a-dozen times you will workharden the copper a bit, and improve its strength. This is more effective than leaving the test pressure on for half-an-hour or so. Any small leaks may be peened over, but "gaps" should be filled with brazing alloy; I don't recommend soft-solder caulking other than on rivet-heads, and even then don't like it, as it means you can never do any more brazing on the job afterwards.

The firebox is a very simple piece of work. Make a paper template to fit the shell, cut out your piece of sheet—allowing for a lap joint—and roll it round a bit of stuff (even the boiler shell if you must!) till it is a good close fit. Note if you have put dummy rivets in the shell you should do the same on this part, *but* put the rivets so that they don't line up with those in the shell proper. Also, you should allow for a ring of rivets on the circumferential joint, too. Once you have the joint made—it needn't be brazed, rivets alone will do—get it quite round, and then make the base. Fig. 3 showed the developed shape of the sheet, on which note that I have shown a small hole at each fold corner. This will give you both an easier cut and a better fold. The 12 holes are air-holes for the burner—not essential as enough should come though the hole in the firebox. Fold it up, and run a fillet of soft solder inside each corner. Twist it by hand till it sits flat. Now take your dividers and scribe a circle on the top a trifle under the diameter of the firebox. Use this to locate the latter, and secure it with four hefty blobs of solder. This having been done, run your soldering iron all round the joint. This will stiffen up the relatively thin firebox no end. Note, if you are using brass it may be necessary to tin the joint first, but this shouldn't be necessary with copper. You can now try the base for flat-sitting, and once you have adjusted this I suggest you file off a few thou in the middle of each side, so that it sits only on the corners.

Mark out for the 6 fixing screws—I used 8BA but the size isn't important—and after drilling or punching the firebox offer up the shell so that the test cocks are at the front, but the lamp-hole is at the back. (The rectangular hole in the base is supposed to be the ashpit door, so this should be at the front, too). Drill and tap the shell, and assemble. The asbestos liner is a refinement, saves the paint. All you have to do is to cut it out, using the paper template you have thrown away, wet it, and mould it to shape. In view of the current apprehension about asbestos it is worth suggesting that you cut it wet, I think. The "Spiral Retarder" (it is really a Helix, as Prof Chaddock will hasten to remind me!) is easily made. Cut a strip of thin copper (anything from 28 to 22 gauge will do) a tight fit to the tube, and twist it so that the coils are about 1 in. pitch at the bottom and 1½ in. at the top. Don't fuss over this—"about right" is spot on in this case! "Wind" this into the flue, and to prevent it from falling right through just twist the top corners with a pair of pliers so that these corners rest on the top of the tube.

The only fitting I have detailed is the safety-valve, Fig. 4, but any sort will do. A "proper" one would have a dead weight, for the period, but these don't scale very well; alternatively, those with two columns and an exposed spring look quite well. The one I have shown is a well-proven "LBSC" design but slightly enlarged in the body. Again, a simple turning job, the only point to note being to form the seat for the ball by tapping a *hard steel* ball into the recess, NOT the bronze one! For the stop-valve I have an ordinary union plug-cock for the time being, to be replaced by a globe valve when I have time to make one. The filler plug is a plain hexagon head plug, and the test-cocks for water level are cylinder drain cocks, with a rather longer "bib" of 3/32 in. copper tube soldered onto the nose.

The lamp was shown in Fig. 6, page 20, last issue.

This could be a bit larger with no harm done, and can be made up of either tube or sheet, but use the thinnest material you can find, especially for the top plate and the wick-tubes. I always braze my spirit lamps, but I think I may be over-cautious, as most commercial lamps are soft-soldered. You may have to make the lamp to fit such wick as you can get the days; if so, aim at a total wick area of about a third of a square inch—3 x ⅜ in. dia., or 4 x 5/16 in. dia., etc. Those who live in the country may be able to get round wick still, and in some places old-fashioned ironmongers or agricultural engineers may have some "engine starting wick" left in stock.

When you have finished the boiler, and made a chimney with a sleeve to fit over the projecting flue (or, if you are a purist, with a flange connection!) you will think it looks tall for its diameter. Quite. This is because you haven't got a firehole door! What I did was to cut out a bit of scrap brass (actually one of the bits cut out of the firebox) to look like one, and attach it more or less in the right place, just as the old German makers of "toy" steam engines used to do. It makes quite a difference, though I wish I had taken a bit more care over the detail of it. Never mind,—a job for the future, to while away an idle moment! Such firehole doors were of many shapes—oval, round, square with round tops etc.—so you can devise your own. However, don't forget that even on the smallest boiler they had to admit a shovel, so don't go below a scale 16 in. x 12 in. for the door; say 1⅛ in. x 1 in. It would be very rare to find such a boiler (in the 1860's) lagged in any way, still less with wood staves, though you might find the cost-conscious farmer wrapping it with sack-cloth or hessian tied on with baling wire. So I suggest you paint it to your choice and leave it at that.

Finally,—superheater! I haven't shown one, as for the purpose mentioned at the start of this piece it isn't really essential. However, dry steam is certainly worth having, and if you feel inclined you can deal with this in one of several ways. The easiest is to thread a pipe down the flue round the retarder, and lead the steam pipe out through the lamp-hole. Just cut a slot in the flue extension to let the pipe in. You would get a fierce superheat if you brazed the pipe to the retarder! Alternatively, you can make a hole in the bottom plate, thrust a steam pipe through this to within ⅛ in. of the boiler top, braze it in place, and arrange a double coil of pipe in way of the flame in the firebox. In both cases you should use slightly larger and thicker wall pipe than usual, to allow for wastage of the metal. Alternatively, (and this is what I do) when you want superheat just lead the pipe down from the stop valve, into the firehole to a double coil, and out to the engine. Just one word of warning, however; *don't* fit a superheater when driving an engine with no proper cylinder lubricator or you may run into trouble with a scored cylinder bore.

So, there it is; an easy boiler to make, that will run small engines quite fast, and larger ones at a nice stately speed. Don't expect everything from it, though; I doubt if it would break away a *new* engine above ⅜ in. bore and for such you would have to run in first either on your bigger boiler or on compressed air. On the other hand, it's a very useful little fellow to have about the place for odd test jobs, and to entertain unexpected visitors who come to see the "Williamson" engine running! ▣

A Miniature Japanese Steam Locomotive

by Kenji Nishimura

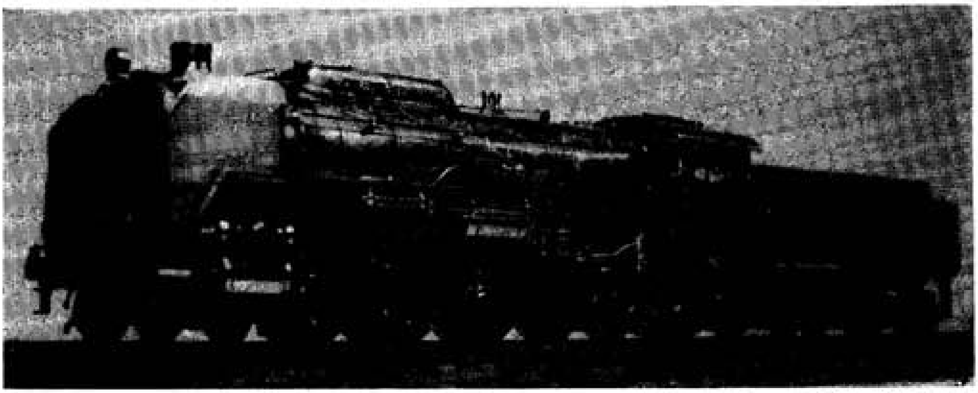
IT HAD BEEN a long-cherished dream of Mr. Ryuichi Sato, member of the Nippon Live Steam Club in Japan, to construct live steam locomotives small enough for operation even in a very limited ground space, and thereby to explore the technical possibilities of such mini-mini locomotives.

The butane-fired 16.5 mm. gauge Hudson-type live steam locomotive Mr. Sato has completed recently is the sixth of his series modelled precisely after the C62, the largest of all the passenger steam locomotives of the Japanese National Railways and one of the most popular with Japanese railway enthusiasts.

According to Mr. Sato, he decided to build these 1/80 scale models in 16.5 mm. gauge since the parts of motor-driven locomotives of the same type and size, such as driving wheels, on sale can be utilised also for his live steam locomotives.

The first model required about two years to complete, but the second to sixth ones were built in about six months each. Thus a total of four and a half years have passed before he completed, after a number of improvements, the sixth locomotive whose performance is satisfactory to him in every respect.

The cylinder bore and stroke are 7 mm. and 8 mm. respectively. The right and left cylinder-and-valve sections are composed of a total of 38 smaller parts. At first, these sections were made of one brass block. But the builder found that such integrated cylinder block was too heavy to warm up in a short time. This meant a larger amount of



Mr. Sato's fine 16.5 mm. gauge 4-6-4 locomotive.

cylinder drain at starting, and he considered it necessary to minimise the drain for economical use of highly "precious" water in the very small boiler. Hence the adoption of built-up cylinder-and-valve sections, which are lighter in weight.

As for the valves, piston valves were adopted from the outset since Mr. Sato believed that it would bring his models closer in appearance to the prototype and moreover lighten the load carried by the Walschaerts valve gear. The valve bore, travel and lap are respectively 4 mm., 2.2 mm. and 0.2 mm.

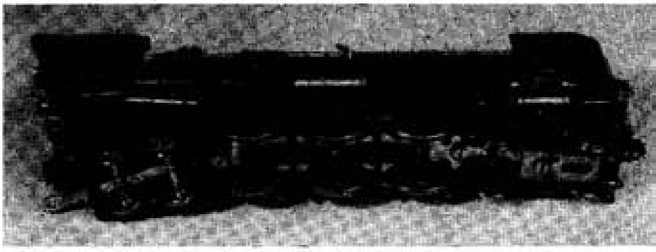
Mr. Sato says the design and making of the motion plates required utmost care and high technical skill as the valve travel is extremely short and even a very small play of the expansion link support bearings was considered to greatly affect the delicate motion of the valves in such tiny models. For space and building convenience, therefore, the builder used the one-side trunnion-pin system, sacrificing the mechanical strength to some extent.

He also says that the expansion link was a little too large in size in his earlier models in comparison with the size of the locos. In his sixth model, he reduced the valve travel by 0.4 mm. to minimise the size of the expansion links.

The boiler, 20 mm. inside diameter, is made of copper plate 0.5 mm. thick. It has a water capacity of 24 cc. and is provided with a single fire tube 9 mm. outside diameter. According to the builder, this type of boiler is better than the multi-flue type in very small locos in obtaining better draughting performance.

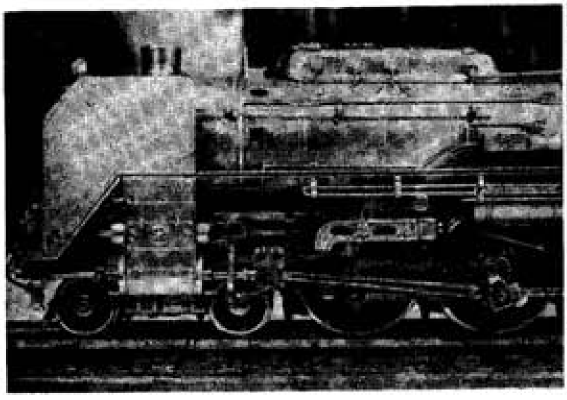
The safety valve, which is located in the steam dome cover, consists of a silicon tube cut with the valve body having two steam escape holes on its side. The working pressure can thus be adjusted freely by using a tube cut or valve body of different diameter.

The water check valve was made at first with a stainless steel ball. But the builder found later that this was no good since, he says, even a very slight

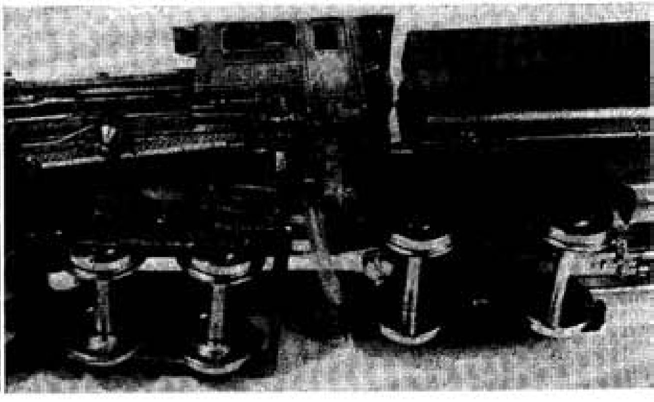


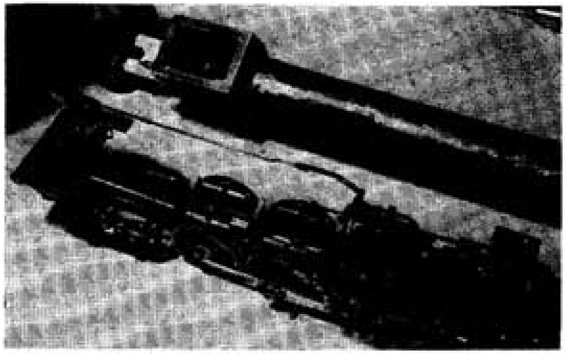
An underside view of the chassis.

Below: Full Walschaerts valve gear is fitted.



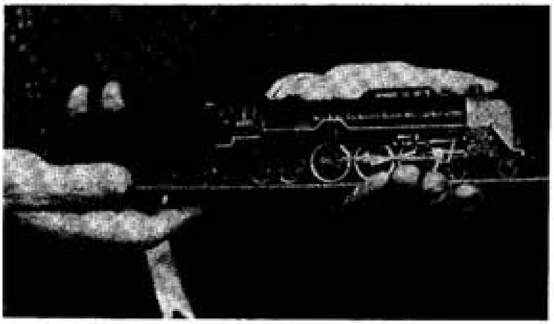
Below: The trailing truck and one of the tender trucks.





The boiler, removed from the model.

Below: This picture gives an idea of the size of the model.



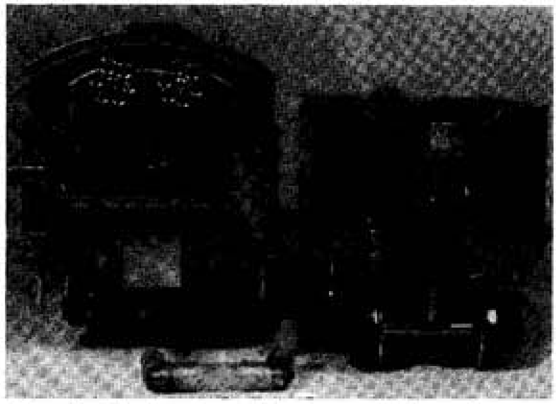
but continuous leakage of water from between the ball valve and the valve seat is vital in such an extremely small boiler. Thus he solved this problem by using a silicon tube cut as in the case of the safety valve. That is to say, the water check valve takes the form of the air valve used on bicycles.

How to make the water gauge was also a problem to him. To minimise the influence of both capillary action and surface tension, he noticed that the inside diameter of the glass tube and the upper glass receiver pipe must be more than 3.5 mm. It was also difficult, he says, to connect the glass tube with the upper and lower receiver tubes in a compact manner.

About two-thirds of the tender capacity is occupied with water (24 cc.), which is fed into the boiler by means of the hand-operated feedwater pump (inside diameter: 8 mm.) fitted onto the tender floor. The butane gas capacity is 10 cc., an amount large enough to fire the boiler for 20 minutes on end. Mr. Sato says butane is an ideal fuel for a live steam locomotive in such a very small size.

According to Mr. Sato, the tender, fully loaded with water and fuel, is no small burden on the engine of this size. To minimise the running resistance of the tender, therefore, he used the pivot system for all the wheel bearings.

Flexible and pressure-resistant tubes were con-



View inside the cab and the front of the tender.

sidered necessary to connect the fuel and water pipes between the tender and the engine. On the basis of this consideration, a 2.3 mm. dia. silicon tube was used for the fuel pipe connection and a rubber tube for the camera air release was utilised for the water pipe connection. The builder admits that the performance was given priority over the appearance in this respect.

The performance of the sixth locomotive is indeed gratifying. When it was operated in summer at a working pressure of 0.5 to 1.0 kg./cm.^{2}, the locomotive ran a total of 70 circuits of a track 1800 mm. in diameter non-stop, pulling six 250 gram coaches with plain bearings. When no coach was pulled, the locomotive made as many as 110 circuits of the same track.

Mr. Sato added that he constructed every running or sliding part of his locos as friction-resistant as possible, and that, when he recently overhauled his third loco for check-up after operation over a total distance of 100 kilometres, he found her running parts still in good condition. The results thus assured him that Lilliputian live steam locomotives have wonderful possibilities.

Sir,—Re "The Shillingstone Light Railway"
by D. A. Bayliss, 19 November 1976.

We would like to correct a mis-statement in this article in connection with the Camberley Railway Beyer-Garratt articulated locomotive. This locomotive was in fact sold by our Company to the firm in Rhodesia and sent by us direct to Beyer Peacocks for "opening out" to 15 in. gauge. Whilst the locomotive was at Beyer Peacocks we heard from the firm in question who advised us that the piece of land they had purchased for their project was without water (contrary to their surveyor's report) and that a steam locomotive was of no use to them. We did at that time send one or two prospective customers to view the locomotive at the Beyer Peacock works in an endeavour to re-sell on behalf of the Rhodesian company concerned.

Richmond. p.p. Cherry's (Surrey) Limited
Phyllis Cardew, Secretary

A NEW SOCIETY AND TRACK IN SHROPSHIRE
by A. P. Butler

THE PHOENIX MODEL SOCIETY was formed in July 1972 as a Club affiliated to the Phoenix Centre. The Warden/Headmaster, Mr. R. C. Neal, and the School Governors were happy to allow the Society to erect a locomotive track on the campus. The Wrekin District Council, besides providing social facilities at the Centre, subsidises the use of all the facilities of the Comprehensive School in the interests of the public, and membership of the Society entitles individuals to the full use of excellent craft facilities on Tuesday and Thursday evenings at the modest cost of 10p per session. The site is open and access can be gained at any time.

As with any new Club or Society, initial membership was small, yet there were all the facilities available to establish a thriving unit. What was lacking was the labour force to build the track without it becoming a long drawn out procedure where members' enthusiasm might flag. In this respect we were both fortunate and, I suspect, unique in as much as both Group Captain W. Howell and I are members of staff in the School, in addition to being enthusiastic model engineers. From my viewpoint, as Head of Technical Studies, I saw the building of the track and its ancillary equipment as an opportunity to develop a novel yet purposeful course of craftwork for pupils in the School.

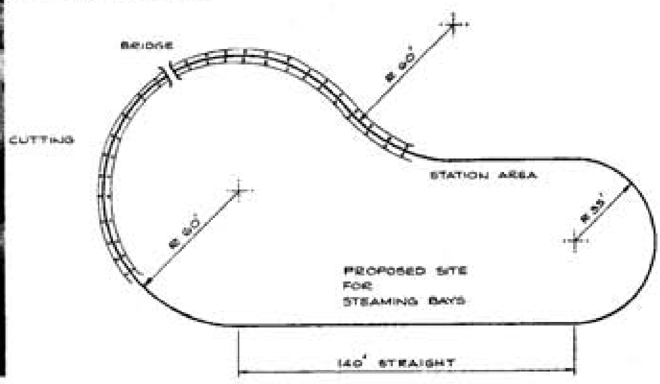
Mr. H. Evans and pupils of the School building the road bridge.

An initial survey of the area was made—thanks to the good offices of one of the County Surveyors, who happened to be a friend of a member of staff. Armed with this, the line of the track was pegged out and the first pillar holes dug. Casting boxes for concrete pillars were made and the first reinforced pillars began to roll off the production line. My thanks here to Mr. H. Evans, the workshop technician and general handyman, who undertook this task with the help of some of the pupils.

Holes were dug at 5-foot centres along the line of the track, pillars put in place and lined up, then concreted in. Meanwhile Club members had put aside their locomotives and were building track in 20-foot lengths from 2 in. x 5/16 in. section mild steel, with tie bolts and spacers at 1-foot intervals. Others were manufacturing jacking plates to fit the steel track to concrete pillars, while allowing room to adjust both the level and super-elevation of the track when *in situ*. Eventually we had sufficient track to put down the 140-foot straight section, and our thoughts then turned to methods of producing 35-foot and 60-foot radii curved sections. After much discussion we decided to build these on a jig to set the curve, with holes for the tie bolts drilled as radii to the curve, bolt up with spacers and we were hopeful that this would retain the shape. This system worked. The initial lengths were duly dismantled and marked as masters from which to drill rail for the remaining sections.

While this was being done the ground was excavated for the cutting, which is 4 ft. deep at its

Plan of the track.



Leading off the straight into the 35-foot radius curve.

maximum; and a second survey was carried out. Now there were more holes to be dug and filled with pillars set in concrete, and there was more rail to be bolted down. The task seemed enormous. Eventually the final sections were ready to be fitted and with a sigh of relief they were ceremoniously bolted in place. In three years and seven months, 700 ft. of track had been laid, as a co-operative venture between a School and an adult Society. All that remained was to test it with a locomotive.

To carry this out we called upon the largest locomotive in the Society's stable, namely a 5 in. gauge "Hall" built by Mr. J. Savage of Oakengates.

Coming off the 35-foot curve into the station area.

View from the station showing the road bridge. The final joint awaits the bolting-up ceremony.

All was prepared and the Chairman of the Society, Mr. P. C. Beddard, came in one Friday to do his stuff. Steam was raised and the locomotive set off —all of us I think having our fingers crossed and a prayer on our lips. The first circuit completed, we spent the next two hours giving rides to all and sundry, finally dropping the grate — a tired but happy group of enthusiasts.

To date the track has been well tested. Its official opening took place on 10 July 1976, when the Warden of the Centre, Mr. R. C. Neal (who is also Honorary President of the Club) and Mrs. Daphne Gask, O.B.E., J.P., Chairman of the Leisure and Recreational Committee of Shropshire County Council, officiated. We now have a 700-foot track for 3½ in. and 5 in. gauge locomotives, complete with a road bridge over it and a coloured light signalling system. Steaming bays, plus a traverser, will be ready by next season, together with a pedestrian bridge to assist with the control of passengers. The area encompassed by the track is being landscaped by the Rural Science Department in the school and should look very picturesque in the near future. As an exercise in co-operation between a School, Community Centre and an adult Club, the formation of this Society and the building of its track has proved a most successful venture.

The official opening of the track. Mr. P. C. Beddard, Chairman of the Society, Mrs. Daphne Gask, O.B.E. J.P., and Mr. R. Neal, Hon. President.

Our stable of completed locomotives consists of a "Hall", a *Simplex* and a *Butch* in 5 in. gauge and a 3½ in. gauge *Tich*. By next season this should be increased by a "Manor", "King", *Speedy* and Stirling "Single", all in 5 in. gauge, and a further *Tich* and a *Britannia* in 3½ in. gauge—all of which are very near completion. A further eight or nine locomotives in both gauges are under construction and will be ready for work in the near future.

Membership of the Club is now in excess of 20—many of whom have been lone wolves, but are now totally committed to the Society. We are anxious to extend our membership and offer a warm welcome to anyone interested in coming along to the Phoenix Centre between 7 and 10 p.m. on a Tuesday evening. You do not need to be an expert, just somebody who is interested in doing something different and, in my opinion, worthwhile. If your interest is not in steam locomotives, do not be put off; we have many members of the Club, in addition to the steam fanatics, who indulge in all aspects of model work from aircraft and boats to radio-controlled model cars. Facilities we can offer, besides a locomotive track, are well-equipped workshops (50 yards from the track), a 30-acre field for flying all types of aircraft, and the use of two large pools within two miles of the Centre for all boating enthusiasts. Functions of any branch of the Society are well supported by all members of the Club. For any social events we have the use of a superb hall and coffee bar in the Centre—provided they are booked in advance.

We feel there is very little any person interested in modelling in all its forms could not find at the Phoenix Model Society, be it in terms of facilities, help or assistance or just congenial company of people with the same interests.

If you are interested and cannot manage a Tuesday evening, please contact either the Secretary, Phoenix Model Society (Mr. W. Weston), 21 Wheatfield Drive, Shifnal, Salop (Tel. Shifnal 461279), or Mr. W. Morley, The Administrator, Phoenix Centre, Dawley, Telford, Salop (Tel. Telford 591531).

Best wishes to all the model engineering fraternity. May our hobby go from strength to strength.

Tony Butler with Jack Savage's "Simplex".

A GOOD OLD LATHE

by Roger Davies

THE LATHE shown in the accompanying photographs came my way last year through the good offices of my friend Mr. Stanton of Stanton-Thompson Machine Tools Ltd., who is by way of being more antiquarian in his interests than myself, and thus appreciated the machine sufficiently to save it from the scrap hammer.

It was found about 1967 or 8 in the maintenance department workshop of a hospital, probably University College as it bears a crudely stamped brass tag "University, Gower St.", when my friend's firm had the job of clearing this workshop. Up to the time it was removed it had been in regular use, but in spite of its long life it had only lost as far as I can make out two change wheels and the travelling steady, bolt holes for which exist in the saddle.

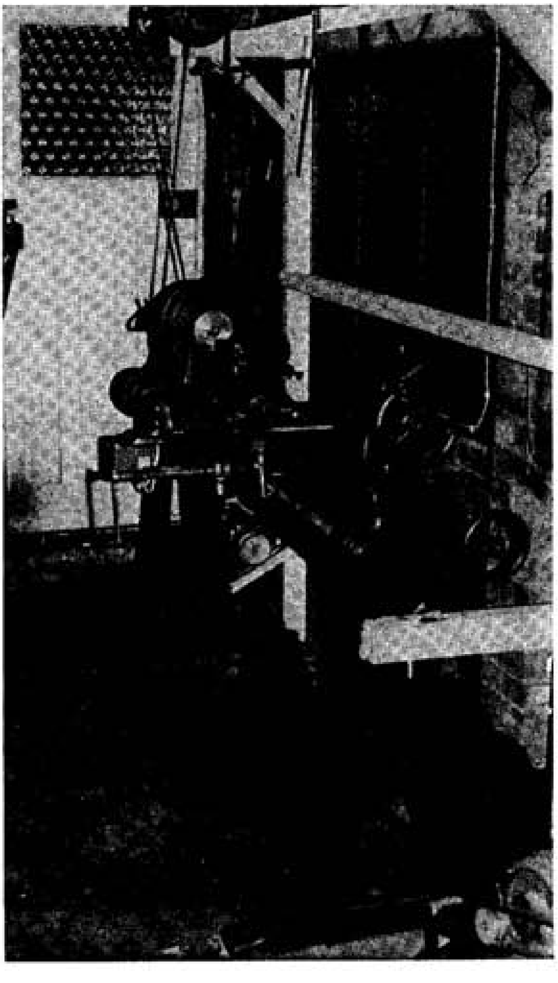
Mr. Stanton set the lathe up in the front window of his Hampton Court showroom as a display, but when he closed down his main road showroom and consolidated the business into his warehouse he decided to dispense with it and pass it on to a suitable user-cum-restorer-cum-curator, and paid me the great compliment of regarding me as a suitable person. As I was looking for a long bed lathe for certain occasional aspects of my business I was glad to have it. I hope to justify his faith.

I like long bed lathes anyway, having had more than enough in 30-odd years' toolmaking of the modern style short lathes which have given me a "pepper-pot elbow" through not being able to get the tailstock out of the way.

The lathe is at present housed in my garage (the modern tin transport being more easily replaced stands outside) and space precludes the possibility of taking a photograph from the normal full length aspect, but one shows the complete lathe from the tailstock end with the countershafting gantry which I have built to drive it. As older readers will recognise, it is a typical straight bed screw-cutting, sliding and surfacing lathe of the turn of the century such as many an aspiring apprentice cut his teeth on.

It was made by William Muir and Co. of Manchester, and presumably supplied in 1904, as evidenced by the brass plate on the headstock, which is also stamped No. 2628 and by the cast iron back gear guards, first required by the Factories Act of 1903. There is however a curious feature in that there is an assortment of numbers on the various parts, the headstock front limb being stamped 2628, the bed having the number 3179 cast on, but stamped at tail end of shears "28" and the slide rest stamped 2035. The various parts seem so coherent a whole, and the fitting so excellent that they were obviously put together at the same time and place, and one can only assume without other evidence that it represents the end of a line and that all the units available in the works partly fitted were assembled into a whole. This would be consistent with the fact that the design as a whole is slightly old-fashioned even for 1904, and more typical of the '80s to '90s of the last century.

I wrote to the Manchester Institute of Culture



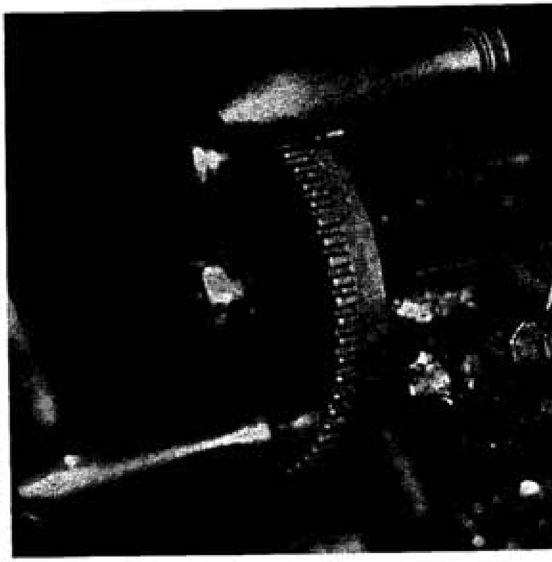
and Science to ask if Muirs were still in existence, and was informed that the firm were incorporated into the David Brown group, so I wrote them and found that since the lathe was made the firm of Wm. Muir had first become a limited company, then incorporated into the machine tool division of David Brown which in turn had finally been closed down in 1966.

Their letter caused me no little amusement, as they appeared to think I was daft enough to be asking for spare parts service after 70 years, and suggested I find a jobbing engineer to help me. I guess the writer meant well but how many jobbing engineers are left?

The machine is 6½ in. centre height, 4 ft. between centres. It has a solid mandrel, with hardened steel cone bearings, adjustable by locknut collars at the rear end, and held up for thrust by a tail-pin with lock nuts. The mandrel nose is 1⅞ x 6 t.p.i. and bored with a "funny" taper hole of approximately the same size as No. 2 Morse but slightly steeper angle for head centre. The drive is by 1½ in. flat belt, with back gear reduction; the back gear shaft being thrown in and out of gear by eccentric motion, and the gears being no less than 1¼ in. face by 8 d.p. There is tumbler reverse to a train of change-wheels for screwcutting which themselves are a massive 1 in. face by 10 d.p. The leadscrew is 4 t.p.i. and 1⅜ in. dia.

Its engagement with the saddle is by a half-nut working down on the top of the leadscrew which is supported from below by two half bearings cast on the bed. The bed itself is *9 in. broad* across the shears by 7 in. deep! I don't get much spring! Working along the back of the bed is a full length shaft (you can see the hand wheel on the end of this just below and to the right of the tailstock which, driven by a three-speed gearbox (there's modern now) gives sliding and surfacing feeds. One feature which would be frowned on more than somewhat today is that both these feeds can be thrown in at the same time. You just have to keep your wits about you. On that same theme the cross-slide and top-slide screws work in opposite directions, which could be disconcerting to the inattentive.

My other photograph shows an odd feature which I've never come across before in quite this form. It is a "quick withdraw" for screwcutting. The bearing for the cross-slide screw nearest the handle is not direct in the casting but is carried in a short, handled, screw of very coarse pitch working in a thread cut in the casting. The handle is normally held down to the right of the cross-slide handwheel by the spring catch seen on the extreme right of the picture. The idea is that on reaching the end of the thread, the catch is pushed in with the thumb and the handle yanked up to the 45 deg.



The quick-withdrawing handle for screw-cutting.

position shown which instantly withdraws the tool. At the start of a new cut, the handle is pushed down again and more cut put on by the cross-slide wheel. Personally I'm not keen on it, being well used to screwcutting by more normal means. Also it does not work for internal threads. I remember Karga lathes used to be fitted with a cam operated slide for this purpose, but as stated I've not come across this kind before.

The tailstock is of usual type, self ejecting and bored No. 2 Morse, the travel of the barrel being a delightfully useful 6 in., enabling most holes to be drilled without shifting up the tailstock. After over 70 years there is only 2 thou. shake at full extension. There are also original scraper marks visible on the bed. If you look hard in the right places, it must be admitted.

There is a 12 in. four-jaw chuck of the old "faceplate" type, a 12 in. faceplate, a three-jaw geared scroll chuck, driver plate and centres, and the massive pile of change wheels, from 20 to 150 teeth (which will give threads from 175 t.p.i. to a 7¼ in. pitch spiral lead) can be seen under the bed on the floor. A fixed steady is provided. The matching cone pulley and parts of the countershaft were also present.

I have also provided and fitted an 8 in. Burnerd Light Pattern 4-jaw independent and a ⅜ in. tailstock drill chuck. Also, through a friend recently made through the pages of *M.E.* I have acquired a fine old vertical-slide of contemporary style which is a perfect fit.

The only damage the lathe has suffered is to the front of the top-slide, some clown having apparently run the corner into the revolving chuck not once but as a habit, the same habit having caused the breakage of some of the teeth of the cross-slide feed clutch. However it all still works.

When the lathe was set up for working and levelled I put a 10 in. length of 1½ in. bar in the chuck and skimmed it along to try the accuracy, and got a taper of only 1½ thou. in this length. Those old boys surely knew how to make them to last.

I am not sure of the weight, my bathroom scales are a bit small to try it, but the man who delivered it reckoned it about three-quarters of a ton.

There was a fine old lot of fun and games trying to get flat belt fast and loose pulleys, shafting, bearings and so on, and the price of 1½ in. flat leather belt today calls for brandy to bring the purchaser round, but eventually everything required was brought to hand.

The gantry and drive may be of some interest, "all out of my own head" as the saying is, but I had to buy the steel. It is a combination of 3 x 2 in. rectangular m.s. tube and 2 in. angle iron. I borrowed an electric welding set to glue it all together, the joints are a bit "almond rock and spatter" but it seems to hold together OK. The longitudinals are bolted so that it will all come apart for transport when the happy day arrives that I can find somewhere to move to where there is some sort of big outbuilding to use as a workshop, our bureaucratic planning laws precluding the erection of such things in suburban areas.

The motor is ¾ h.p., primary drive by vee rope to sub-countershaft, and then by flat belt to 10 in. fast and loose pulleys with striking gear. Personally I like this system as affording a much smoother take-up of drive than the direct on/off switching of the motor, also if you get a dig-in the belt comes off before damage is done. Of course, in modern industry one gets used to the all-geared clutch drive, and doubtless it is necessary to have all the power needed for fast speeds and heavy feeds, but in pursuit of a hobby one does not necessarily like to be "fighting the clock" unless possessed of masochistic tendencies. Also, even in industry it is often found that the full power of a machine cannot be used because the job won't stand it, being too flimsy itself to stand a big cut.

Now that the Factory Acts have been applied to school, laboratory and maintenance workshops where people are employed, they are being re-equipped and the next few months may see the last chance to rescue some of these fine old machines from the scrap man's hammer and apart from museums where they will stand forever silent and who have only limited demand for them anyway, the amateur engineer of antiquarian tastes is the only class able to take up their live preservation.

As a turner from the age of 12, when I had a treadle-driven "Adept", through nearly 40 years machining and toolmaking, I can assure those who may be doubtful that these fine old machines have a great deal to offer.

Of course, the ubiquitous Myford has opened the way with its versatility, accessory programme and cheapness to hundreds of amateur engineers who could not have started without it and not everyone has space for an "old un", but all things being equal, if you are lucky enough to get a good old lathe of this type and learn its ways you will be surprised at what it will do.

From time to time I intend to photograph set-ups in this lathe and if our Editor thinks them of sufficient interest to publish them. ■

A "Great Westernised" PISTON-VALVE BAKER
by K. D. Hornsby

THANKS to Mr. L. C. Mason's excellent book, castings and materials from both Messrs. Kennions and Reeves, I completed a *Minnie* traction engine and this, as any steam enthusiast will tell you, is where the bug bites.

I have fiddled about with boats, radio controlled aircraft, etc., for many years, but there is nothing quite like the attraction of the smell of hot oil, steam and burning coal. The power of these small machines is quite remarkable. However, the next project obviously had to be a locomotive.

I felt that I could aspire to something a bit more elaborate than *Tich,* so catalogues of castings were perused and LBSC's *P. V. Baker* was chosen. It looked a fairly handy size, 3½ in. gauge, no tender to build and not too much of a burden on the pocket.

My old friend Bill Manley (a contributor to *M.E.*) gave a good deal of encouragement and offered to let me have a go with it on his garden track, if and when completed. Off went cheques for drawings, castings and materials. I also got into touch with T.E.E. on their stand at the 1975 Exhibition for back copies covering *P.V.B.*

I was in for a bit of a shock; there were only two articles on this locomotive. They started well enough "Something to build on the quick" and dear old Curly goes on to describe the construction, obviously aimed at the experienced builder, which I was not. By profession I am a manufacturer's agent in the fashion business. By now, however, castings, drawings and materials had arrived so a start was made.

Frames carefully and accurately cut, buffer beams, hornblocks and axleboxes fitted to close limits, wheels quartered spot on with my jig (previously described).

Coupling rod centres were carefully matched to axlebox centres and on assembly the wheels spun around with no tight spots or sloppiness in the bearings; the movement of the cranks was a joy to behold. There was a snag. If any one of the ⅛ in. packing blocks was removed from the axleboxes the whole lot locked up solid.

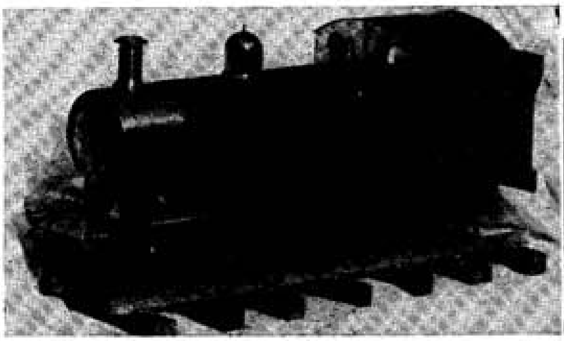
Bill Manley happened to drop by at this episode in *P.V.B*'s construction; he explained that the whole idea of sprung axles is to accommodate uneven tracks, but that crankpins and journals must have sufficient tolerance to allow for this. While it is very creditable to work to close limits, certain factors in locomotive construction call for much wider tolerances. After going to work on the coupling rod bearings with a reamer the necessary clearances were made.

The next job, of course, was cylinders and motion gear. Curly's words and music describing Baker valve gear is fairly clear. I am lucky enough to have a set of Delapena hones so I was able to hone piston valves and piston valve cylinders to quite close limits.

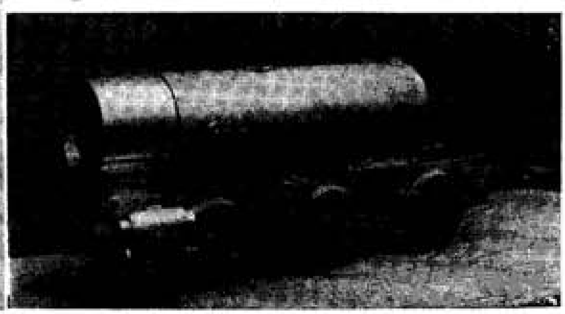
Baker valve gear is really quite fascinating in its action. Very simple but most effective. I spent a good deal of time to make sure that all centres were correct so that the linkage movement was smooth.

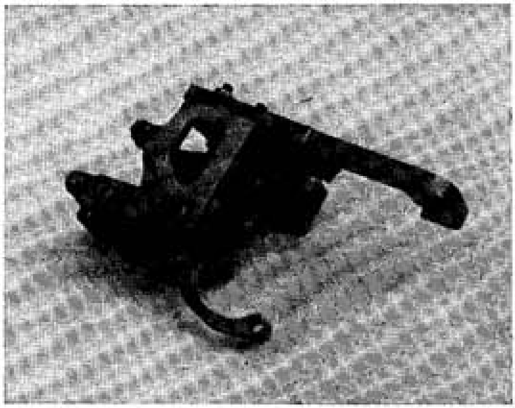
First assembly of one cylinder, valve and motion gear was tried on compressed air. A bit of juggling

The locomotive approaching completion.

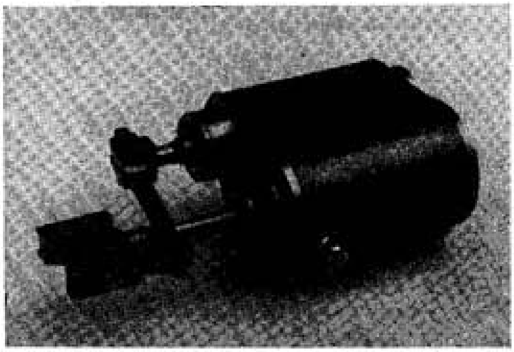


Fitting the boiler to the chassis.





The gear frame and parts of the Baker valve gear.



The piston-valve cylinder with crosshead and combination lever.

with the piston valve on its screwed spindle produced a steady even beat, much to my satisfaction. The other side was assembled with the same result. With ten pounds on the gauge it was just possible to stop the driving wheels by hand — LBSC's designs certainly produce the power.

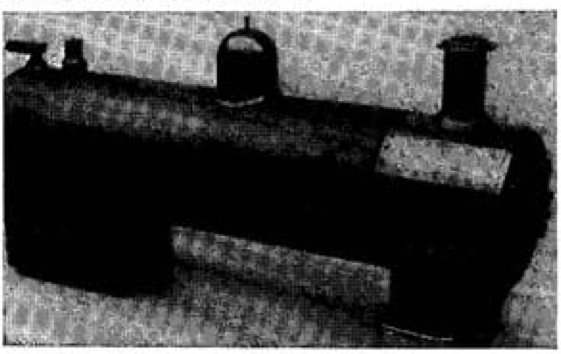
I used "O" rings on pistons, rods and valve rods as on the *Minnie* and until the first steaming the whole motion was fairly stiff.

P.V.B. is a freelance model which is just as well. There is a good deal of detail missing from the drawings. As can be seen from the photographs, a hump was put on the back of the bunker *à la* Great Western, cowlings made over the steam pipes and other assorted trimmings. The boiler is lagged with 1/16 balsa sheet, stuck on, and 28 s.w.g. copper sheet. The copper was cut from an old copper clothes boiler.

Pipe work in the smokebox was a bit of a problem, but after a couple of attempts a sort of manifold was made for steam pipes and lubricator union and all successfully put together.

After final assembly the whole bag of tricks was stripped down for painting. Black, dull G.W. green and red in the appropriate places as suggested by our Editor, Mr. Martin Evans.

The boiler and smokebox unit.



First steaming was in the garage. Frame blocked up and bits of ⅛ steel propping the axleboxes. It was a great success, no adjustments to valve timing needed and no other functional disorders evident. I must confess that the revs were a little alarming if the regulator was cracked upen a bit too much!

Bill Manley was next persuaded to let us use his track—he had already promised, anyway. A day was fixed and off we went with full equipment, steam oil, charcoal and meths. Bill also provided passenger trucks, one of which has raised footrests so that one can sit low and handle the controls and stoke with considerable ease; the track is at ground level.

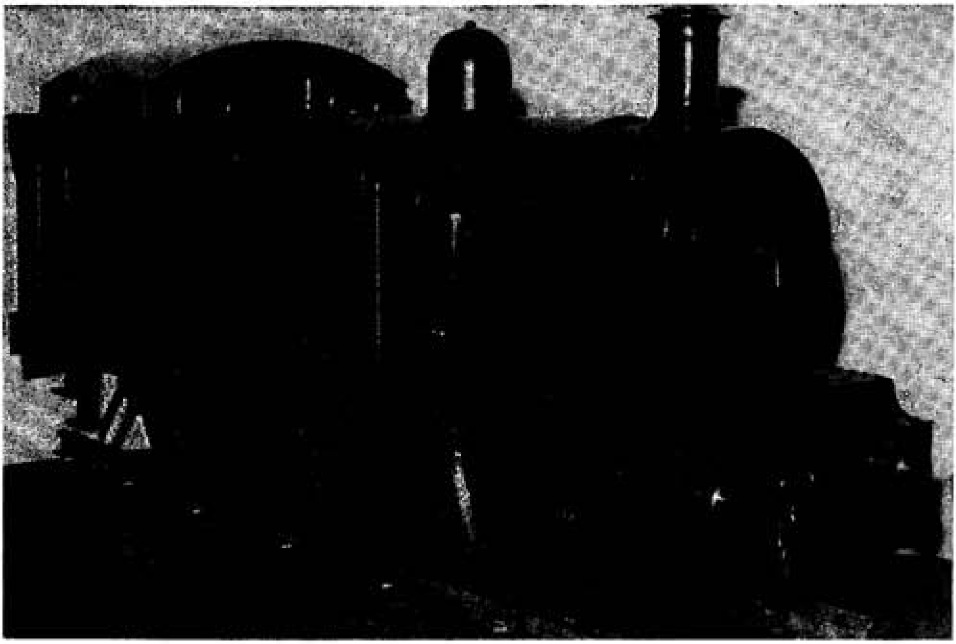
We got the electric fan going, spirit soaked, charcoal shovelled into the firebox and the lighting up process began. I discovered that it is a mistake to light a boiler with fingers covered with meths. . . . they tend to burst into flames as well as the fuel in the firebox. A lot of shaking and blowing extinguished the unwanted part of the fire and quite soon we had a few pounds on the gauge. The blower took over, the fan taken off, chimney slipped back on and we were in business.

A few shovelfuls of coal got the pressure up and with the regulator tentatively opened, priming started. The drain cocks were opened releasing the water.

Madame *P.V.B.* was not coupled to the passenger trolley during the initial steam raising, which was a mistake, and she was docile enough . . . until the priming cleared.

As soon as the water was out of the cylinders she shot away like a rocket. I made a mighty dive and managed to grab the back of the coal bunker, the wheels spinning in protest at the unexpected restriction.

I have visions yet of my carefully nurtured model throwing herself off the rails at the first bend with ghastly damage to the valve gear, coupling rods, etc.



The finished 0-6-0 tank locomotive in its Great Western livery.

We coupled the driving trolley, regulator cracked open and away she went. Regular, even exhaust beats, a wisp of steam from the safety valve, a slight rim of oil around the top of the chimney, the smell of steam and steam coal, it is difficult to describe the intense satisfaction of the thrusting power created by one's own hands.

During the morning we broke one of the gear levers and the axle pump decided to malfunction, but these were small things and soon corrected. Incidentally, a new gear lever quadrant was made giving about ¼ in. more movement to the Baker gear links than the original design.

The power of these little locomotives is really quite surprising; at a recent 'get together' on the Tiverton Club track she made no bones about pulling two adults and five children.

P.V.B. was completed in eleven months and although I scrapped a few odd bits and pieces there were no real snags. As a first attempt a freelance design seems to be the best bet; certain liberties can be taken and variations in design incorporated which one would hesitate to do on a scale model. To say the least of it, my *P.V.B.* looks like a hard-working dock tanker and there were probably original prototypes very similar in appearance.

In the course of my business I have to spend the odd few nights away from home so that workshop operations are suspended, but when I am at home I reckon to spend an hour or so every evening, even if only to drill a few holes.

In this way one always has something to do; there is always a mental stimulus which, for me, at any rate, is far more entertaining than the "box". I am lucky too in having the kind of wife who shares my enthusiasm; she is most intrigued with the odd little bits I take into the house from the workshop. She was quite fascinated with one of the Baker gear assemblies when I demonstrated the reversing action.

The dull finish paints supplied by Precision Paints of Cheltenham, transfers and materials from both Reeves and Kennions, who were most helpful, courteous and efficient, finished the model off to my complete satisfaction.

KENNETH JOHNS LTD.

Kenneth Johns Ltd., of 9 Gleneldon Road, London S.W.16, have asked us to clarify the position of sales of the Sievert bottled gas and similar equipment. Wm. A. Meyer Ltd. are the importers of this equipment, while Kenneth Johns are one of their retailers.

ERRATUM

Marshall Portable Engine

On the front face of the block diagram, page 1199, 3 December, the recess for 3/32 in. O-ring should be 0.227 in. dia., not 0.277 in., which gives 5.76 mm., not 7.035 mm. It is recommended that this recess is not machined until the governor stand is ready for fitting.

AN L.M.S. CLASS "2F" DOCK TANK

by G. F. Hennell

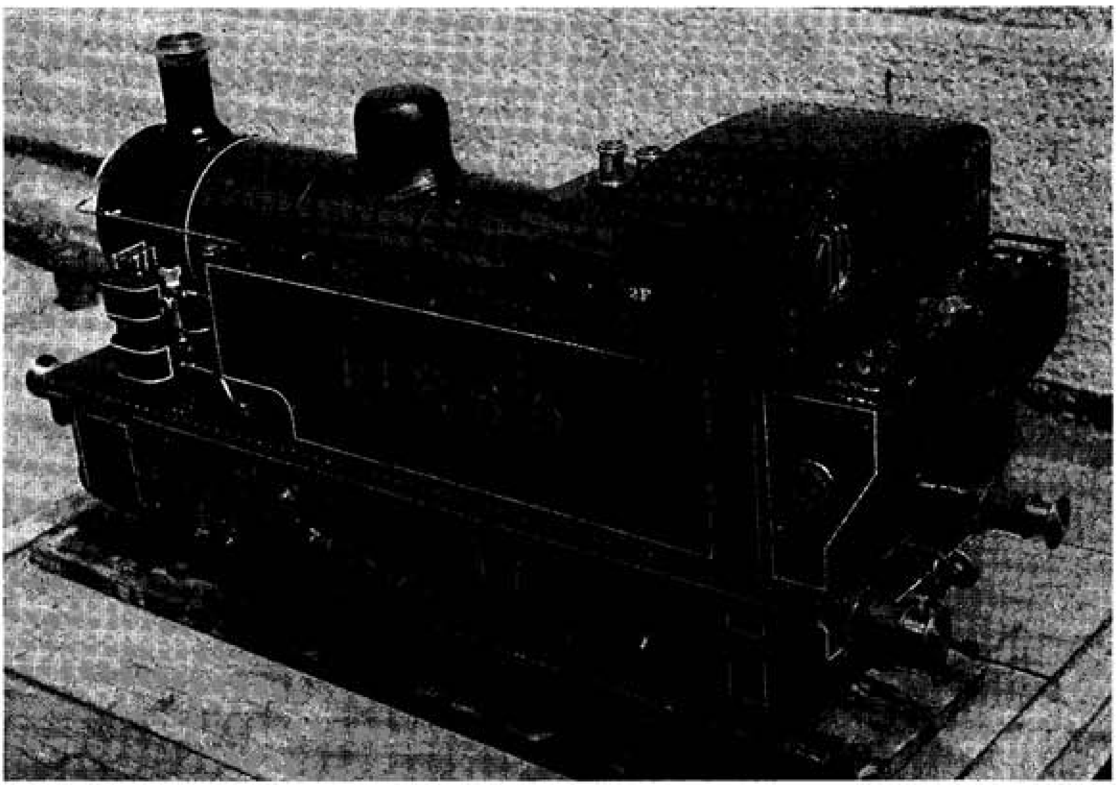
MY LOCOMOTIVE *Percy* was built in 1948 and spent the last fifteen years locked away gathering rust and cobwebs. During 1975 I decided it was about time the engine relived. *Percy* was taken out of his wooden tomb and after some preliminary checks and cleaning was run-up on compressed air and appeared to function satisfactorily.

A track was soon sought on which to run the locomotive. Harlington Locomotive Society proved to be the most suitable from the point of view of minimal travelling distance and excellent track.

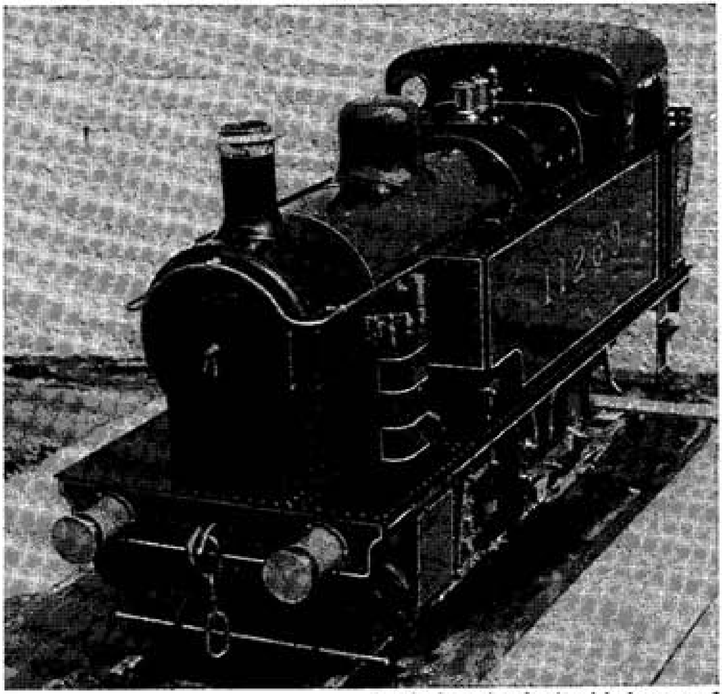
The boiler was duly tested and after a modification to improve the effectiveness of the safety valves was passed as safe to run. *Percy* had only run on an up-and-down garden track before and so his first run in fifteen years on a track as large as Harlington's was quite an event. *Percy* ran very well considering his age and tatty appearance.

I did not at the time know what the engine was modelled on, if anything, but it was not long before some of the club members pointed out its striking resemblance to a Fowler 2F dock tank of the L.M.S. railway.

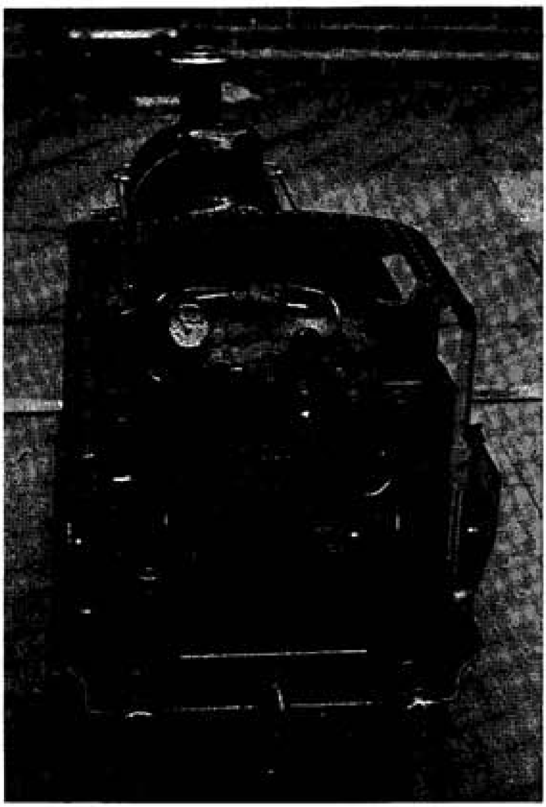
After a reasonably successful season's running, during which various shortcomings were noted like badly worn valve gear and connecting rod bearings, lack of drain cocks, injector refusing to work due to warm water in tanks and the continual "ribbing" from club members for having an L.M.S. engine painted G.W.R. green, I decided to strip the engine during the winter months and rebuild it. The further the engine was stripped the more things were found to repair or renew. In the end the whole engine received attention of one sort or another. The valve gear linkages were rebushed, new die blocks made, big and little end bushes replaced, etc. The boiler was built to LBSC's standard with fittings screwed directly into the copper. Most of the fittings had to be replaced which resulted in damage to the soft copper threads when trying to unscrew the corroded fittings. To prevent this problem happening again, the boiler was



This 5 in. gauge 0-6-0 tank bears a striking resemblance to the Fowler "2F" dock tanks.



The model is finished in the pre-1928 livery—Crimson-lake with dull black edging and straw lining.



entirely rebushed with bronze ferrules which with the aid of Peter Torrent's (of *Midge* fame, *M.E.* Vol. 142 No. 3536) excellent skill in boiler making and repair were silver soldered in place.

Boiler cladding was made in an attempt to improve the appearance of the boiler. Glass fibre matt was used as lagging, held in place with glass fibre tape, the whole being wrapped in aluminium foil (shiny side inwards). This method has proved to be quite effective.

To replace the injector and for an exercise in building a steam engine from scratch, a twin cylinder donkey pump was built based on LBSC's design and is fitted on the running board next to the smokebox. Drain cocks controlled from the cab were fitted to the cylinders. As the "ground" clearance was very small a crash bar was fitted across the chassis in front of the drain cocks to protect them against untoward events such as derailments.

The livery chosen was pre-1928 and is crimson lake with dull black edging and straw lining. The prototype 2Fs were originally numbered 11270 to 11279 but as *Percy* is not true to scale nor painted the correct livery for the class, 11269 was chosen as a suitable number. The L.M.S. insignia was taken from Jenkinson's *Locomotive Liveries of the L.M.S.*, as was the livery, and is etched in brass filled with black. Precision Paint's quick-drying gloss was used for the crimson lake and a 50-50 mix of their brushing gloss and matt black for the dull black. Humbrol was used for the buffer beams and lining and for the cab interior. The smokebox was baked in the oven (much to the disgust of the wife) for half an hour at 350°F to harden the paint and to eliminate any possibility of blistering during the first steaming.

A request was made by the club for members to provide access to the boiler, for testing, via a ¼ B.S.P. union. This was done by utilising one of the blow down valves, making it double acting so to speak. The valve is such that when it is unscrewed a further seat is encountered which seals the thread and allows direct access to pressure test the boiler. When the steam test is complete the "blow down" valve is shut in the usual manner and the test apparatus disconnected, leaving the locomotive prepared to take to the rails.

It was during July of this year that *Percy* was completed and took to the rails with great success. The effort was shown to be well worthwhile, the improvements in the valve gear and the added boiler lagging showing themselves in a twofold reduction in water consumption and extremely free steaming of the boiler. (An enlargement of the blast nozzle may now be called for.)

In conclusion, the rebuilding and finishing of the locomotive has proved to be worth the effort and *Percy* has shown himself to be a worthy little engine and a keen worker. The trouble now is that the "seed has been sown" and I am now contemplating building a locomotive from scratch, a *Springbok* I think, as a starter.

JEYNES' CORNER

E. H. Jeynes on Conveyors

As the name implies, a conveyor is a mechanism for conveying materials from one place to another; of course, strictly speaking a freight train or a pipeline could be described as a conveyor, but the term is usually meant to indicate a short distance traversed between two points. There are many types of conveyor, powered in the past by steam, electricity, and in some instances, by compressed air, others by belt drive from line shafting, while many still operate by gravity.

The usual industrial conveyor is quite a simple affair, rotating drums at each end (one of them power-driven), coupled together by a broad flat belt, which is run over rollers, usually arranged in sets of three, the middle one horizontal, and those on the sides inclined, more or less keeping the material to the centre of the belt. Means for tensioning the belt are provided, and rollers at intervals support the emptied belt on its return underneath to the loading end. All the rollers on modern belt conveyors are fitted with ball bearings, and many of the larger ones have roller bearings.

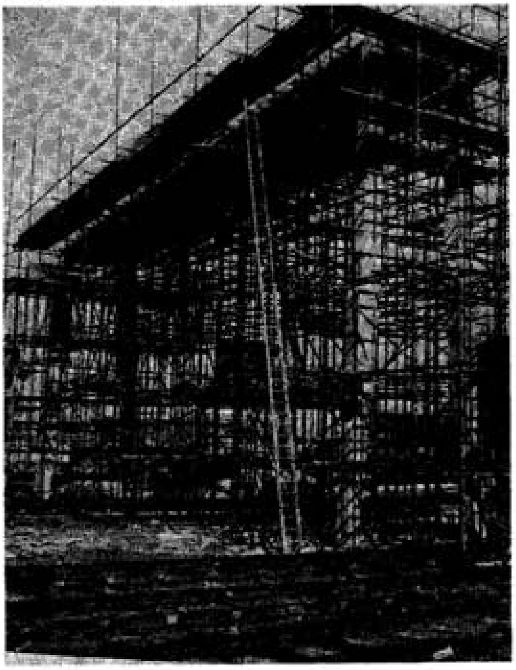
On long runs, it is usual to run several conveyors in cascade, each being inclined slightly upward to allow for discharging by gravity, on to the next belt, and in these circumstances it is necessary to operate the belts in sequence, starting up the belt furthest away from the loading point first, and stopping the belt nearest to the loading point when shutting down, to avoid pile-ups of material. It will be seen from this that the belt furthest away from the loading point will be the last to stop running.

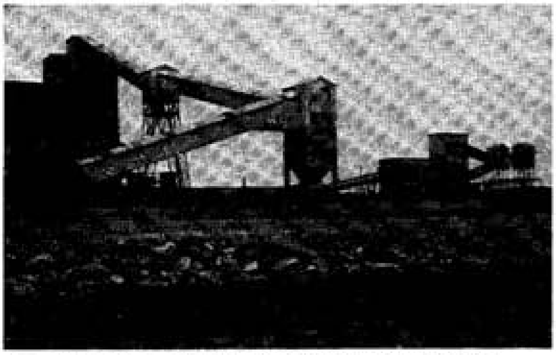
As I mentioned, there are many different types of conveyor and my first acquaintance with conveyors brought me into contact with the Zimmerman type. These were driven from line shafting, some by plain crankshaft and connecting rod, and others by cams with spring return. These were steel troughs inclined slightly downwards, mounted on lancewood strips, and the material moved forward with the trough, but remained stationary as the trough drew sharply back from under it, being moved forward in a series of jerks.

Some conveyors are sharply inclined, and could be called elevators really, having a series of buckets attached; most of the old threshing boxes were fitted with one of these to lift the grain to feed the sizing screen. The assembly lines in large works are merely slow-moving giant conveyors, the overhead Telpher cableways are long-distance conveyors, while another type is the moving staircase encountered in large stores and main line terminals.

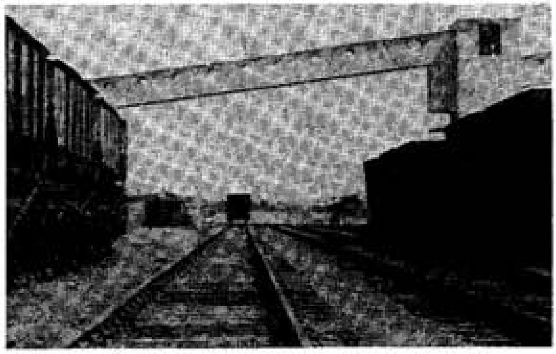
Where coal storage for coking ovens is in segmental bins, a conveyor capable of rotating through 360 deg. is often fitted, the belt being supplied by gravity to the centre, where the blending bunkers are differently

This picture gives an idea of the tubular scaffolding required to support the shuttering and concrete, while the latter hardens.





A completed steel-framed conveyor with another partly completed in the background.



A view of the large conveyor when completed.

arranged. What is called a shuttle conveyor is used, the belt being made reversible, being fed in the centre, and capable of discharging at either end.

Another type of conveyor is the chain grate used for boiler firing and in the beds of furnaces used in the continuous production of hot billets for press and stamping work. The last one I worked on of this type was at Garrington's Bromsgrove Works, where pressing a single button opened the furnace doors at each end, the conveyor moved forward by ratchet, a hot bar was pushed out on to a mechanical all-metal conveyor, while a hydraulic cylinder pushed a fresh bar in at the feeding end, a "Magic Eye" preventing more than one bar passing, and the doors closed. This conveyor was formed of chains having heat resisting prongs to move the hot bars, the chains being underneath out of the heat.

The Coal Board are very large users of conveyors, both above and underground; at some collieries the 'Joy' loader is used at the coal face; this is a short movable conveyor. At some collieries I have seen coal descending by spiral chutes. The Gas Board and the Electricity Board are large users of conveyors for coal handling.

Quite a few accidents have occurred through people riding on the belts and in some cases static electricity has been very troublesome; where the belts are run in hot, dry conditions, extensive bonding and earthing has to be carried out. I have experienced this where the belt was driven by line shaft, with no electricity whatever in the building.

Of course there are accidents in erecting large conveyors, caused by slings and chains breaking, and sometimes where the large concrete belt-ways have collapsed, through being insufficiently shored up.

There are two totally different methods of constructing the belt-ways, one being a skeleton framework of steel joists and angles, the whole being protected from the weather by galvanised or asbestos sheeting. The other method is much slower in erection; here the whole structure is cast in concrete, the whole shuttering for which is supported by tubular scaffolding. The sole advantage I have been able to see in the latter method is that once it is erected it will not require painting to preserve the structure. With a steel structure, especially if near the sea, rusting sets in. The steel constructed conveyor can be put into operation before the sheets are put on, but the concrete has to set before anything is done in the concrete belt-way. A steel-framed conveyor can be erected in almost as many days as weeks required for a concrete structure.

Some conveyors are gravity operated, such as the "Zig Zag" used in fruit canning factories to convey the empty tins from stores overhead to where required. These are most ingenious things. The tins fall by their own weight, but not far enough to damage them, and it is quite a novelty to see a dozen tins or so wriggling their way down, as the sides of the conveyor are open; these I imagine would be the work of the works joiner.

The only model conveyors I have seen of late years have been in the museums, whereas in my schooldays (some time ago) there were plenty of small wooden models in the shops, which could elevate sand, or if a

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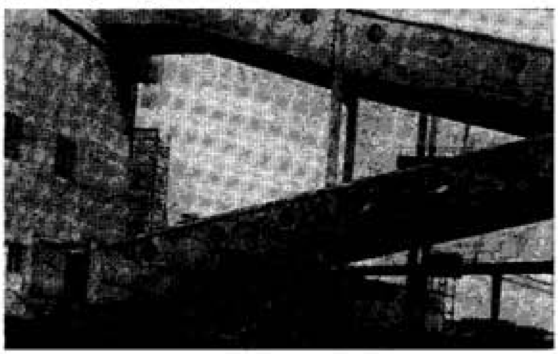
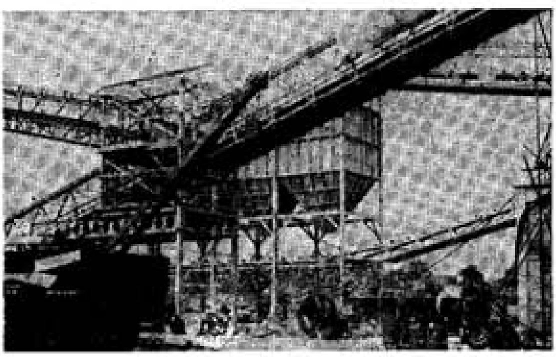
Below: An example of reinforced concrete beltways for heavy duty conveyors.



Below: A steel-framed conveyor of the junction type, with two other conveyors in the background.



AN ALTERNATIVE TO THE LATHE TOP-SLIDE

by F. Butler

THE TOP-SLIDE of a centre lathe has three main applications; it can be used to produce short internal and external tapers; it allows the tool point to be correctly positioned with reference to the workpiece and it can be set over to half the included angle of a screw thread, which can then be cut by successive increments of feed on one flank of the thread.

These desirable features are to some extent offset by loss of overall accuracy, inconvenience of operation, complexity of tool-setting and lack of rigidity on heavy work. The extra sliding surfaces, together with slackness in the feedscrew and nut assembly, affect both accuracy and rigidity. Moreover, the top-slide is liable to foul the chuck, tailstock or workpiece and on small lathes the feedscrew handle or wheel is fiddling to operate. Setting the tool point to centre height calls for the use of assorted packing strips or for special quick-change toolholders which are costly and sometimes flimsy in construction. If American-style toolposts are used, adjustment necessarily alters the rake angle of tool bits and on small lathes the set-up is rather springy.

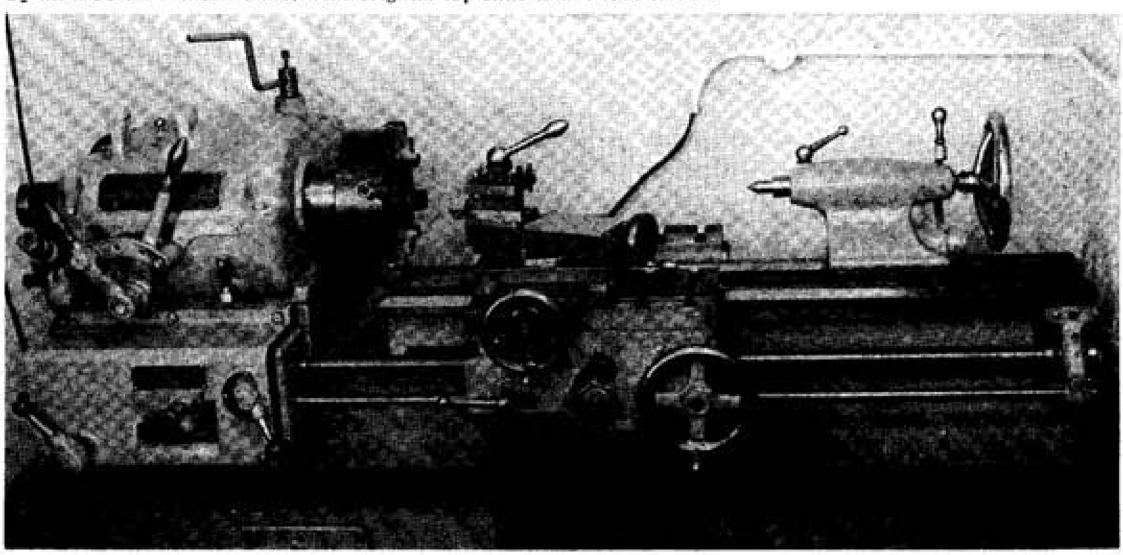
Older readers may remember the 3½ in. Drummond flat-bed lathe in which tool height adjustment was effected in a simple way.

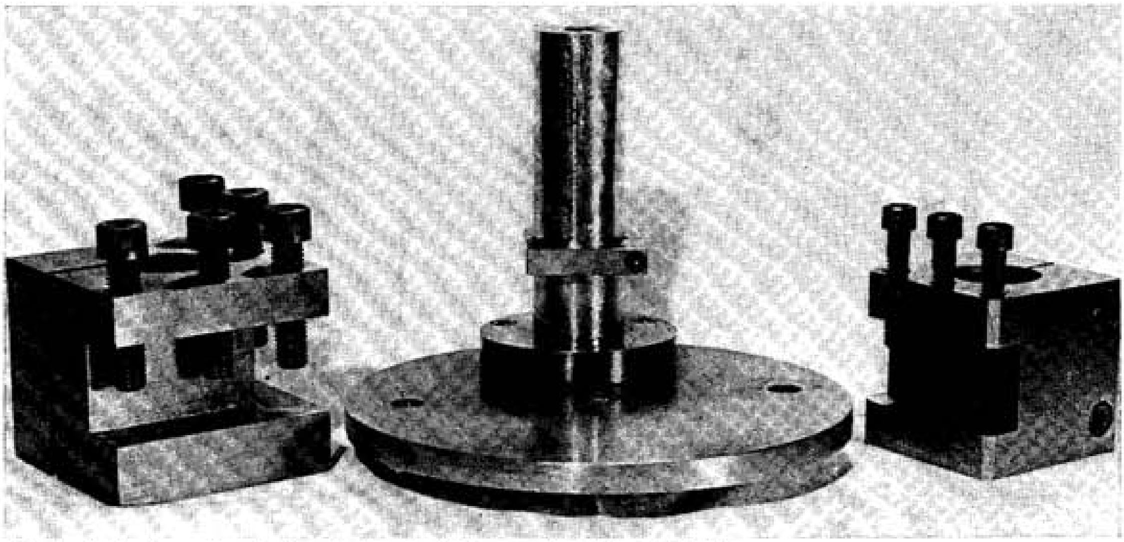
The top-slide carried at one end a short machined cylindrical stub. A steel tool-block was bored out to slide over this and was split down one side and fitted with a clamp-bolt by which it could be locked at any desired height along the stub. A square broached hole at the other end of the block accepted the tool bit which was held in place by two set-screws. The idea never caught on, possibly because of the competition from 4-tool square turrets which were just coming into use.

Thinking along these lines, I was prompted to produce an attachment suitable for my own 6½ in. x 36 in. lathe, shown in the picture. The machine is ideal for hogging cuts on large workpieces. Against this, the saddle is so wide that short pieces are difficult to turn between centres and the rather cumbersome top-slide also gets in the way. This component swivels through a complete rotation over a circular T-slot. Two short bolts clamp it in any desired angular position. The lower surface of the top-slide carries a short plug which fits a ¾ in. hole bored at the centre of the T-slot. These features were exploited in the unit to be described. The main requirements are that the strength and stiffness should more than equal that of the regular top-slide; tool positioning with respect to the workpiece should be possible over a wide range and height adjustment should be accomplished in a matter of seconds, without loose pieces or small parts.

Furthermore, every possible type and size of

6½ in. x 36 in. Willson lathe, with original top-slide and 4-tool turret.





The tool blocks and swivelling toolpost of the new top-slide substitute.

cutter ought to be usable in the tool-block. In the end an extremely simple unit was developed which met these requirements.

The second photograph, which is almost self-explanatory, shows the basic design features. A steel disc is fitted with a centre plug which allows it to be swivelled round on the top surface of the cross-slide table. It is locked in place by two bolts fitted into the circular T-slot normally used by the top-slide. A cylindrical post or column is fixed near the edge of the plate so that the unit resembles a disc crank. A rectangular tool-block is bored out to a close sliding fit on the tool post, sawn down one side and fitted with two socket clamp screws by which the block can be set at any required height on the post and then firmly locked in place. Wide milled slots or channels accept tools of almost any reasonable shape or size. These are clamped in place by the usual array of hardened socket screws. By suitable rotation of base plate and tool post, cutters can be presented to almost any work-piece for regular turning, boring and facing operations. Adjustments are quickly made by the use of one ring spanner and one hexagonal key wrench.

Interchangeable tool-blocks can easily be made to meet special requirements or can be tooled up for a sequence of operations. Two typical blocks are shown in the photograph. One of them has two tool slots and is of extra heavy duty construction. The other, with a single slot, is smaller in size and is used when it is difficult to bring the larger block close to the work.

Another useful addition is a thin bored collar, split and provided with its own clamping screw. This is slipped over the tool post and underneath the tool-block and is then locked in position with the cutter exactly at centre height. Subsequently, the tool-block or base plate may be swivelled about as required without losing the height setting. It is also worth making a simple centre-height gauge to simplify tool setting.

Details of Construction

In what follows, the quoted sizes refer to the unit fitted to my own lathe. They can be varied to suit other machines. A start can be made on the circular base. This is roughed out from steel plate, gripped in a 4-jaw chuck and machined all over to a finished size 8 in. dia. by ½ in. thick. A ⅝ in. hole is bored in the centre to take a short centring plug.

The tool post is a 6 in. length of 1¼ in. round bar. Mine was parted off from a scrap length of hydraulic ram which was hard chromium plated and accurately ground. It is shrink-fitted into an undersized hole in the base-plate at 2½ in. off centre. The plate thickness (½ in.) is too small to give a firm grip. To improve this, a 3 in. by ⅝ in. disc was prepared, faced on both sides and bored out well under 1¼ in. dia. It was then firmly fixed to the circular base by three socket screws fitted into counterbored holes in the 3 in. disc. The tapped holes in the base were made a very tight fit for the screws by using only a taper tap, taken nearly, but not quite, through the base. The plate and ring assembly was then set up on a large face-plate, the hole roughly centred and opened out to 1¼ in. minus 0.0015 in. to allow for shrink fitting. Heating the plate over a gas ring allowed the tool post to be dropped into position and held rigidly in place on cooling down.

Making the tool-blocks involved only the simplest turning, boring, milling, drilling and tapping operations, except that the central hole was lapped to an accurate sliding fit on the tool post. In the smaller block, all screws are ⅜ in. Whit. In the other, the turret screws are ½ in. UNC. The overall sizes of the blocks, dictated by available steel off-cuts, are respectively 3¼ x 3½ x 3⅝ in. and a 3 in. cube. The tool slots are 1⅝ x ¾ in. and 1⅛ in. x ⅝ in. To save wear and tear on milling cutters, surplus metal was drilled away before milling.

Performance

When using this accessory, the heaviest turning, boring, facing and parting-off operations can be carried out with confidence. Tool overhang is minimised and short-tapers or chamfers can be made by plunge cuts using wide tools.

The lack of vibration means that carbide tools can be used at high speeds without risk of tip chipping or fracture.

The left-to-right and front-to-back tool movements are equal to or larger than those made possible by the normal top-slide. The change-over from one system to the other can be made in a matter of moments. My impression is that the surface finish obtained with the new unit is superior to that when the top-slide is in use. This is certainly the case when screwcutting square threads. Backlash in the feedscrew and nut may account for this, unless the top-slide gib strip is locked up tightly, when of course, backlash is of no account.

Modified Cross-slide Feedscrew

As so often happens when a machine is improved in one respect, unsuspected weaknesses show up in other areas. In this case, following common practice, the cross-slide feedscrew is located at the front end only, so that, against the reaction of a heavy cut, the screw behaves as an end-loaded column under strong compression. This is a bad arrangement and a check on various high-grade lathes reveals that the screw is carried right through the saddle and lock-nutted at the far end. This is a better scheme and so it was decided to replace the existing screw.

A high tensile steel bar 22 in. x 1⅛ in. was centred, roughed out and screwcut 5 t.p.i. ¾ in. dia. left-hand square thread. The integral surfacing feed pinion (13-T, 14 D.P.) was next milled to size. To fix the handwheel the front end of the shaft was reduced to 0.656 in. dia. and screwcut ⅜ in. B.S.P. (28 t.p.i.). The handwheel bore was screwcut to match and finished with a suitable tap. A locknut and spring washer held it in place while allowing easy adjustment for wear. I have used this method several times and prefer it to the more usual Woodruffe key, which calls for rather accurate fitting. The remote end of the shaft was finished to ⅜ in. dia. and partly screwcut ⅜ in. BSF and fitted with locknuts.

The biggest problem was to drill the far end of the saddle to accept the new shaft. Dismantling would have been a major operation and the back was inaccessible because the machine was too close to the wall and far too heavy to move. In the end a steel bush, centrally drilled ¼ in. dia., was press fitted into the bore of the feed nut. The cross-slide table was then pushed right back until the feed nut touched the end wall of the saddle. A ¼ in. drill was then fitted to the end of a long rod which was pushed through as if it were the feed screw. The free end of the rod was chucked in an electric drill and a pilot hole made through the casting. To open up the hole to ⅜ in. another long rod was prepared. One end was bored out No. 1 Morse to take a taper shank ⅜ in. drill. An external taper was machined on the other end to fit the spindle of a large, low-geared breast drill.

The first ¼ in. bush was replaced by a much longer one (⅜ in. bore) to give better guidance to the drill. Finally, the hole was reamed out to a good finish. The whole operation was completed in a small fraction of the time required for dismantling and re-erecting the saddle. The extension drill rods have proved useful for other work.

Checks with a dial indicator clamped to the saddle with the plunger in contact with the cross-slide table show that with heavy roughing cuts there is still a detectable movement though much less than with the single-ended mounting of the screw. Finishing cuts show no significant or consistent movement and the modification is considered to have been well worthwhile.

Soon after this accessory was finished, a useful test piece turned up in the shape of a cast iron pipe 3 in. O.D. by 8 in. long, cored out 2 in. bore and with a 6 in. circular flange at one end. It was gripped by this flange in a 4-jaw chuck and machined overall at one setting except for the outer face of the flange. The free end of the 3 in. section was found to be +0.0015 in. up in size on the end near the chuck. The bore showed twice this error which is not surprising considering that the maximum overhang of work and boring tool from the front bearing was more than 23 in.

It is interesting to note that a lathe with simple split parallel bearings cannot possibly produce a truly parallel bored hole if it has been adjusted to turn a parallel shaft held in a chuck. This is because of the necessary bearing clearance. With cone or taper roller bearings the situation is a good deal better, but the cumulative compliance of the machine frame, the spindle and the workpiece must necessarily lead to *some* error because of the reversal of cutting forces and deflections as between boring and turning. In practice the error may be negligible and in any case it can be minimised by taking light finishing cuts with sharp tools.

READERS' QUERIES

★ Queries must be within the scope of this journal and only one subject should be included in each letter.
★ Valuation of models cannot be undertaken.
★ Readers must send a stamped addressed envelope and a current query coupon with each letter.
★ Replies published are extracts from fuller answers sent through the post.
★ Please keep queries separate from orders.

Corliss Engine
I would like to build a model of a Corliss engine, and would be glad to have your advice on the layout of the cylinder ports and passages, eccentric and wrist plate settings etc.—G.M.B.

Δ *The best source, as far as we know, for information on the Corliss engine is D. K. Clark's "The Steam Engine", Vol. IV, Chapter XXIV. His plates give longitudinal elevation and plan of the frame and governor of a Hick, Hargreaves engine with single cylinder 40 in. x 10 ft. with 30 ft. flywheel, and there are 30 pages of information including about 30 engravings of details from cylinder sections, valves, dashpots, crossheads, crankshaft, flywheel, conn. rod, air pump, feed pump, governor, etc. Also Clark's Chapter XXV and plate VII gives arrangement and some details of a cross-compound by Musgrave.*

Sentinel Steam Lorry
I wish to build a model of a steam lorry, such as a Sentinel, to 1½ in. scale, using a vertical boiler and a Stuart engine. Can you please give any information on the size and type of boiler, coal or oil fired, and suitable size of engine, the model to be capable of hauling one person.—W.T.H.

Δ *The standard Sentinel boiler was 2 ft. 8½ in. dia., and 3 ft. 10¾ in. long, so your model boiler might be 4 in. dia. x 6 in. long. A suitable engine would be the Stuart Turner "Double-ten". There are many dimensions of such a wagon in the book "The Sentinel", Vol. I, by W. J. Hughes, which should help you.*

Brazing Equipment
I intend building a 3½ in. gauge "Tich" locomotive and a 1 in. scale "Minnie" traction engine in the near future, and would be glad to have your advice on suitable brazing equipment for dealing with the boilers.—L.T.

Δ *We can recommend the Sievert propane heating equipment for the brazing or silver-soldering of your boilers. The ideal burner would be Sievert No. 2943—that is the second largest in the range—with burner support No. 3028. Such a burner will deal very easily with the size of boilers you have in mind. You will also need a cylinder of propane, which you can obtain from your nearest stockist of "Calor Gas", but make sure that you are supplied with propane, and not butane, as the two are easily confused. You will need a regulator, suitable hose and a hose failure valve.*

For silver solders, we can recommend the Johnson Matthey products, Argoflo, Easyflo No. 2, and Easyflo, together with Easyflo flux.

Locomotive "Metro"
I am building your 5 in. gauge locomotive "Metro". I spoilt my gunmetal steam chest casting and made up another from cast iron. I have fitted bosses to this made from gunmetal but am wondering if these can safely be press-fitted in view of the different expansion ratios of the two metals, and in view of the high working pressure and temperature involved. Do you think that Loctite would be sufficient to hold the bosses rather than press fits?—I.W.

Δ *We do not think that there is any danger in using gunmetal bosses in a cast iron steam chest, but we would prefer a press fit in this case rather than Loctite in view of the possible high temperature of the steam. The areas of the bosses actually exposed to the pressure of the steam is actually quite small, so we do not think there is any danger of their being forced out. However if you feel any doubt about this, you could fit a small round pin of gunmetal, about ⅛ in. dia., through the side of the steam chest and into the boss, clear of the valve spindle.*

Horizontal Multi-tubular Boiler
I have built a horizontal multi-tubular boiler to K. N. Harris's design (design No. 2 on page 151 of his book) and am having trouble with the burner. I have tried propane and butane but find that it is impossible to keep the flame alight when the burner is inserted well into the flue, and the flames do not seem to be drawn through the tubes at all.—W.H.

Δ *We think that in this design of boiler it is essential to provide a little induced draught, as in locomotive boilers, and in the absence of any exhaust steam from your engine, we would suggest that you make up a blower, having a single jet drilled about No. 60, this to be inserted in the middle of the upright part of the funnel.*

The blower may need to be left slightly open the whole time the burner is working. In any case, it is not usual for the burner to be inserted very far into the flue, as this would put the mouth of the burner very close to the tubeplate, and this would almost certainly put it out.

Locomotive "Doris"
I am building your 3½ in. gauge locomotive "Doris", and would like to know if it is safe to use 14 s.w.g. copper sheet for the inner and outer wrappers of the firebox and the firebox tubeplate and backplate.

I have made the brake gear for this engine and find that the brake pull rods foul the main axlebox springs. There appears to be enough room between the springs and the ashpan for these rods.

Can you say whether there are any other snags to look out for in this design?—P.J.

Δ *14 s.w.g. copper sheet would be quite safe for the firebox wrapper and firebox tubeplate and backplate provided that the staying is adequate and all joints properly silver soldered. You could use the 14 s.w.g. for the inner firebox wrapper, or even 16 s.w.g. (1/16 in.) if staying is adequate.*

It should be possible to get the brake pull rods to run in between the backs of the driving wheels and the axlebox springs. If they are placed closer to the inside, they may prevent the ashpan and grate being removed.

In reply to your last query, some builders have reported that the bottom row of tubes in the boiler of

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