advantage of a favour. So cleaning down the lathe, I slipped off the belt, locked up the workshop and walked home, feeling 10 ft tall.

Drilling the stud holes

In the workshop my brothers were setting out the guide bars. They examined the register just to make sure there was no fluke about it, before it was passed as worthy of using.

That evening we drilled the stud holes with a small breast drill, starting with a small one, then opening them up by slow stages. A second pair of eyes were necessary in order to keep the drill straight, and I thought how easy this would have been on Mr. Waller's bench drill.

Transferring the holes to the cylinder was done in exactly the same way. Great care was exercised in order not to break into the steam jacket. But our efforts to make studs were not so good. Stuart Turner's studs were things of beauty in my eyes, but despite the fact that we had sunk hard cash in a new die, somehow our endeavours never came anywhere near those which came to us from Henley-on-Thames in a white linen bag. In the end, I oiled up the die and the mild steel rod.

Suddenly we seemed to be working hard. Making up guide bars, and the bracket which is part and parcel of it, carrying valve spindle guide, and the link lifting shaft, called aloud for a blue-print. In its absence, the eye came into it. We hacked out things from steel plate ranging from 1/8 in. to 3/8 in. The wastage in the hacksaw department was best forgotten, and the sound of the file prevailed.

More patternmaking

Where I worked, a fitter was judged on his ability to file flat. In turn, I struggled in their wake, and on one engine I had extra practice. I often heard it said that by the time a man was treading on his beard, he could justly claim to be master of the art. I still think there's a lot of truth in it. I was rather glad when the need for casting arose so that I could leave the metal fabrication of the bracket to those with more power than I in their elbows. Patternmaking is fascinating work, and so for that matter is foundry work, particularly when it's for yourself.

I made the wood shavings fly making patterns, and moulding them ready for the Sunday morning's cast (we always did our foundry work on the Sabbath) and the following Saturday afternoon found me making the brass fly in our friend's lathe. I remember arriving there on one occasion, to find a perfect replica of an Aveling and Porter compound traction standing on the bench, so small that it would have sat in the hand of a man. Another time there was the loveliest of table engines, all graceful pillars, shafts, discs and columns, that only an artist could have fashioned.

Yes, there was always much to see at Mr Waller's, which prompted me to keep up my standard of turnery to the shining examples that looked over my shoulders from both shelf and bench. In these surroundings the piston rod, piston, steam chest covers, glands, slide valve assembly, safety valve, and steam flanges were made. Meanwhile my brothers had brazed up the motion bracket, crosshead, and lifting links.

Our greatest asset at this point was the presence of that cylinder. It was as a foundation is to a house. Without it, I don't think that traction would ever have been, completed.

Parts relating to the motion were made to it for size, length and breadth, and the non-existent drawings were forgotten. We had to build a strong bench on which to set up the boiler with chocks under its barrel and hornplates. It could then be viewed at a distance.●

June 18 1959

GEORGE W. EVES recalls the Blacksmith's shop and the skilled man at the anvil.

We decided that things would have to be different if our traction was ever to be finished. We could not possibly stop kindly callers who came uninvited at all hours, but it meant a cessation of all work. We decided to continue working whoever arrived. But that was easier said than done. We welcomed rainy nights when nobody stirred abroad. It was then that the sounds of filing were loudest. The cylinder was machined and assembled. It looked remarkable to our eyes.

The fact that the hornplates were already slotted for the main bearings was a great help in getting the cylinder mounted correctly. But the line up of levels, plumb lines and squares to get the whole thing on the crown of the boiler was a very long job, and the task of drilling the boiler for the holding down studs even longer. So whilst my elders shut one eye and then the other, I turned to patternmaking. Main bearings, big-end bearings, eccentric sheaves and straps were quite straightforward, but the chimney top, which should have been easy, became a problem.

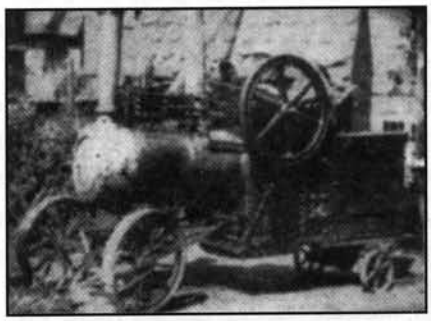
Foundry work appealed to me no end. Outside in the lean-to, I had accumulated all the clutter of that ancient craft. On Sunday mornings there would be at least half-a-dozen moulds ready and waiting, and not all of them for the engine either, for china ornaments can become things of rare beauty in burnished gunmetal. These " foreigners" were viewed with disfavour by my brothers, but Mum thought me no end of a clever boy.

I never lost the magic of the great moment when, after the sweat, grime and dust of casting, I was able to hold in the tongs, a gleaming casting that would be one more step in getting John, as we called our model, towards completion. Such was the standard of my teaching, that I never once had a bad or even indifferent casting. Good work, good castings was always the rule.

In my role of pattern maker, foundryman, turner, I was always well ahead of the fitters, and thus took care of the inquiries and small orders that flowed between us and, the suppliers afar off. My efforts at making hexagon nuts were about on par with my endeavours in the stud world, so that Saturday afternoon found me sending hard won pocket money through the Post Office. Behind the heavy brass grille, a village lass of whom Tennyson would have written a sonnet on the spot, would beam on me as she handed out the postal order: "Stuart Turner's again ?" Thus, whatever the engine's requirements, it would be passed to me.

One winter's night, when the fire glowed bright in the workshop stove, there was borne on the still air, the crackling exhaust of an approaching motor-bike. There was no mistaking Ernie. His joy in life was to buy up the most disreputable looking motor-bike, and strip it down to the last nut, bolt and washer. In his father's workshop, the cylinder would be rebored, an oversize piston fitted, and everything else which was worn would be replaced with home-spun replacements to be followed by re-building.

Comfort and appearances were things which never bothered Ernie. Performance was the thing, and as soon as the machine was ridable, over to our place he would thunder. That was about the word. Straight exhaust, no silencer, mudguards, or anything unnecessary unless it was the black bulbed horn, required by law. We grew to know his approach, and tonight his coming was heralded from afar.



" The square nuts make me shudder" comments George Eves about this picture of the unfinished traction engine.

The door opened and he staggered in with a heavy looking load on his back. Gingerly he lowered it on to one of the wine casks.

" There's a drilling machine for you. The old man picked it up with some scrap he bought today."

It was typical of him. From its many coverings, we brought to light a small drilling machine. It was in a shocking state, but pioneers are prone to see things in a rosy light. It was gear driven, had a handle on the side, and a heavy wheel on top of the spindle. No chuck as we know it today, but a tapered square recess. From then on all the drills in our establishment were ground to fit it—another job for me in stolen minutes at work, where the emery-wheel was handsomely driven by a 2 in. leather belt. Bolted to our bench, the drill made us look a bit above the normal workshops in the village, even although we had to turn it by hand.

The valve gear

What a blessing it was after the breast drill! It was on this machine that Arthur drilled out the Stephenson link from plate. Today it still produces even exhaust beats which cause onlookers to slightly incline their heads to lend an appreciative ear. A tremendous amount of work went into that valve gear, which was hacked out of plate ¼ in. thick.

In my year in the blacksmith's shop, where all the bits and pieces appertaining to agricultural engines and machinery were fashioned from plate and bar, the sound of the ringing anvil predominated. Mighty men were the blacksmiths, grimy sweating giants with arms and hands almost as tough as the metal they worked. Their stout leathern aprons were buckled on with brass clips and they chewed incessantly—but it was not gum. In this place, giant machines sheared up steel plate with a great grinding of gears, but the doyen of them all was the steam hammer whose blows could be light as a feather fall or, when necessary, make the dim interior shudder with their thunderous poundings.

Delicate control

Indeed, it was a very wide-eyed boy who one day saw the hammer man put his watch on the anvil, glass upwards, and then bring down the hammer so delicately that the watch was pinned down and still the glass remained whole. This was a favourite way to impress visitors, as I found out later. The boss always steered his callers towards the smithy, and gallons of beer were the outcome of such a feat.

In spite of all our planning and scheming, we could not make faster progress. We were the village handymen. Arriving home some night, we would discover that Mrs. Smith had left her ancient sewing machine for Arthur to look at, which usually meant a major repair job. There was always a strange clock of one sort or other ticking away on the mantelpiece.

In spite of the distractions and unwanted callers our engine continued to take shape. I will not set down all the work entailed in getting the motion work made, let alone fitting it. It was a hard grind where a whole evening's work could pass unnoticed. Like the starting handle. First it was turned, then the shaft flattened, filed, drilled and polished. Such a part took care of a whole week. Come spring and we had the whole of the motion work finished, and what was more important, it could be turned round. By temporarily stopping up the holes in the boiler intended for gauge glasses, petcocks, blow-down plugs and such like, we could turn the engine backwards for half a minute. The slightest pressure pumped into the boiler was sufficient to produce two or three faint chuffs from the exhaust pipe and cause the crank to turn a rev and a half. We found this very pleasant to behold.

Wednesday, when the Exhibition opened. soon came. We three reached Victoria and floundered about in the maze of streets in our efforts to locate the Horticultural Hall. When we eventually found it, there were long queues waiting for admission. We marched boldly past them, flourished our passes and swept inside.

What a transformation ! Gone was the chaos of the day before. Everything was spick, span, clean, and neat. The aisles were filled with a multitude of visitors. It was all very well-mannered and orderly. Apart from a discreet whistle or a lifting safety valve from the direction of the locomotive tracks, the only sounds came from a gallery high above the entrance doors, where at intervals, a stringed orchestra played.

We first made our way to where our engine stood. It was exactly as we had left it despite our fears. Many visitors looked at it apparently in profound thought. I could read it in their faces: "This is the engine we saw in the papers." "Built with almost no tools." "Farm labourers." "Came all the way under its own steam." "No lathe," and so on.

All the angles the newspapers had conjured up were in the faces round the engine.

Did you really make it ?

No sooner had we spoken to the commissionaire who watched over our model than a man touched me on the arm.

"Excuse me", he said, "but did you really make that two-speed wheel from a casting?"

Instantly I detected disbelief. When I answered, "Yes," he replied: " You'll have a hard job to convince people of that."

That attitude was general. Almost everybody accepted the newspaper story that we drove the engine to London, which we did not—yet the truth about the cast two-speed wheel, the road wheels and much else, was treated with reserve.

I realised there was more to this hobby than actually building models. But there was not time for mooning about. Everybody from the organisers downward wanted to see our model in steam.

With that thought uppermost, things began to move. While Fred and I descended into the basement in search of wood and coal, the side doors were opened and willing hands made light work of the five hundredweight the engine weighed. In a small area off the pavement and—thank heavens—separated from the crowd by a stout set of railings, I got the small steam raising plant going, despite a blustering wind.

Meanwhile Arthur had lit the fire and, aided by the auxiliary blower, things began to hum. We were asked enough questions to keep the three of us completely occupied. In exactly 18 minutes, the hand on the steam gauge moved off the pin, which enabled us to use our own blower and dispense with the auxiliary. This was immediately carried away by someone from the locomotive track section.

By now the pavement was entirely blocked. Faces looked over the railings and through them. It was then that a kindly policeman appeared. At his suggestion Arthur put John Fowler minimus into bottom gear, pulled the reversing lever hard back, and cracked the throttle. The response was instant movement, and some smart work on the steering wheel saw our model on the road complete with licence and those ridiculous, oversize, yet standard number plates.

A dozen or more press photographers appeared from nowhere. The problem of keeping the onlookers back so that the engine could be photographed was bringing an obvious edge into the policeman's voice. Everything was neatly solved when a small van, with the words PATHE PICTORIAL, arrived on the scene.

"The film people are here," someone whispered and on all sides, as if by magic, the crowd fell back. Evidently the film people required room. The film camera was assembled on its tripod, and Arthur was soon surrounded by important people. There was so much to talk about that the firing was forgotten.

Why not haul a load ?

In due course, the still cameraman having photographed the engine and us from almost every angle, the film people moved in. The engine, Arthur stoking up, the motion work ticking over—all were given generous footage. But they wanted more. What about showing it in operation? This was easy, but they wanted it pulling a truck or trailer—which was just what we had not got.

I knew not the film people. In less than five minutes, a light fruiterer's van appeared minus its shafts. To its front carriage a wire drawbar was fashioned, and we were invited to couple up. Arthur drove the engine to the other side of the road and backed up to the cart. I observed all this with not a little trepidation, for the engine had never pulled a load before.

Arthur said to me: "Now then, you can drive it round the square." As I made sure the wire was well secured to the drawbar, I looked up at the cart. It was crammed with kids! My heart dropped. The engine would never pull that lot. I looked again at the water column, noted the needle on the steam gauge tight on the 60 mark, and with great optimism gave John Fowler half throttle.

The load behind might well never have been there, such was the engine's getaway. Fred and Arthur sprang to the opposite sides of the cart and watched the steering of the make-shift trailer. But they need never have bothered for the wire was perfectly tethered. We rounded the first corner of the square without a hitch, followed by a crowd of curious onlookers. The film men took us approaching, then picked up their gear and dashed madly a hundred yards to repeat the performance.

At one point a Sentinel steam wagon slowly caught up with us, then slackened down while the astonished crew grinned down upon me, a study in sizes which the film men jumped on with glee. A hasty glance rearwards, revealed my brothers wearing smiles a mile wide. Meanwhile I noticed that there were men in the cart. That mattered not a jot now-indeed I would have welcomed an additional trailer.

Our progress round the square became a procession. The crowd, hitherto content to tramp along each side of the cart, now infiltrated forward as well, until John and I were in the centre of a large human horseshoe. There was a white plume from the safety valve, and I remember dropping the ashpan damper a couple of notches. Otherwise I concentrated solely on the steering. No longer did I think of inferior finish. Our engine could pull a load like the original engine. I steered well, it steamed well, it did not slip.

We were travelling down the home side of the square again long before I realised it. I stopped before the main entrance to the Horticultural Hall and hopped off the tender with the realisation that tender-riding without a cushion is hard going. The film men quickly whisked the van away.

Three coals left!

I put the engine in neutral and suddenly remembered I had not given a thought to the fire since starting. When I opened the door there were only about three glowing coals left. The gauge glasses showed the water level exactly where it was when I started, and once again underlined the wisdom of a continuous working pump with a bypass set to suit.

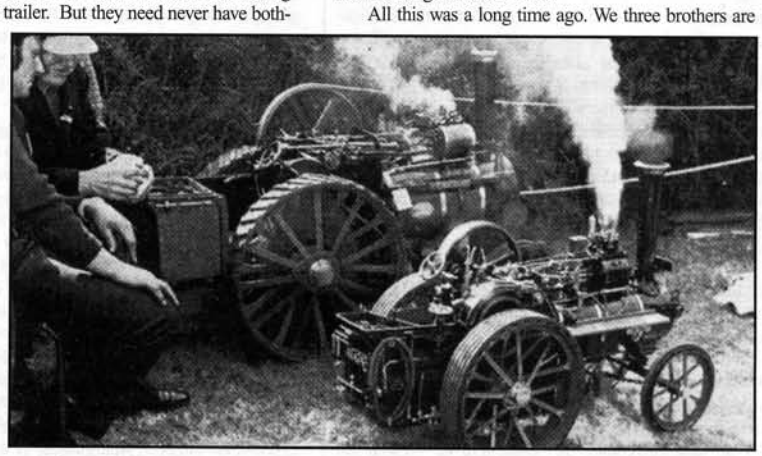
The crowd, with the exception of a few small boys, melted away. We dropped the fire so that the engine could cool down and be taken back into the Exhibition. In the small confines behind the fence, we raked out every vestige of ash and cinders and on the engine itself not a spot of oil or grease remained. Some two hours later we rolled John Fowler back into the annexe. Then, well content, we really toured the Exhibition. My eyes opened in wonderment at the vast array of tools on the trade stands.

The models were things of pure delight. We had never seen such a varied array or even imagined that so many existed. For hours we lived in happy exploration.

The fruits of that Exhibition were sweet—a medal, a diploma, and in addition, an award of five pounds, which was wealth indeed. The medal joined the very select group of bric-a-brac under the glass dome which protected a bust of General Buller from such dust as was permitted to settle briefly in our Sunday parlour. The diploma was carefully framed and given a place of honour in the same room, beside the picture, of stern-faced grandfather Eves

All this was a long time ago. We three brothers are

STEAM IN HIS VEINS



3 in scale Burrell and a 3 in, scale Fowler with Thresher restored by George Eves.

married now, and we live a hundred miles from each other, thus making combined efforts out of the question. But how I miss the old workshop, ill-equipped as it was, and the story-tellers that were part and parcel of the place.

My old works are now a shambles, and the threshing machine follows in the wake of a tractor. Only the traction engine rally remains to hold the tattered remnants of the great era of steam. But thanks to MODEL ENGINEER this vanishing era is being retained in model form.

Amid all these changes, our traction engine still survives in the village where it was built. Arthur, now retired, bestows on it all the care in the world. Naturally there have been many improvements. It now has steel cut gears, rebored cylinder, piston slide valve and link block, and a mechanical lubricator. It also has a new boiler. Not that the old one failed. No, this was brought about one dark night back in 1941, when an enemy bomber droning over my village toward London, suddenly found he had one of our fighters on his tail, and promptly jettisoned his cargo.

They still talk about that night down there, when four big high explosives, ten oil bombs, and two canisters of incendiaries, each containing 300 fire raisers apiece, turned night into day. Mercifully there were no casualties. Every devilish device fell in the open fields, orchards, cricket pitch, lanes, churchyard, even in the rooks' nest atop of the high elms. All except one oil bomb and one incendiary. Need I say where they fell?

Immediate leave

I was in the London Fire Brigade during the war, and on that particular morning after a hectic night in Stepney, my arrival back at the fire station coincided with an urgent message from Arthur asking me to return home. A postscript informed me that there were no casualties and thanks to a kindly station officer, I was immediately given leave of absence and transport. An hour later, considerably cleaned up, I was on my way.

The train was specially halted for me at "Paraffin Junction." From there to my destination was a mile and a half, and it rained steadily the whole way. What a scene of desolation greeted me! The house was little more than a blackened shell. The ground floor was totally shattered, and firemen lashed tarpaulins over gaping holes in the roof. Civil Defence personnel toiled to salvage bits and pieces from soot and water. The sickening stench of burnt oil hung heavily in the air.

I noted that the wide open cellar where at the outbreak of hostilities I had hastily stored all my precious possessions was now full of oily water. Hurrying to the back of the house, two things caught my eyes. First, the badly blasted workshop and then, to my infinite joy, the traction engine standing in the middle of a patch of blackened Brussels-sprouts, with a scrap of lino thrown loosely over it.

The joy was quickly tempered, for on closer inspection I saw a hole as big as a hand on the firebox wrapper where magnesium thrown off by an incendiary, had done seemingly irretrievable damage.

Today, there's little evidence to show the ordeal the house went through, so well has it been rebuilt. The drunken workshop Arthur restored to something of its former shape in a matter of weeks. The new boiler took a little longer. For 13 years, the engine was little more than a greased up cocoon, awaiting the day when circumstances would permit a fresh start.

A day did come when a faithful replica of John's original boiler was delivered to our old workshop. To Arthur's eternal credit, he single-handed rebuilt the engine on to the new boiler. It was a fine achievement, one which I would never have attempted. To him must go all the credit for the fine state of preservation the engine is in today.

Last autumn I travelled especially down to the village, where a Handicraft Show Day was being held in the village hall. In the brick forecourt there was a special attraction. It was nothing less than our engine, gleaming in the sunshine as it was driven round in sedate circles. On the far side Arthur leant on the fence watching intently. I soon joined him and together, the pair of us watched John Fowler minimus come to life again. It was a great moment. ●

May 30 1946

I find it hard to envisage any commentary from Model Engineer without mention of the writings of LBSC. 'Curly', his other favourite name, was certainly a locomotive man. Apart from his write up of running repairs to a friend's ancient portable called 'Old Broccoli' there is very little mention of road steam. However his very first model, while no doubt it is open to interpretation, is a traction engine. After all it had overhead motion, a flywheel, and ran without rails straight on the floor!

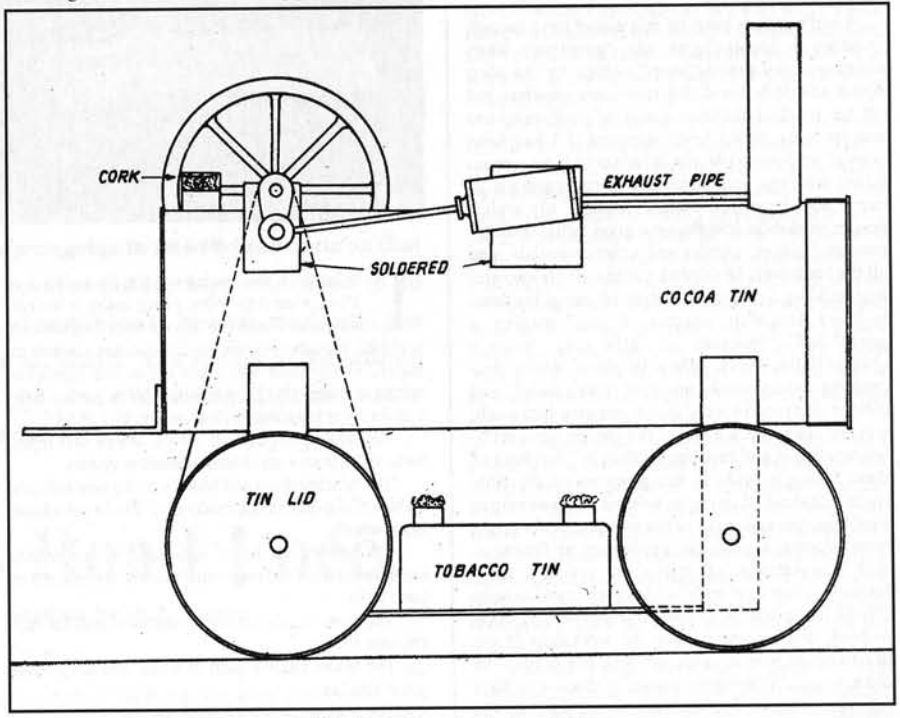
RANDOM REMINISCENCES By "L.B.S.C."

The drawings of the motion-plate, guide-yokes and valve-gear for the "Lassie," are taking longer than anticipated; in fact, I haven't yet finished tinkering about with my bits of tin, cardboard and pins, by which means I get the lengths of the various components, and make certain they work all right. This week, therefore; we will give the "galloping sausage" a rest; and instead of dishing out the usual instructions, have a sort of general chinwag with the good folk who look to these notes for sugar as well as pills.

Early efforts

Readers who ask for more Curly tales and childhood reminiscences, frequently want to know what sort of locomotives I was able to build on the kitchen table, or an equivalent, with the simplest of hand tools. They can hardly realise that it was possible to put something on the track (or the kitchen linoleum) that would turn its own wheels under steam, without using a lathe or proper tools of any sort. Well, as I said before, it is a bit of a job to take a look backwards along Memory Lane and still see the other end of it over fifty years away; but recollections of some of the antics I got up to still stand out, faint but perceptible. I learned how to use a soldering bit by watching a tinker at work mending pots and kettles and other domestic articles; nobody ever accused young Curly of not keeping his eyes open. Much I found by experience, such as the fact that copper and brass needed to be very clean for a good soldered joint, and required more heat than tin. My first attempt at riveting, was when the rivets in the front end of the frame of my tin "Ajax" came out. To replace them, I got two copper flat-head rivets and two washers; with the heads inside and the washers outside, I managed to flatten the stems on to the washers, which held the tin frame together, and did not look unsightly. When one day I saw the tinker whose shop was an open-sided shed between two houses in a side street rivet a handle on a pail, I learned how to "head" a rivet. As already, mentioned in earlier notes, I put my acquired knowledge to use by doing a travelling tinker out of his job as far as the Crescent was concerned, and took care that the housewives never had any cause for complaint, which was more than could be said for the tinker !

My locomotive building compared pretty well with the history of full-size locomotives. Everybody familiar with locomotive history knows about Dick Trevithick's engine with a single cylinder, big flywheel, and drive through gearwheels. Mine had a



The first attempt, a la Trevithick

single cylinder, flywheel, and drive by a cotton belt. My tools consisted of a soldering bit, carpenter's rule and square, and a couple of worn files (relics of a"prenatal" grandfather), an old pair of scissors, and an Archimedean drill from a child's fretwork set. I also had an old carpenter's chisel, with neither handle nor tang. With these, and empty cocoa-tins for material, I built a locomotive that"went." One tin made the boiler, with the lid soldered on, and the other end and seam soldered over to make it tight. Four pieces of tin were soldered to the sides, forming bearings for the wire axles. The wheels were four lids; to find the centre, for attaching to the axle, I measured the diameter, and then scribed a circle same size on a piece of paper with my school compasses. This was cut out and put inside the lid; the drill was applied at the point where the compasses had made a hole in the paper, and a mark made on the tin. After marking all four (I had no centre-punch) the holes were drilled with my one and only drill, and reamed out with the point of the scissors until the lids were a tight fit on the axles, to which they were soldered. As the lids had a slight bead, they looked something like flanged wheels with wide treads.

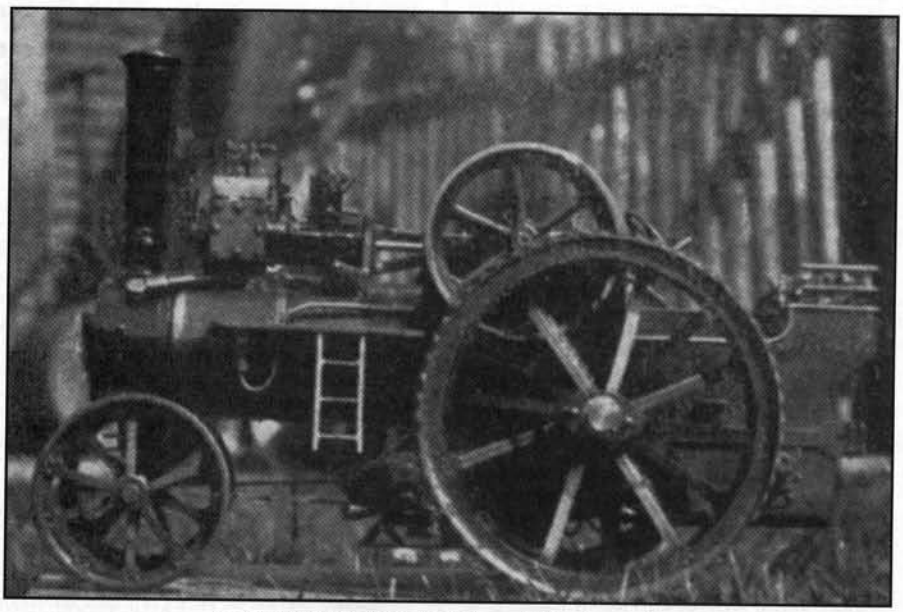
The cylinder and flywheel came off a discarded toy stationary engine; I forget now where I got them. They were mounted on top of the boiler, and the exhaust pipe went into a dummy tin chimney. At the back end of the boiler I made a hole with the scissors, soldered a tin ferrule into it for filling purposes, and plugged it with a cork, as I had no screw fitting, or any means of making any. The grey matter under the golden curls figured that the boiler could not explode as the cork would blow out first; as a matter of fact it did, more than once! The two-wick spirit lamp was made from a small flat tobacco tin, carried on a bracket between the two axles. The flywheel, like Trevithick's, was well to the rear, so that the cotton belt which ran from the small pulley beside it, to the ex-lid-wheel just below, was well clear of the lamp. This crude contraption worked first time, and to such good purpose that its first run ended in disaster— not to the engine, but to the mat at the street door; for it sprinted away, and before I could catch it, it climbed the mat, overturned in the process, and decanted blazing methylated spirits all over the said mat, which didn't improve its appearance. Poor mother was dismayed, but I made it up to her.

I had not then been on this planet long enough to attain a double-figure age. Sometimes when working in my present"shop" (which by the good rights, should be the dining room, but somehow got off the road!) I fall into a sort of daydream, and wonder what would have happened if I had been born of well-to-do parents, who would have sympathised with my ambitions, and encouraged me in every way. I can just picture young Curly with a proper workshop containing a good lathe, drilling-machine, planer, grinder and other essentials, and all the hand tools he needed, putting all his energies into building a real small edition of one of his dearly-loved Brighton engines. I can imagine a genial"dad" breezing in after tea with a cheery"Hallo, Dolly, how's Brighton Works progressing—can you take me on as fitter's mate?" and mother chipping in with"Don't you give him a job; why, he can't knock a nail in the garden fence without bending it and bashing his thumb!" and both of them taking a pride in the progress of the little engine. Instead of going to work in the locomotive sheds for one-and-eight pence per day, Curly might have become a premium apprentice at Brighton, with the chance of rising to succeed Billy Stroudley; that is, if he could have managed to keep off the footplate! A dream indeed; well, it costs nothing, and anyway I have the workshop of my heart's desire now, even though it be late in life. The old saw says,"Everything comes to those who have patience to wait." True enough, if you don't do the waiting part sitting down or down or sleeping! ●

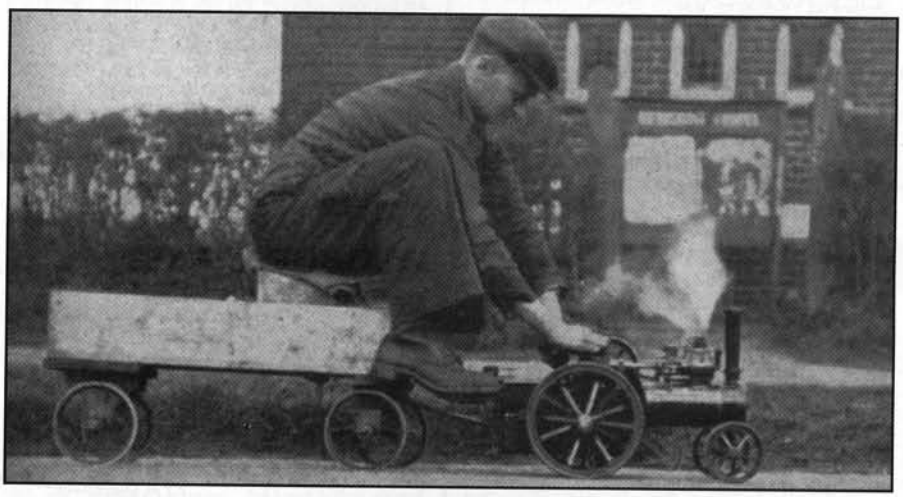
October 16 1941

A Model Traction Engine Made from Scrap

by J. West



A near-side view of Mr, J. West's model traction engine.



Blowing off and eager to be away with a comfortable load.

The boiler of this, engine is made from a piece of 3½-in. water-tube, from a large boiler. It has correct pattern inner firebox, with water all round; it is welded throughout except the 17 x ⅜-n. tubes, which are brazed. The cylinder was taken off an old high-speed engine, and altered to fit; it is ⅞ in. x 1¼ in. stroke. It has a ratchet type lubricator, built according to"L.B.S.C."

The water pump, check valves, unions and piping were, taken from a car chassis lubricating system.

The winding drum and brake is on the near side, and on the off is a differential, made up of Woolworth's hand-brace wheels.

Two speeds are fitted; some of the gear wheels being taken from old magnetos, the others being cut by hand to fit.

The front wheels are 6¼ in. diameter, and the back measure 10¼ in.

The tender holds a quart of water, and has a hand-pump fitted in.

The working pressure is 85 lb. per sq. in.

It has pulled three adults on the truck, shown in the photo. of me driving. If"L.B.S.C." is ever in the Aylesbury district, I should like him to try his hand at driving a traction engine.

Steamroller Prints a Newspaper

We have frequently heard of traction engines being applied to tasks that would not be described as normal but we do not recall having previously heard of a steam roller being pressed into service for printing a newspaper. We are indebted to the editor of the Middlesborough Evening Gazette for permission to reproduce the sketch on this page to illustrate an incident in the history of that newspaper. The incident occurred on November 15th, 1890, when an explosion in Middlesborough gas-works caused the power supply to fail and rendered the presses idle. This did not daunt the enterprising management, however; they borrowed a 15-ton steam-roller, knocked a hole in the printing-shop wall, band-linked the roller's flywheel to the machines and printed 64,000 copies of their newspaper by evening!

December 15th 1949

Mr. H. G. Greg, of Styal, Cheshire, has solved the transport problem by means of a miniature traction engine, which with a couple of bottles of water carried on a trailer and a bucket of coat, will run for many miles. It can haul half a ton and climb steep hills, and a year's tax costs only 5/- [25p!].

January 8th 1948

Browsing through the issues for the immediate post war years the description of the model showman's engine built by Mr Harwood caught my eye, although the model was completed just before the outbreak of war in 1939. In common with many model engineers he made his own workshop, in this case a cellar which he dug himself. A feature which I approve of (and W J Hughes does not) is the lack of of twisted brass on the canopy supports. While not mentioned in the text the lack the now usual line of bulbs along the name boards is also refreshing. This piece is a typical 'Bill Hughes', both detailed and informative. I chose it mainly because of Bill's last few paragraphs. The text reminds us that steam power was still very much of the present but its days were seen to be numbered. Atomic power had been proved as a force to be reckoned with, but few folk had any real idea of what it was all about. The notion of 'an atomic sized engine the size of a teacup' is both quaint and alarming. It is best not to even think of using asbestos for the lagging!

A Showman's Road Loco.

Built by J. S. Harwood and described by W. J. Hughes

Throughout his working life of more than thirty years, J. S. Harwood has been an engineer by profession; he is now chief engineer to a large firm in Sheffield. Yet, as he says, he still finds that the best relaxation from engineering is model engineering. Perhaps it is that the problems and distractions at the works may be solved quite often while some problem of the home workshop is being worked out; or is it that at home the pace is one's own ?

Whatever the reason, the hours that Mr. Harwood passes in his workshop are profitably and happily spent. The chief machine-tool is a 41/4 in. Britannia lathe, with a hand-shaper and small drilling-machine, and, of course, a large number of hand tools. The workshop is a cellar, which was dug by Mr. Harwood himself, by the way.

The 1¼in. scale model here described was begun in order to satisfy a long-standing desire to build a road locomotive, and is one of a list of models which the builder keeps in mind as projects which must be built sooner or later. A diary of progress was kept, and it is interesting to note that some 1300 hours of spare time, spread over 1¼ years, were spent in its construction. It was finished in April, 1939, and on the outbreak of war, it and its showcase were screwed up in a very strong specially-made box, and placed under the work bench, so that, should the house receive a direct hit, as so many did in Sheffield it should be possible to salvage the model. Fortunately, however, this was not necessary.

The engine is more a representational showman's engine than a model of any particular prototype, but is very similar in outline and arrangement to the Fowler "Lion." The chief construction was from Henry Greenly's drawings; but many hours were spent on fairgrounds measuring up and sketching details to ensure that the locomotive would be a good representation of the real thing. The accompanying photographs show to what extent the objective has been achieved.

Note, for example, the details of the driver's cab. There are the usual pressure-gauge and water-gauge, reversing-lever, fire-door and so on; but the driver's seat, coal-rails, number-plates, rear-light, and other

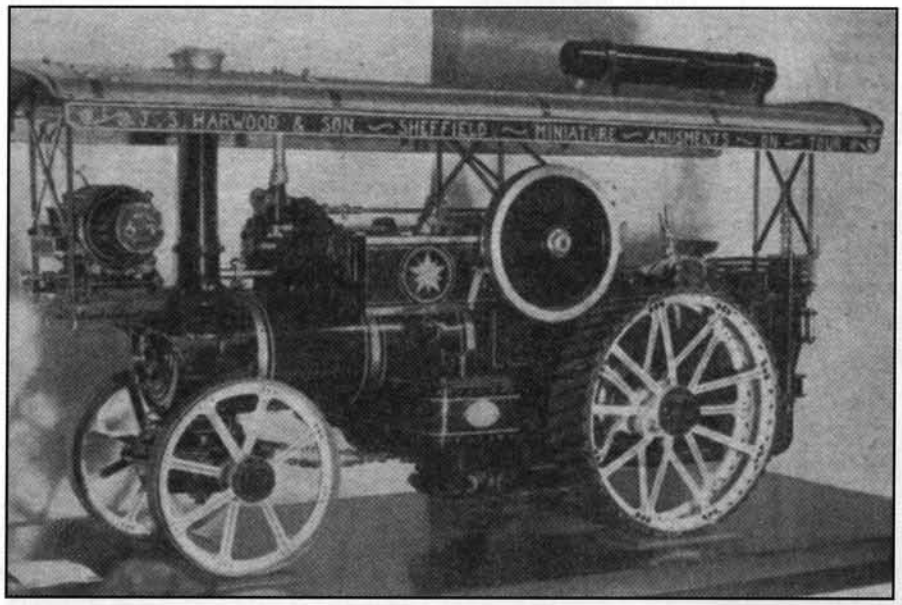


Photo No. 1. A fine showman's engine which was awarded a first prize at the 1947 exhibition of the Sheffield S.M.E.E.

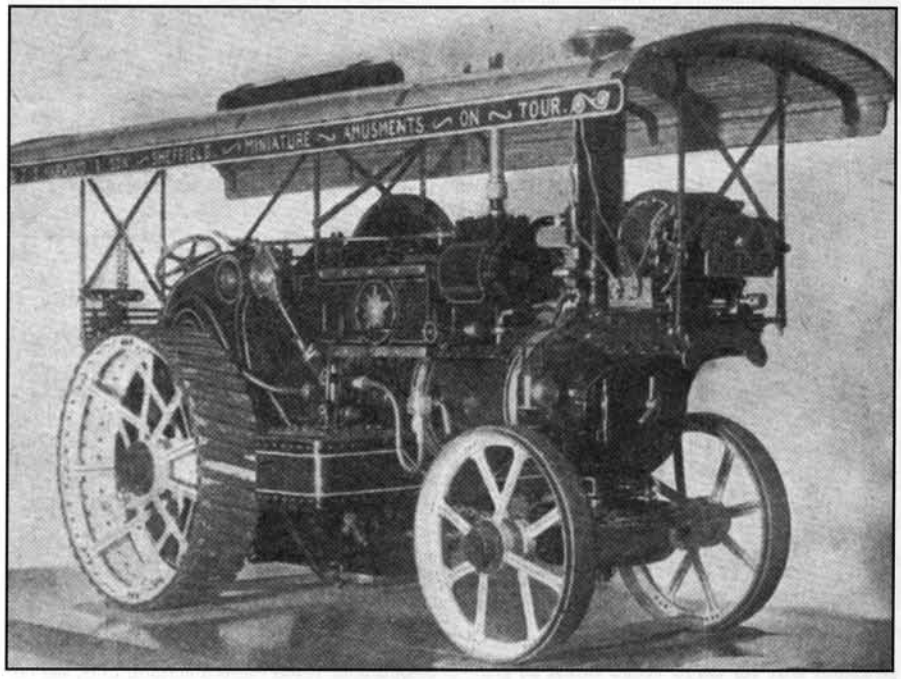


Photo No. 2. An imposing model! Note the fine detail work, including side-lamp and number-plate

fittings add much to the realism of the model. Incidentally, the builder doubts whether the coal-rails actually were featured in the Fowler "Lion," but could not resist the temptation to fit them, to gain realism. Most showmen's engines are compound, but Mr. Harwood is dubious as to the value of compounding, unless the initial pressure is over 100 lb. per sq.in. so his engine is built with a single cylinder of 1 in. bore by 1½ in. stroke. The valve-gear is Stephenson's link-motion; the curved links are not slotted through, but are milled channel-section from the solid. The reversing-lever may be seen on photograph 1 just above the rear wheel. The displacement lubricator may be seen on photographs 1 and 3, just in front of and above the cylinder.

The boiler is coal-fired, and has five ⅝ in. tubes only, which were all that were shown on the Greenly drawings, but the builder says that had he read, marked, learned, and inwardly digested "L.B.S.C.'s" articles as thoroughly in those days as he now has, the tubes would have been smaller in diameter and more in number. The boiler is of copper, lagged with asbestos, and covered with a thin brass cleading. An inspection manhole is fitted, which may be seen on the nearside, just below the motion cover (photograph 1).

A water-tank is fitted in the cab, and is connected to the belly-tank, under the boiler, by means of a 5/16 in. pipe. This has correct square flanges to affix it to the tanks, and has a screw-down stop-valve, behind which is fitted a sliding expansion joint to allow for expansion of the boiler. These features are seen again in photograph 1, just in front of the rear wheel, the expansion joint being just behind the wheel-valve. The tanks are riveted-up from copper, and then silver-soldered for strength and water tightness. Correctly-shaped filler-caps are fitted, with two strap-hinges and screw-down fastener. Access to that in the cab is obtained by hinging the driving-seat backwards, as on the prototype.

The seat was beaten to shape from copper sheet on a wooden former, and fretted out with a jeweller's piercing-saw. In addition to being hinged, as mentioned above, it is sprung on a single spring-leaf, and adjustable both for height and in the forward direction. It can be seen in all the photographs. In passing, it may be remarked how extremely comfortable were these seats, correctly shaped to one's anatomy !

Eight spokes are fitted to the front wheels, and sixteen to the rear ones. The rims were turned from steel rings, the angles being integral, and the hubs are built-up, with the spokes fastened by screws in grooves milled across the ends of the centre-section, and concealed by end-caps. The driving-pins of the rear-wheels are held in place with specially-made flat-section split-pins. Forty-five cross-strakes, held by four rivets each, are fitted to each rear-wheel, and three circumferential strakes to each front wheel.

There are two speeds and free-running position, operated by a lever in the cab, which is visible in the "close-up" photograph, just behind the valve-lever. A winding-drum is fitted behind the near-side rear-wheel, and there are steel roller-type cable-guides fitted to the cab-side, one in the horizontal plane behind the wheel, and two in the vertical plane at the rear corner of the cab, also visible in the "close-up."

Referring again to the latter, the other lever seen between the gear-change lever and the steering wheel is that controlling the throttle, which is in the valve-chest. Immediately below it, visible through the entrance to the cab, is the water-gauge, which is on " stalks " to clear one of the gear-shafts. The steering-wheel was turned from the solid, with the spokes fret-sawn and filed to shape. Immediately below it may be seen the handle which operates the ash-pan damper, and on the near side of the cab, just behind the entrance-opening, the brake handle. Note also the chequered foot-steps, one riveted to the brake operating-beam, and the other to the cab-side level with the entrance.

The number plates and name-plate "Peterkin" were made by fretting out the letters, numbers, and surrounds separately from sheet-nickel, and these were soft-soldered to their back-plates. Side-lamps (only one of which was mounted when the pictures were taken) and rear-lamp are built-up by silver-soldering; the lenses are ground down from glass marbles which acted as stoppers in the old-fashioned "pop" bottles—do you remember them? An alternative source of supply would have to be sought nowadays! The lamps have oil-containers and wicks, which will burn perfectly with the container outside the body of the lamp. However, since one "can't scale Nature" (where have I heard that phrase before?), the tiny scale-size air-holes will not pass sufficient air to support combustion, and the flame goes out when the container is put in its rightful place.

Steering is by the usual worm-and-wheel and chain. The steering chain, and the towing chain, were hand-made as follow. Suitable nickel-silver wire was wound several turns round an oval nail of suitable size, and a saw-cut was made length-wise along the nail, to separate the links. A pair of links having been put together, the joints were silver-soldered, the operation being repeated several times. The pairs of links were now joined by single links to form sets of five, which were again joined to make sets of eleven, and so on, until the requisite length was achieved.

Of course, no showman's engine would be complete without a dynamo. In this case, the working parts of a cycle dynamo were "dressed up" with thin end-plates which had feet formed in, and these were bolted down to a platform having a screw-device for belt-tensioning, which the builder favoured as against the alternative method of slide-rail adjustment (both

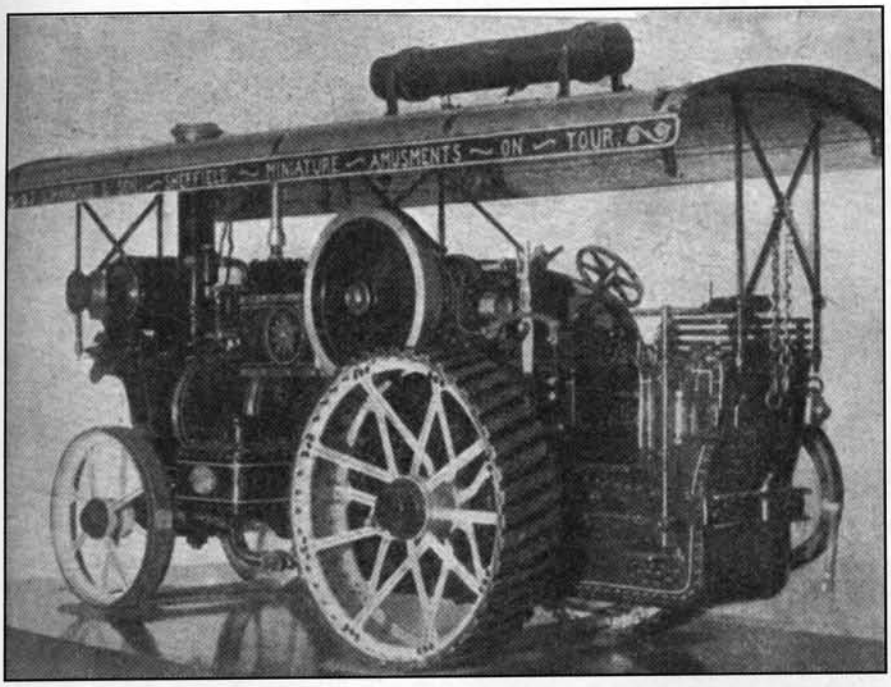


Photo No. 3. The displacement lubricator is in direct line with chimney. Valve controlling flow between tanks is just in front of rear wheel

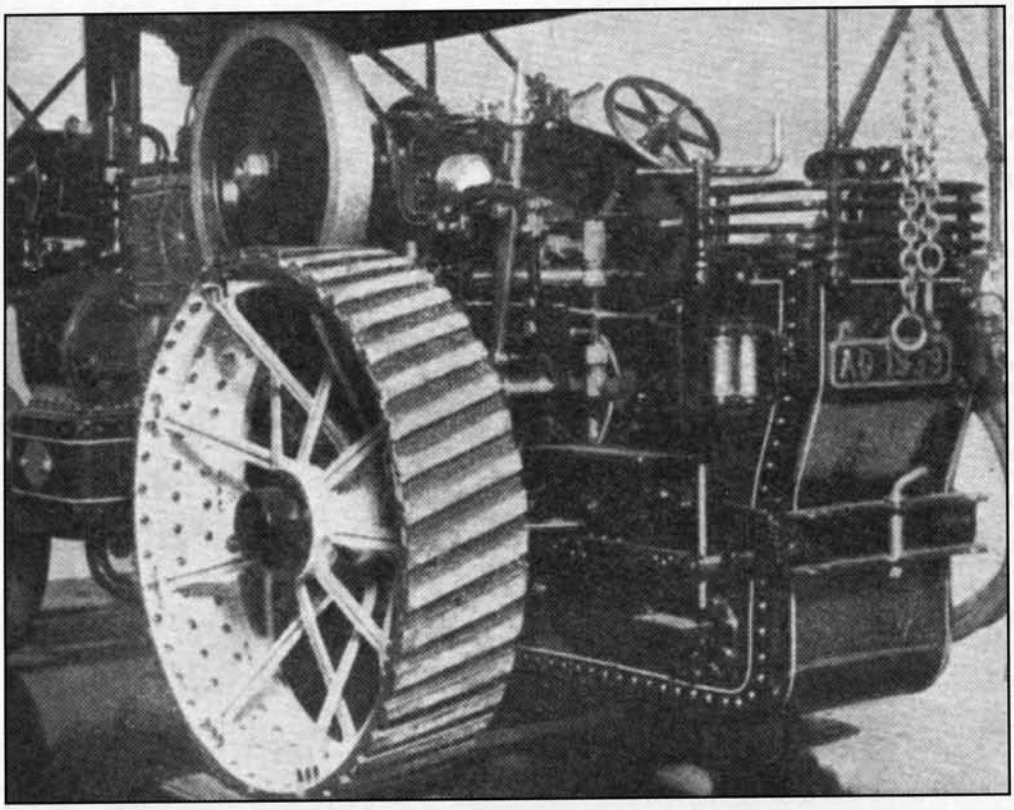


Photo No. 4. "Close-up"– A more detailed rear view. Note haulage-chain, number-plate, rear lamp, rope-guides, etc.

methods are used on prototype engines). The screw may be seen between front number-plate and name-plate. The knurled wheel which normally runs on the cycle-tyre was annealed, turned down, and fitted inside the crowned and flanged pulley seen in the photographs, which was easier to do than to bore an internal taper in the latter to fit the taper of the armature shaft.

Mr. Harwood has an inherent objection to the twisted brass columns which frequently support the canopies of showmen's engines (I like them myself !), and on his model he has copied accurately the plain supports actually seen on an engine in a Sheffield fairground. The canopy itself is a thin sheet of oak, vee-grooved underneath to represent oak match-boarding, and bolted down to the curved angle-iron supports underneath. It is covered with "roofing-felt," held down with cleading-straps, and fitted with rain-water deflecting-strips. As will be seen, the extension chimney is mounted on top; visible in photographs I and 2 are the small eye-bolts to which the wire stays of the extension chimney are fastened when it is erected. The woodwork is cut away around the chimney and the safety-valve extension, as in the prototype, to obviate the dangers of overheating, the gaps being filled by sheet-metal bolted to the canopy.

A water-pump is mounted on the off-side of the engine, driven by an eccentric on the crankshaft. It connects with the rear-tank on the suction side, and on the pressure-side with a clack on the boiler-barrel. There is also a suction connection to which the rubber hose may be coupled, with a pressure connection to the belly-tank, from which the pumped-in water may flow to the rear-tank, via the wheel-valve and pipe previously mentioned. While the tanks are being replenished, pressure-feed to the boiler may be shut off by a cock between clack and boiler. All these points may be seen on photograph 2, but unfortunately what does not show is a beautiful little strainer fitted to the receiving end of the hose, to keep out frogs, newts, and "tiddlers" when filling- up from a ditch or pond. An emergency hand-pump is fitted to the rear-tank.

Sheet-copper was used to build the cab because of the flanging required, and, after riveting, was silver-soldered, the tank being built in. The drag-beam, which extends forward to the horn-plates, and through which the towing-pin passes, is made from steel, however.

The engine was painted by the builder, entirely by hand. Smokebox, chimney, and firebox are black, with maroon boiler and cab, on which the lining is black and yellow. The wheels are primrose yellow, with a thin red line on each spoke, and rivet-heads picked out in red. All lining was done with a fine brush made even finer by having most of its bristles cut away. Chimney-cap, safety-valve extension-tube, boiler-bands, and decoration on motion-covers are of polished brass, with a small brass plate on the near-side of the belly-tank engraved with the maker's name. The flywheel rim, gear-lever, and sundry other working parts are polished steel. Altogether, the engine presents a sight which gives me, at any rate, a nostalgia for boyhood days, when I used to hang around the back scenes of the local "Feast," watching these beautiful giants purring away at their appointed task, seeming to be living, breathing, sentient beings. It is sad to think that, in the name of economy, they are now almost extinct, replaced by racketty monstrosities with no soul and certainly with no aesthetic qualities worthy of a self-respecting model engineer. Ah me! the combined scent of steam, oil, and coal-smoke that greeted the nostrils—the incomparable glory if the Jove-like attendant allowed one to put a knob or two of coal on the fire! Sad indeed that the lads of today can only know the reek of exhaust gas and an unappeased numbing roar. Even the mellow tooting of roundabout steam organs has gone, replaced by the over-amplified adenoidal bleating of some love-sick crooner. Progress ? Maybe—but one wonders what today's boyhood will have to say about the fairgrounds of twenty years hence. Will they be sighing for the exhaust fumes of the "good old-fashioned diesels" of their youth, replaced by some atomic-powered engine about the size of a tea-cup, which doesn't even produce any kind of odour? Verily, one generation's meat is the next one's poison! ●

August 18 1949

Many pages of Model Engineer over the years have been devoted to historical perspectives and the development of the traction engine. In the earlier issues a gentleman called 'Frostspike' offered a comprehensive review of the traction engine. I have selected some of Ronald Clark's 'Traction engines not so Well Known', and at that some the more obscure ones, where a Company made only a very few engines.

Traction Engines not so Well Known

by Ronald H. Clarke, A.I.Mech.E.

XII—C. J. R. FYSON, Mount Works, Soham

A small local firm who, with rather meagre plant and tackle, produced by partial assembly 17 tractions, all very successful !

The boilers were mainly by the Grantham Boiler & Crank Co. Ltd., or Alfred Dodman & Co. Ltd., King's Lynn, and the leading dimensions were as follows:

Inside diameter of barrel 2 ft. 4½ in. Length between tubeplates 5 ft. ¾in. Tubes No. 36 x 2 in. diameter x No. 11 s.w.g. thick. W.p., 140 p.s.i. The cylinders and motion were bought from Burrells of Thetford, but all the other items were made at the little works at Soham.

An interesting feature is the construction of the rear wheels. The spokes fit into recesses cast in the centres and are secured by two 3/4 in. taper bolts. The rim or head end of the spoke is welded on to the shank and held to the angle-iron of the rim by three 3/4 in. taper bolts with nuts inside the angle. They are driven up tightly with a four-pound hammer, and Mr. Fyson tells me he has never known one work loose. The usual method is to cast the spoke in at the centre and rivet the head end to the rim.

All engines had the letter "T" prefixed to the number thus T1, T2 and so on to T17, and Fig. 27 shows No. T4, and what a good-looking engine it is. The only other unusual feature is the standard flywheel which has curved spokes. All cylinders are 9 in. x 12 in., each engine having two speeds built upon the three-shaft principle and working pressure of 140 p.s.i. In Table V is given a complete list of the 17 tractions with year of manufacture. It is interesting, in view of present-day costs, to note that for No. T17 the labour costs were £416 19s.1d., the material and other costs £516 3s. 5d. making a total work's cost of £933 2s. 6d.

Actually there was one engine turned out some years before No. T1. This was a portable having a single cylinder, the crosshead guides being two solid bars 1½ in. diameter, and the boiler was hand-riveted at Soham.

Those interested will find most of these engines still doing good work in the Fen country.

TABLE V—List of FYSON. Traction Engines

Works No.	Year	Remarks
T1	1894	Gears ex Fowell.
T2	1895	
T3	1898	
T4	1900	See Fig. 27.
T5	1901	
T6	1905	
T7	1906	
T8	1907	
T9	1908	
T10	1909	
T11	1911	
T12	1911	
T13	1913	Rebuilt on new boiler. Other parts off Robey No. 5187
T14	1914	
T15	1916	
T16	1921	Painted lead ground coat only Jan. 1922. Finished (Dec.) brown April 1922.
T17	1924 (May)	

XIII-Harvey & Williams Ltd., Victoria Foundry, Huntingdon

A small firm, undoubtedly new to most readers, and who turned out two tractions all told. They were both single-cylinder engines and an elevation of the 8 n.h.p. is seen in Fig. 28, a 7 n.h.p. being the other size made, the cylinder dimensions being 8½ in. x 10 in. for the 7, and 9 in. x 12 in. for the 8 n.h.p. respectively. The working pressure was 125 p.s.i. Both have trunk guides, two speeds with the differential on the right-hand end of the countershaft, the three-shaft layout being used, and the drive is double-geared on the last motion. As in the Fowell engine, the front axle is set well back, giving a short wheelbase and ease in negotiating stackyards, gateways, etc. Stephenson's link-motion is employed with the valve-chest on the left-hand side of the cylinder. The valve-chest cover bears the maker's name and the date cast in relief, thus:

HARVEY & WILLIAMS LTD.
1900
ENGINEERS
HUNTS.

Note that the county abbreviation only is given as the locality of the firm, the name of the place—Huntingdon—being reserved for inclusion with the maker's name again on the centre of the smokebox door, also cast in relief. This is a late period to find the year of manufacture given, as this practice had died out ten to fifteen years before, hastened by the temptation it offered to the unscrupulous vendor to erase or otherwise "doctor " the date in order to influence the sale to his advantage !

Although not very apparent, the chimney is hinged to the cast-iron base, similar to portable engine practice, but there is no crutch. The boilers were made on the premises. It is rumoured that the cylinder castings were made of " borrowed " Fowell patterns and certainly the comparison of Figs. 28 and 25 indicates a striking family likeness confirmed by an inspection of the engines themselves.

The writer saw these two engines at work very recently in excellent condition and still a credit to their builders in a district not usually associated with engineering.

XIV—Holmes & Sons Ltd., Norwich

Established as far back as 1827, Holmes & Sons produced their first traction engine which won a Silver Medal at Fakenham Show in 1867 ; from then onwards, various improvements were made, culminating in the straightforward design seen in Fig. 29. Only single-cylinder engines were made, in two sizes of 8 and 10 n.h.p. The gearing of cast steel is arranged for two speeds, giving about 2 and 4 m.p.h. respectively, with the differential on the third shaft,

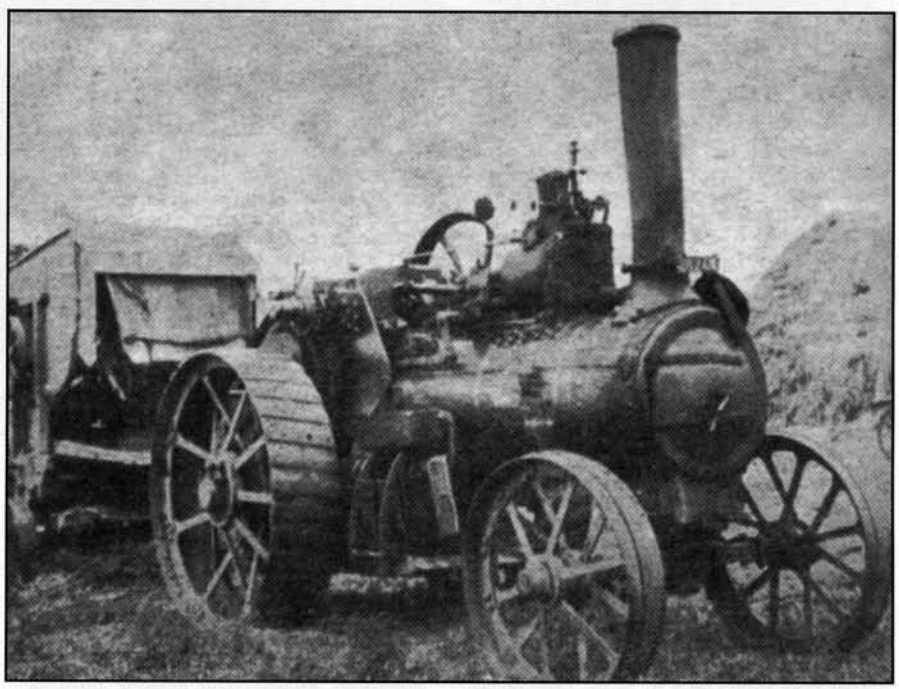


Fig. 27. Fyson traction engine No. T4 still in use

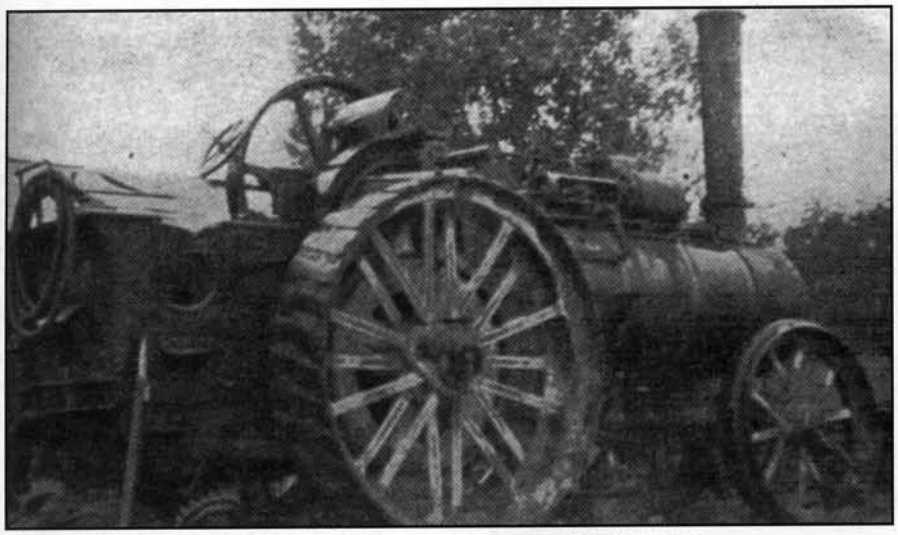


Fig 28. 8 n.ph.p. traction engine by Harvey & Williams Ltd.

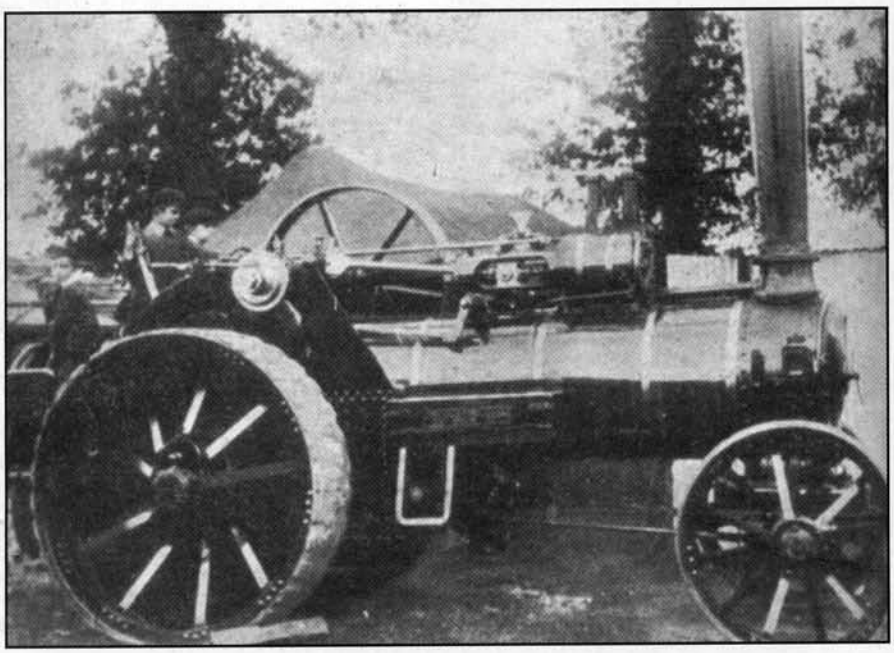


Fig 29. A fine traction engine built in the City of Norwich by Holmes & Son

the four-shaft principle being employed. A winding drum with 60 yd. of best wire rope were included, and governing was by means of a two-ball pendulum governor. Other fittings included Ramsbottom safety valves, water lifter, and crankshaft driven feed pump.

It is interesting to note that the list prices in 1890 of the 8 and 10 n.h.p. tractions were respectively £460 and £540.

Holmes & Sons were well known locally for excellent stationary engines, and whilst several of these exist in daily use, the last traction was destroyed in 1939. A high-class finish was given to all their engines, as a study of Fig. 29 will confirm.

XV—J. & F. Howard & Co. Ltd., Bedford

In later years, until their demise in the chaos of the Agricultural & General Engineers Ltd., Messrs. Howard & Co. were well known for agricultural implements, in particular their ploughs, having not made a traction engine for a number of years.

But this traction was most interesting as well as celebrated, being called by them their "Farmer's Engine," and a photograph of one is reproduced in Fig. 30, from which it will be noticed that the machine is of a very unconventional type, the engine and motion being placed horizontally and behind. Fig. 30 should be studied in conjunction with the line drawing in Fig.31 depicting a plan of the engine.

A steam dome, as in railway locomotive practice, was placed about half way along the boiler barrel, and was equipped with double Salter safety-valves. Two winding drums were fixed, cantilevered out behind the tender, with the cables led forward and around the deeply grooved guide pulleys, one just in front of the leading axle and two just behind it. The drums were driven off a countershaft and could be clutched in or out of gear as desired. Drive to the rear wheels was by another countershaft placed beneath the engine, the final motion to the wheels being via a pinion on the countershaft meshing with a gear-ring fitted to the nearside road wheel, all seen in Fig. 31. The main dimensions of the engine were as follow :

Cylinder 8 in. x 10 in. Flywheel 3 ft.10 in. diameter. No. of tubes 26 x 2¼ in.. outside diameter. Heating surface, firebox : 26½ sq. ft. ; tubes 75½ sq. ft. ; total 102 sq. ft. Grate area 4¼ sq. ft. Tank capacity 150 gallons. Rear wheels 5 ft. diameter x 16 in. tread. W.p. 120 p.s.i.

One of these engines, built in 1877, worked for many years in the Fen country and was later, in 1929, run back to the works to be preserved, from Burwell, Cambs under its own steam. Upon the death of the A.G.E. Ltd., in 1932 other interests of foreign origin took over the control of Howards, and, with scant regard to the claims of posterity, destroyed the old engine completely. There may be, however, one or two unknown to the writer.

XXIV—Wm. Weeks & Son, Maidstone

Known primarily for their agricultural implements they embarked upon the manufacture of a few traction engines—half a dozen maybe, and one of them is shown in Fig. 52. They were sturdy machines employing a single cylinder, four-shaft transmission, a boiler having an ample reserve capacity of steam, double Salter safety valves, trunk guides and a large open-spoked flywheel for steady running on the belt. The offside end of the crankshaft was unduly long, as is the case in some Allchin engines, so that a pulley smaller than the flywheel can be fitted when required (compare Fig. 49).

The cylinder was steam-jacketed, the jacket terminating in a small flat dome above the valve-chest ; in the dome were placed the safety-valve seatings.

Fig. 52 shows probably the last Weeks engine, which was working in South Lincolnshire until during the first war. It finished its days at Bourne where it was broken up.

October 27 th 1949

XXV—Hybrids or " Bitzas "

Some country owners and buyers of tractions in the past must have been rather difficult to please, having, like the present day motorist and motor-cyclist firmly rooted

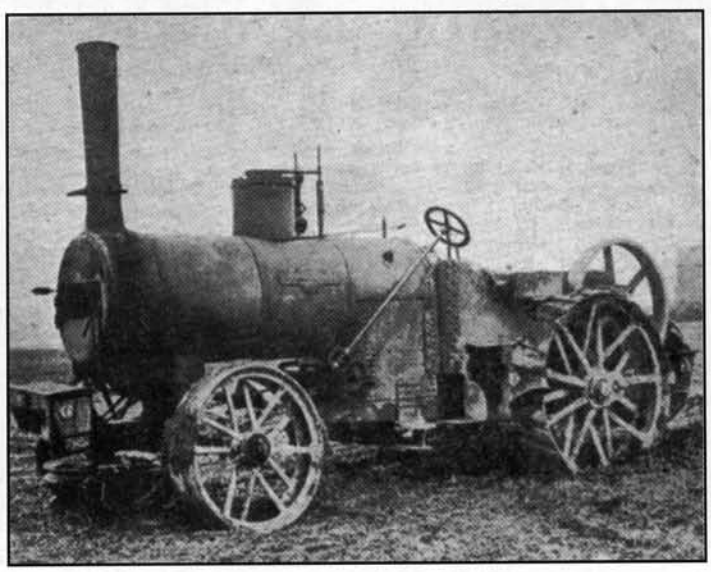


Fig 30. Side view of the Howard "Farmer's Engine"

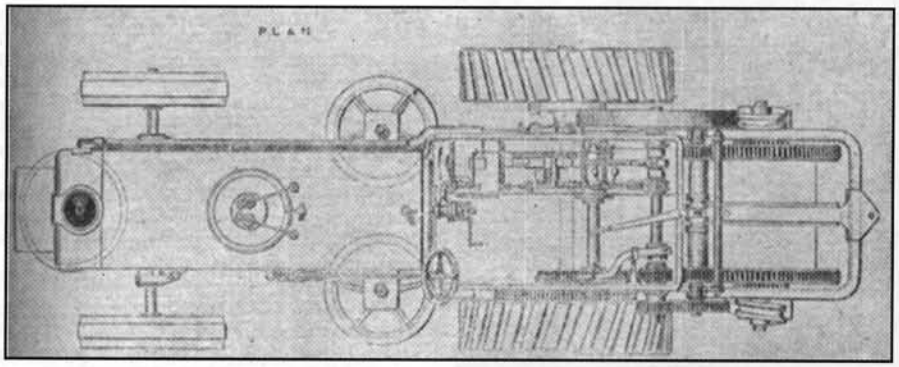


Fig. 31. Line drawing showing plan of the engine in Fig. 30

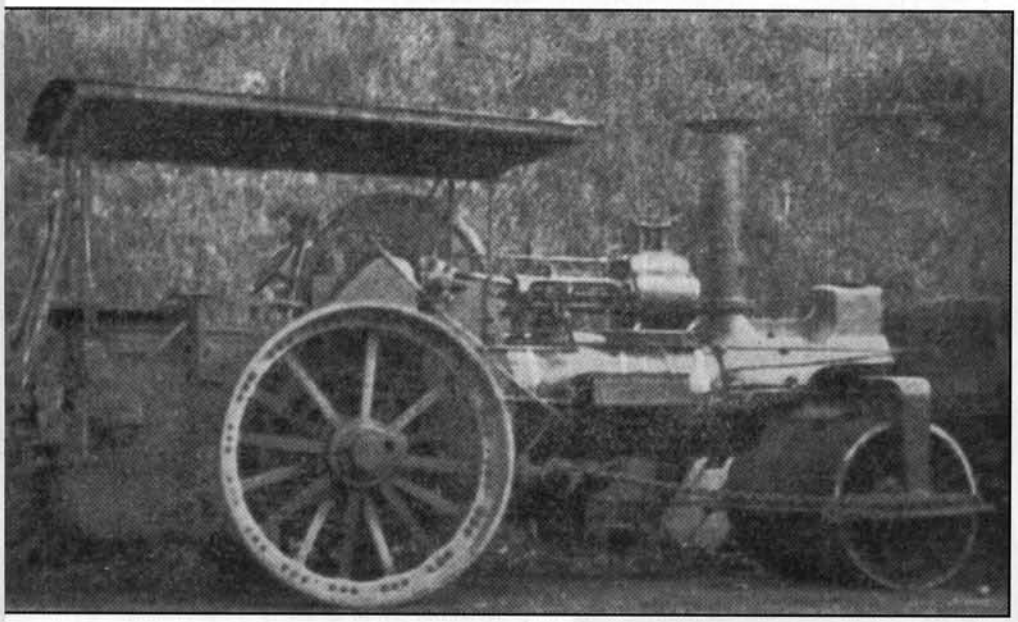


Fig. 53. A Burrell-McLaren "Hybrid" roller

ideas as to what constitutes their "ideal" or "dream" machine. In the same way as we find the motoring fraternity changing over engines, gearboxes, frames and adding proprietary and home-made gadgets and fittings off other makes to produce their own ideal in the form of a "Bitza" so do we find some traction engine owners had anticipated the craze and they too have produced a crop of hybrids. Space is running out so I must confine myself to one or two examples, the first being the roller seen in Fig. 53. Here the front rolls, saddle, chains, axle and chimney come off a Burrell, No. 2161. The remainder of the engine was formerly a McLaren, No. 661. The canopy is from some engine now quite unknown. It is in regular use, sometimes in sight of the Humber.

But the classic example is that shown in Fig. 54 which in its way is as unique as Savage's annular compound. Here is the brief specification :

Boiler and rear wheels	Fowler.
Cylinder and motion, etc.	McIaren No. 79.
Gears	Savage and Wallis & Steevens.
Gear case	Savage.
Front axle and wheels	FoweII.

Many odd fittings, bolts, nuts, etc., off any other scrap engine handy, together with "J. & H. McLaren, Engineers, Leeds, No. 79" on the brass nameplate on the cylinder, and "Fowell & Sons, St. Ives, Hunts" cast in relief on the front wheel hubs, caused a headache for the road fund licensors. After much internal debate they decided on the name Fowler and as such it ran for many years and worked well as I can testify. Alas, it is now scrapped and gone the hard way of many old engines but the nameplate remains resplendent and polished in my collection to remind me of a clever piece of "adapting" in a Norfolk village.

The late owner confided to me that he found fitting the cylinder-block a "bit" of a teaser as the barrel diameter of the Fowler boiler was a little larger than that of the McIaren, necessitating the removal of a little metal either side of the curved base of the block. It was only a country shop with no borer handy, so the job was chewed out by hand, using a hammer and cold chisels

I am not so sanguine as to imagine the foregoing list is absolutely complete. There may be others, "one-off" jobs that have never been noticed and perhaps the details will be forthcoming from those who have had access to them. In conclusion, I hope the foregoing data and illustrations will be helpful to the model maker casting around for a subject which is "different," and helpful, too, to the reader who goes out in search of "finds"; and I wish him the expectant thrills, adventures and discoveries on his journeys as still befall me when I go out "tractioning". ●

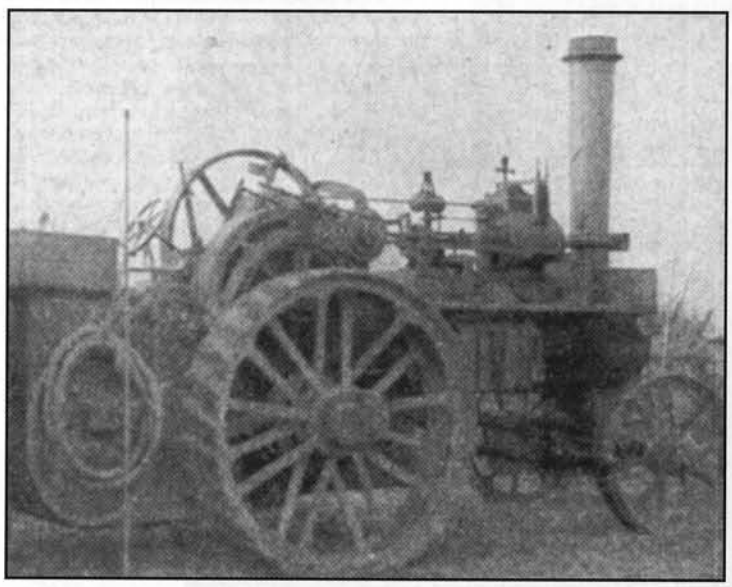


Fig. 54. A classic example of a traction engine "Bitza"

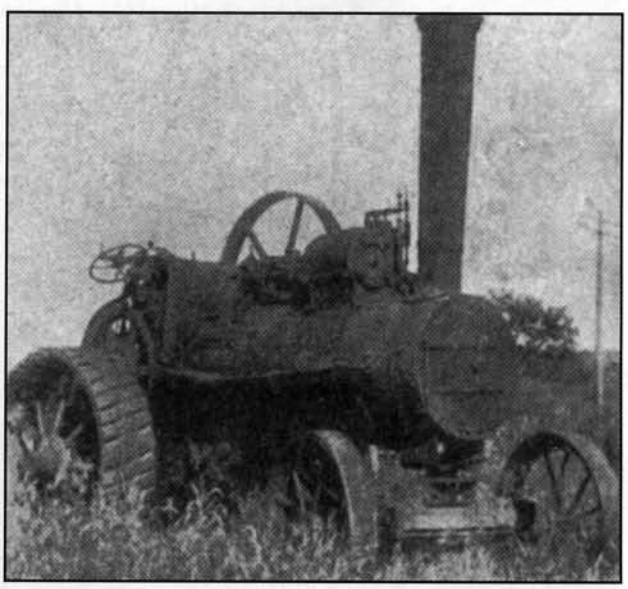
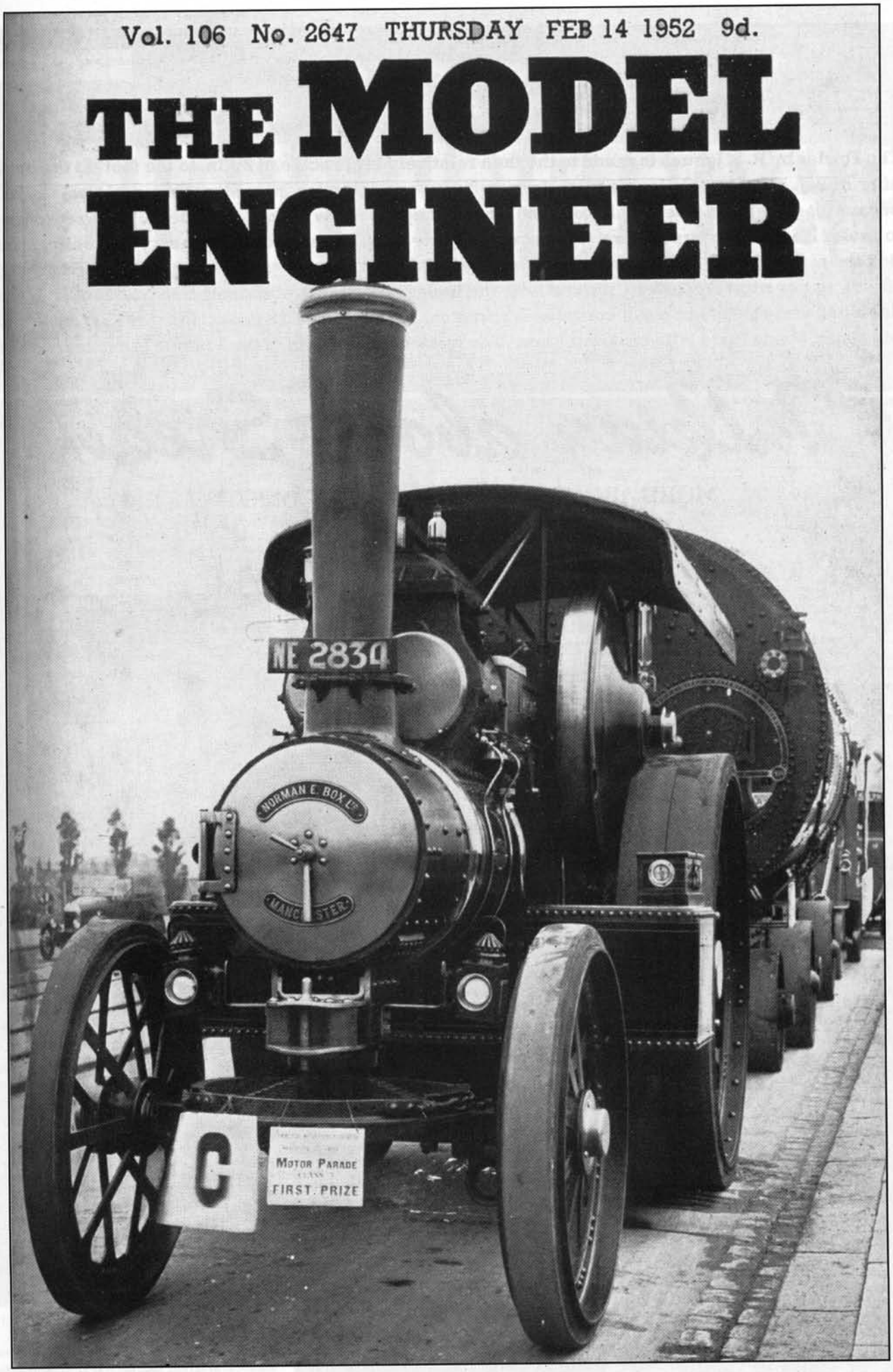


Fig. 52. Traction engine by Wm Weeks & Co., of Maidstone.

Vol. 106 No. 2647 THURSDAY FEB 14 1952 9d.

THE MODEL ENGINEER



There now follows several pages on model Fowler road engines. I know this will not appeal to all but in reviewing the more immediate post war years this prototype is certainly dominant. Bill Hughes wrote many articles describing model Fowler road locos which together with further descriptions from within exhibition reports, London and otherwise, would certainly fill this whole issue. The Fowler Road engine with its three speeds, constant mesh suspension system, and doubly inclined valve faces presents perhaps the biggest challenge to the builder. I guess it is the road steam equivalent of the G.W.R. King. In my selection of these four models I am very conscious of the others I have left out. I had identified eight Fowlers but clearly that is way too many. Apologies to all the fine models left out. ●

July 29 1954

The Fowler by R. S. Jaques is made to the then relatively large scale of 2¼ in. to the foot. At the beginning of W.J. Thompson's look at R.S. Jaques 2¼ in. scale Fowler he wrote 'This scale was chosen because it gave an engine which would be large enough to allow the smallest detail to be reproduced to scale.' He was of course later proved spectacularly wrong, the models of Cherry Hill being a fraction the size but with detail that leaves us all weak at the knees. Copper hornplates were employed which, as per prototype, were integral with the boiler, which was of riveted construction. The cylinder block was also of copper, a complex fabrication that honoured all the coring and passageways of big sister. It was fitted with cast iron liners. The model now resides in the Science Museum, London.

Talking about Steam

MORE ABOUT FOWLER ROAD LOCOMOTIVES

By W. J. HUGHES

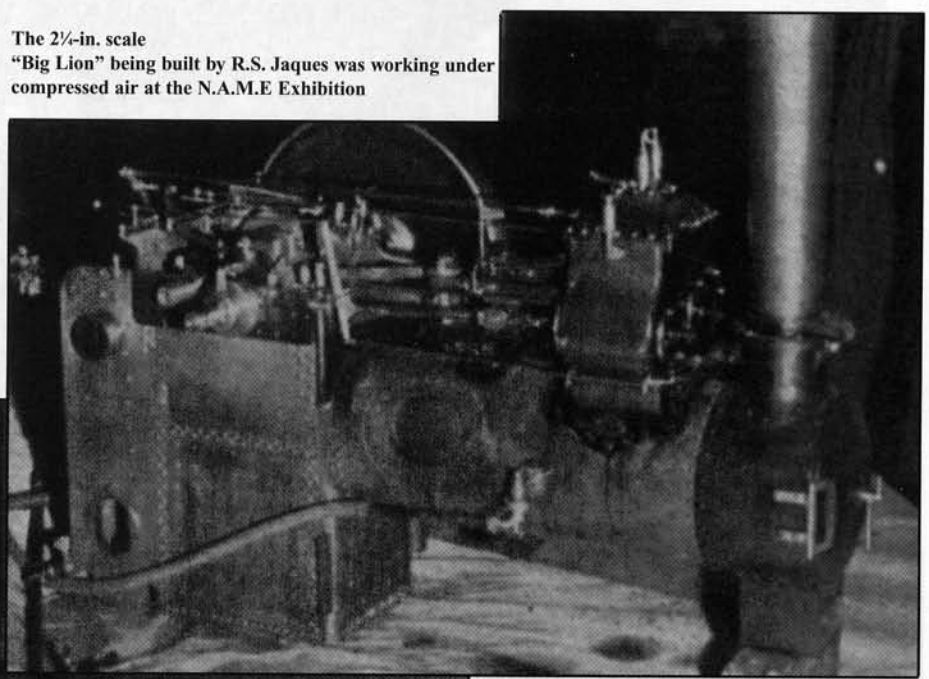
My postbag tells me that the Fowler roadlocomotive is being modelled in many diverse places, and so do people I meet at exhibitions and other functions. I therefore make no apology for publishing further photographs of a magnificent engine seen recently at Brighouse. Most of these are close-ups of various parts, which should be valuable to the modelbuilder, and also of interest to the student of detail who is not building a model.

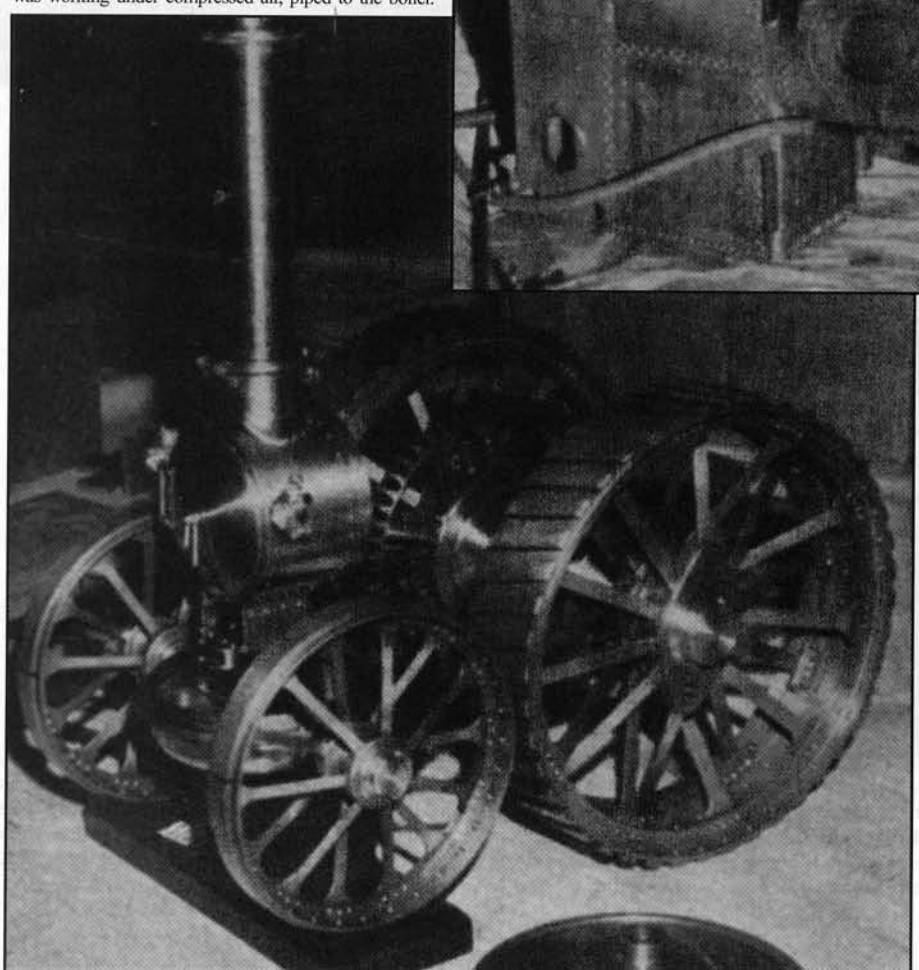
Let us have a look at the progress made by R. S. Jaques, of Boston, and L. Tatlock, of Bolton, in their "Big Lion " models.

Mr. Jaques is working to 2¼in. scale, and Mr. Tatlock to 1½ in.

At this Year's Northern Exhibition Mr. Jaques's model was working under compressed air, piped to the boiler.

The 2¼-in. scale "Big Lion" being built by R.S. Jaques was working under compressed air at the N.A.M.E Exhibition





The engine ran beautifully, at speeds from a mere tickover to a blur, despite the non-expansive properties of the compressed air, and gave a promise of the tremendous power which will be available at full steam pressure.

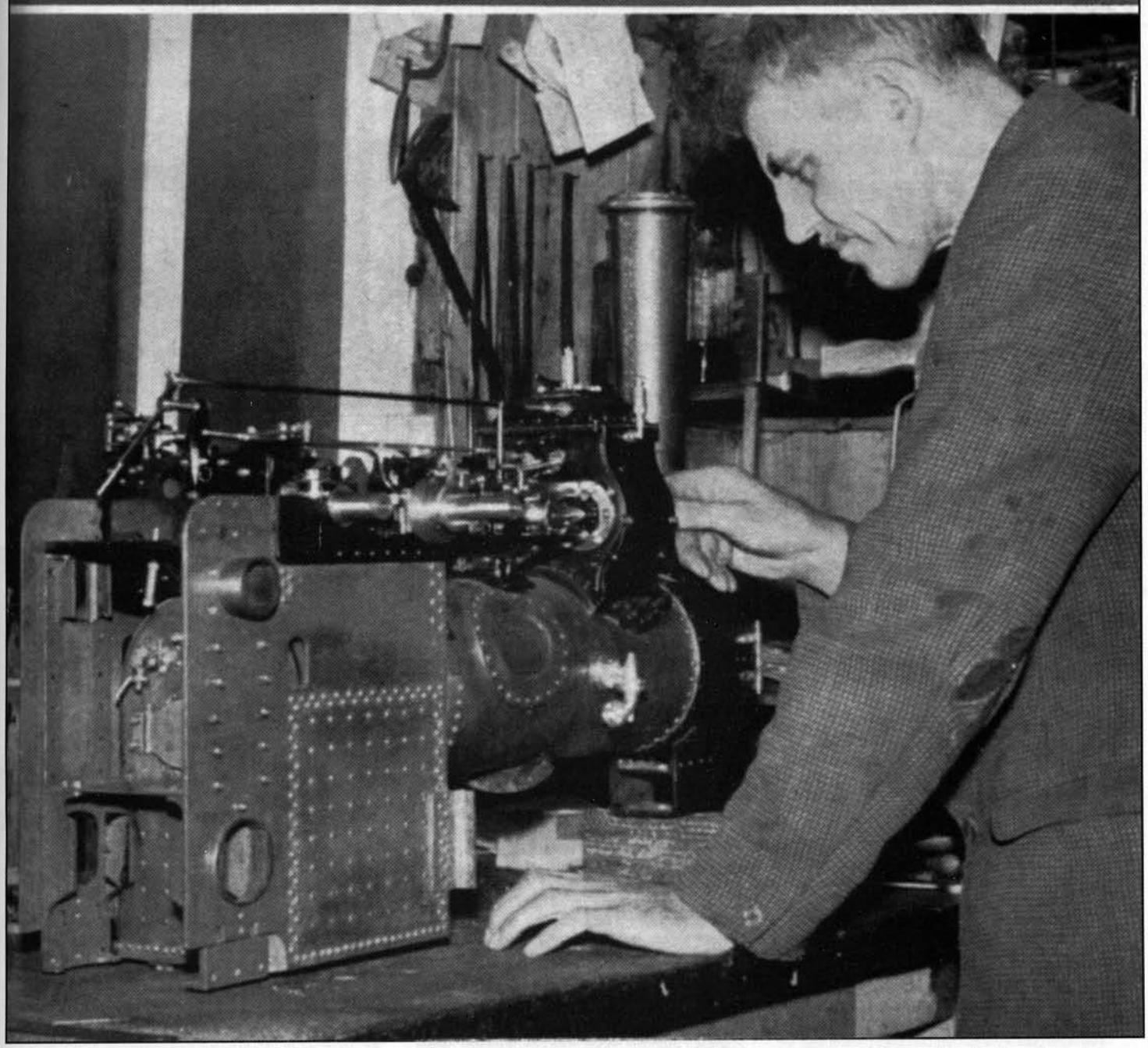
All the work was carried out most beautifully, even to the tiny detail of the interlocking latches of the gearchange mechanism, and the boiler is of close riveted construction, as in the prototype.

Mr. Tatlock's engine is not so far advanced as Mr Jaques's; he has completed the front end from wheels to chimney, and the hind assembly, including windingdrum, compensating gear, and main wheel. Here again the craftsmanship is superb; in fact, if these two models should ever come up against each other in open competition, the judges will have a pretty problem before them! ●

L. Tatlock's 1½-in. scale Fowler is making excellent progress; this, too was at Manchester

October 16th 1954

THE MODEL ENGINEER



OUR COVER PICTURE

The road locomotive, as a prototype for a model, seems to be gaining popularity, and bids fair in this respect, to become the equal of the steam railway locomotive. A very fine example of the model road locomotive, at present in course of construction, is the 2¼in. scale Fowler "Big Lion" by Mr. R. S. Jaques of Boston, described and illustrated in this issue. The photograph is taken from one of the illustrations submitted with the description by Mr. W. J. Thompson of Esher.

December 16 1954

A Model Fowler "Big Lion"

A BRIEF LOOK AT A FINE JOB WHICH R. S. JAQUES OF BOSTON LINCS. IS BUILDING

By W. J. Thompson

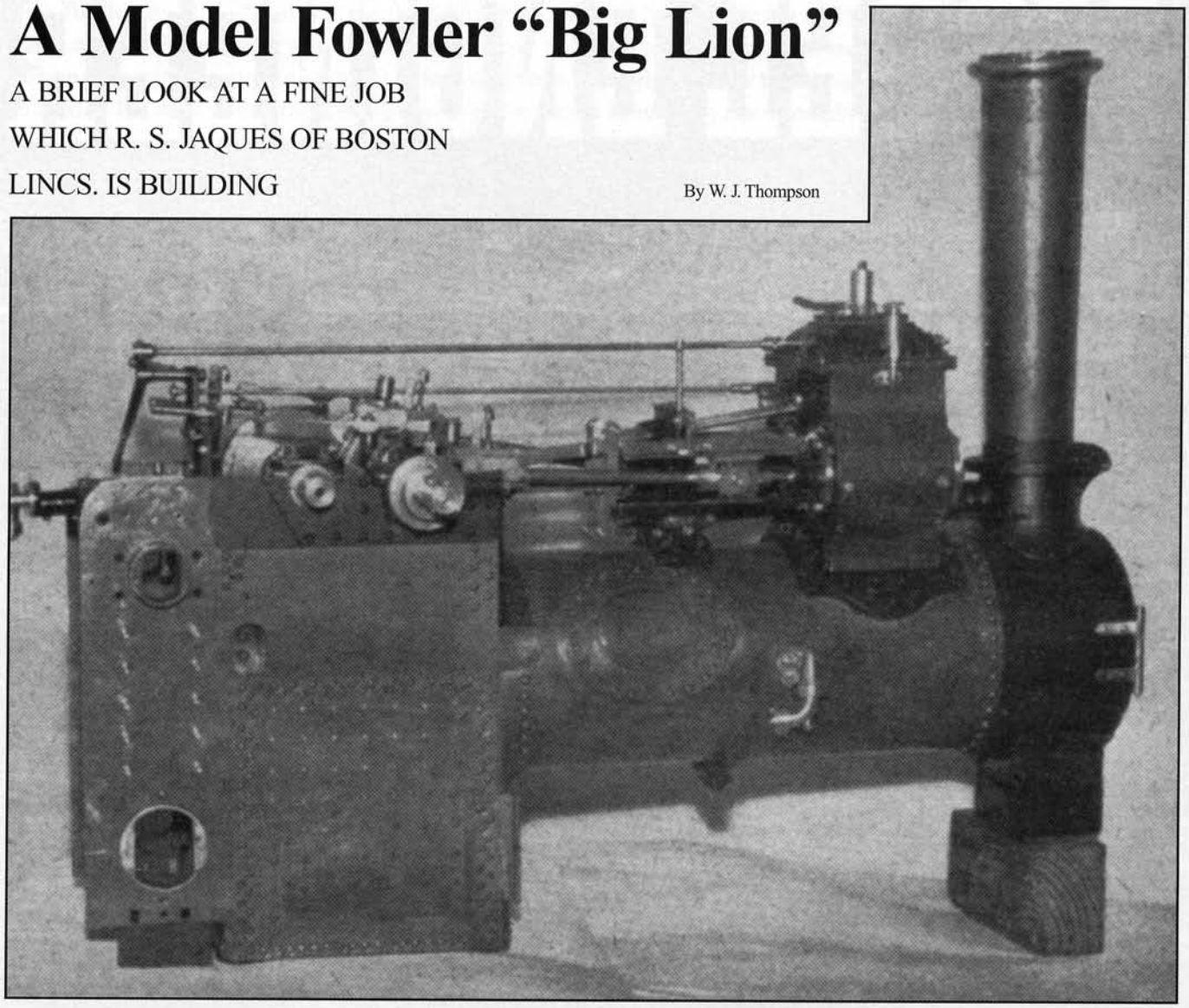


Fig. 1. Right-hand side of engine. Note provision for compensating gear to enable rear axle and third shaft to move together on the springs

THE engine described is built to the somewhat unusual scale of 2¼in. to the foot. This scale was chosen because it gave an engine which would be large enough to allow the smallest detail in the original to be reproduced to scale. There is little on a full-size engine of this type which is less than ¼in., and this reduced to scale is 1/64 in. which is still a workable size.

Why a Fowler? Mr Jaques remembers one of these fine machines which belonged to Drakards of the Dockside Ironworks, Boston, when he was going, or supposed to be going, to school.

There were times when the "Big Lion," which announced its presence in the vicinity by the ring of the big steel flywheel, seemed to have greater claims on his attention than the school bell. Later, when school years were over, Jaques worked for a time at Drakards and, amongst other things, made sets of stakes, drilled with the old diamond point drills, for the Fowler.

Fowlers says Jaques were engincers; some of the other firms, so much beloved by traction engine fans, were agricultural engineers. A fine distinction, though I think that a close examination of contemporary designs does show that Fowlers were more in the tradition of the mill-engine builder and less of the village blacksmith than some of their rivals.

The boiler of the model is made of copper throughout and is of riveted construction. Fig. 1 shows that the hornplates are an extension of the firebox side sheets, as in the original, and not separate plates, as in many models. The usual argument advanced is that one must use steel for the hornplates, to stand up to the thrust of the pistons. Jaques says, I think rightly, that the thrust from the pistons is proportional to the steam pressure, and as the copper of the boiler stands up to the one it will stand up to the other.

Fig. 2 gives a very good idea of the cylinders, motion bracket, slidebars, etc. A comparison with the photograph of the fullsize cylinders in Mr. Hughes' excellent book Traction Engines Worth Modelling will confirm that they are certainly like the real thing. I doubt if any foundry would undertake to cast cylinders with all the jacketing of the original, even on this comparatively large scale, so some other way had to be found. Jaques overcame the difficulty by fabricating the cylinders from sheet copper and fitting castiron liners to the bores, and bronze port faces. The type of construction is not new to Jaques and many will remember his 2½ in. gauge L.M. S. Black Five which won the cup at the first Northern Models Exhibition.

The construction of the copper cylinders does involve a great deal of very accurate work to ensure that the joints are close and remain so, even under the heat of the blowlamp during brazing.

The cylinders had reached the stage when they required brazing, early in 1952, but due to lack of heating facilities and, perhaps, courage, they were not completed. Jaques brought them along to the Northern Models Exhibition in 1953 to seek the advice of Mr. K. R. Whiston of Stockport. Mr. Whiston not only gave advice but also offered —in the interests of science—to do the job, and later I spent a very interesting afternoon watching the brazing material, I forget which grade was used, run like water just where it should and nowhere else. The finished result is a very fine pair of cylinders which not

only look right but actually have all the passages and jackets of the full-size variety.

Fig. 2 also shows the slidebars, which are typically Fowler. They and valve-spindle guides are lubricated from an oilbox on top of the motion bracket. The box can be seen in the photograph, just behind the rod which operates the simpling valve. One often overlooked advantage of the four shaft engine was that the bottom bar did all the work when the engine was running forward on the road. The bottom bar, as can be seen in the photograph is in the form of a trough which held the oil, and even if the lubricator should run empty, little harm would be done. On a three shaft engine under similar conditions, the top bar does all the work, and as the oil will naturally run off this, it follows that a constant feed mast be maintained.

The motion bracket is built up; in fact, no castings are used at all in the engine. This has not prevented cast-iron being used where its wear resisting properties are an advantage, as in the cylinders. Another example is in the bottom slidebar, where a piece of cast. iron is let in for the slipper to run on.

The simpling valve is an example of the care taken to get the smallest detail correct. This valve may be seen over the l.p. cylinder cover in Fig. 2. It is an exact reproduction of the full-size valve, although the body is, of course, built up and not a casting as in the full-size edition. The isolating cock is a working cock, and the gland is packed. The cock is a refinement which was often omitted on full-size engines of other makes.

A good idea of the motion can be gained from Fig. 3. It will be seen that nothing is being left out. Separate balance weights are fitted to the crankshaft by means of straps round the webs. The crankshaft is made from a piece of flat mild steel, the centre section being twisted, hot, through 90 deg. after roughing out and before finishmachining. The interlocking device for the gear levers is a very tricky bit of work, but it functions perfectly. It is incorporated in the bracket in the bottom lefthand corner of the photograph and prevents more than one gear being engaged at one time. When one gets down to such fine detail as this, 2¼ in. scale is none too large. The gear levers and some of the other small parts we made in stainless. steel, though I am glad to say that our friend has not taken any liberties with the original design, as did one of the other exponents of this material.

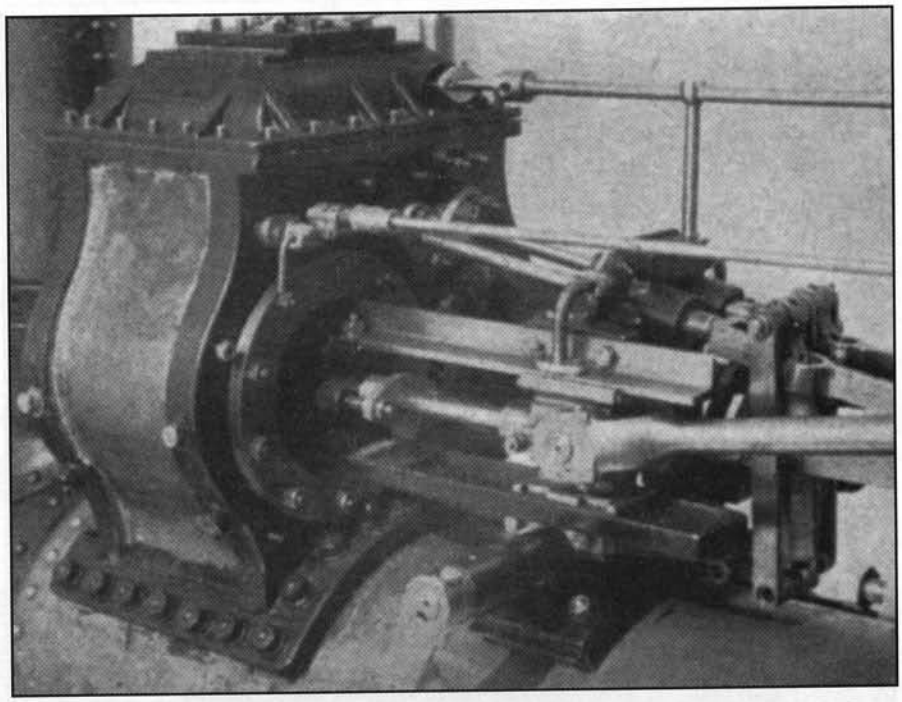


Fig. 2. Cylinders and motion bracket. Oil box on top of bracket lubricates both slide bars and value spindle guides

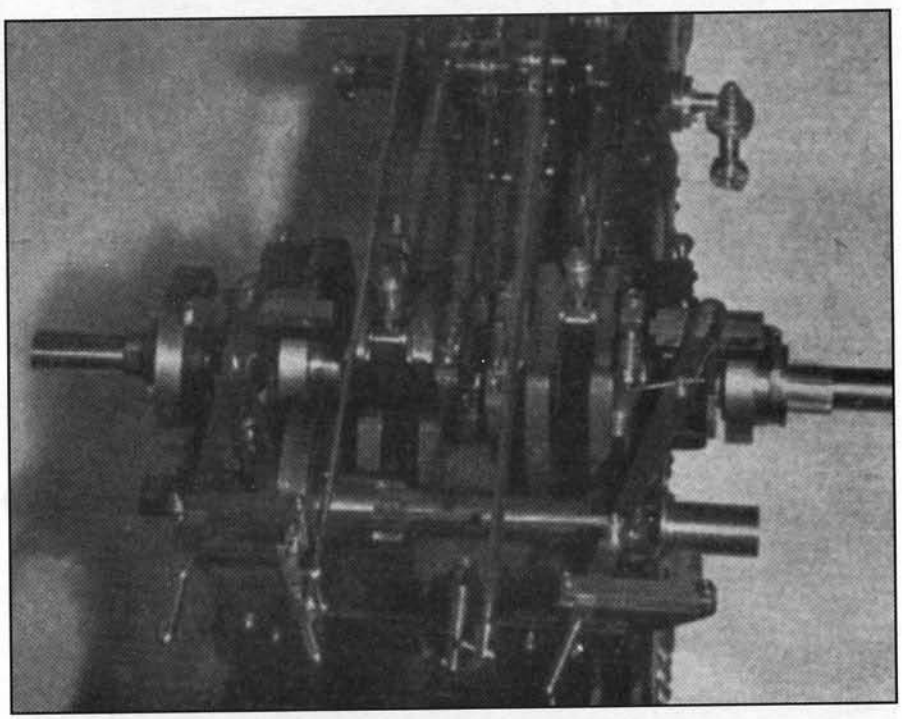


Fig. 3. View of motion and crankshaft from above

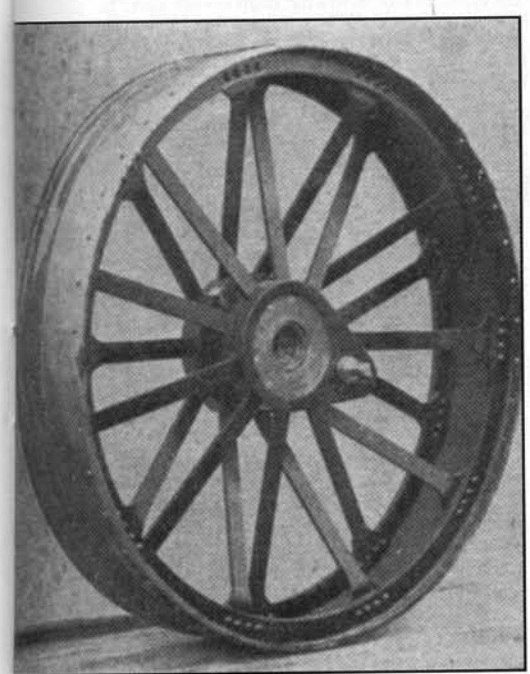
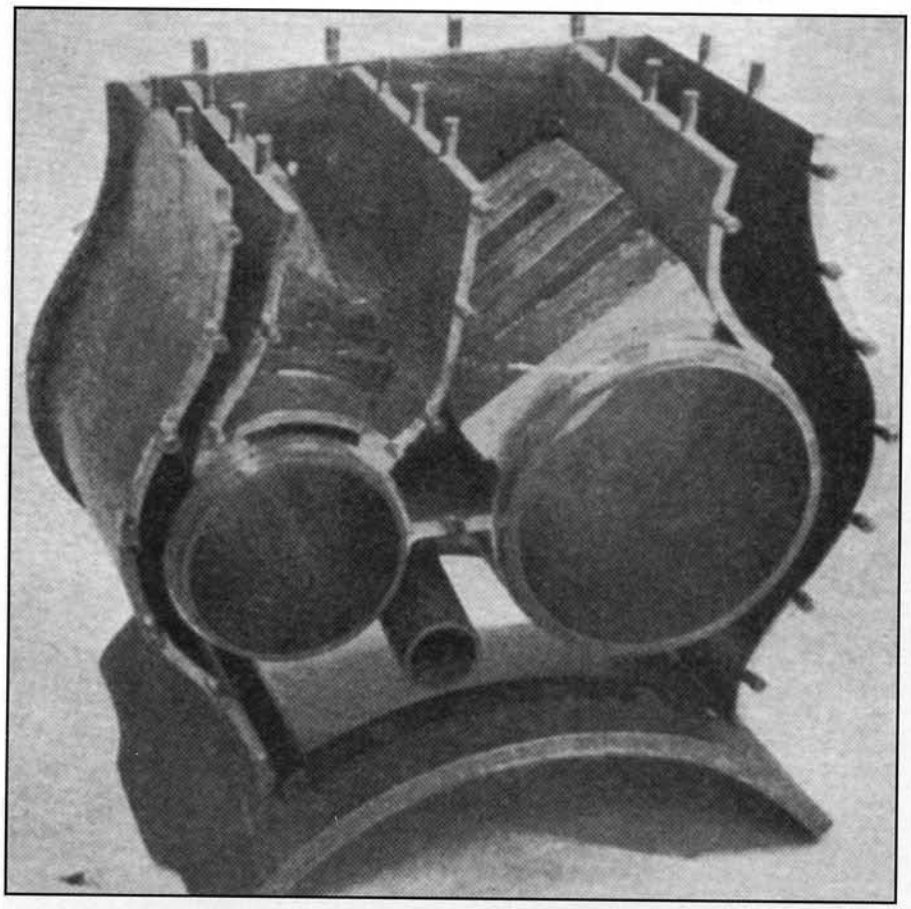


Fig. 4. Rear wheel not yet completely drilled for stakes. Note special lubricator between spokes

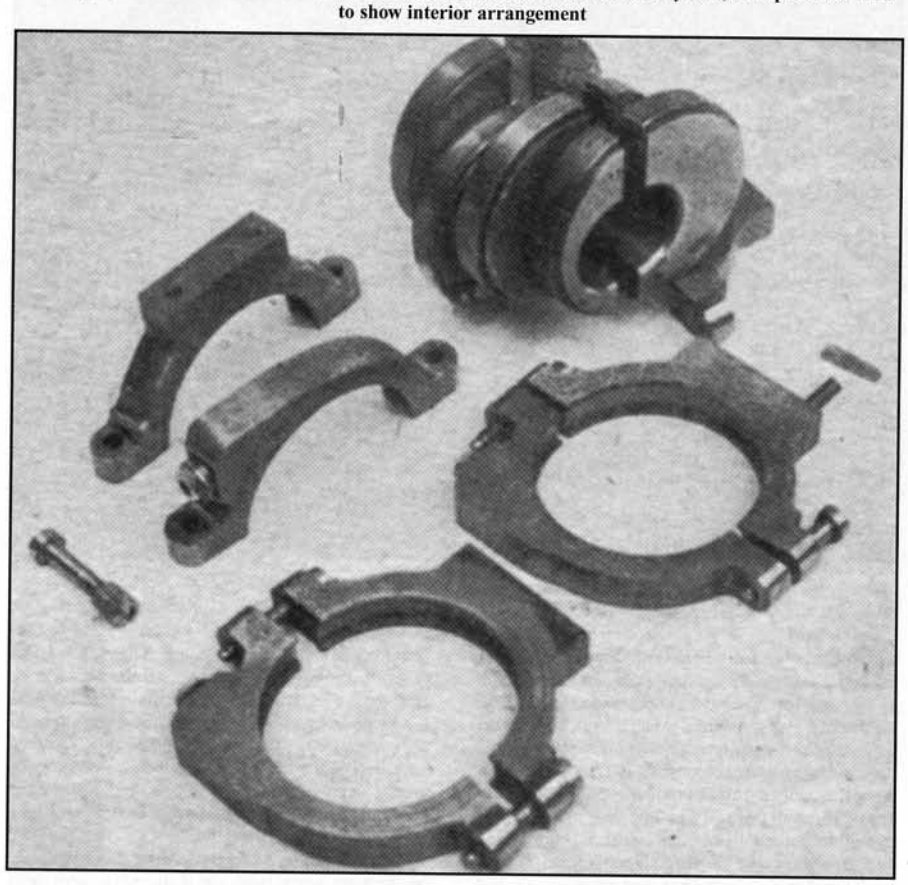
One might be tempted to think, after looking at the photographs, that Mr. Jaques has very ample resources in the way of materials and workshop equipment. Neither of these assumptions would be correct. Take but one example: the chimney cap; this was made from a piece of brass which once formed a circular union nut all complete with a full compliment of "C" spanner slots. The result of this was that it would not clean up to the required diameter; so it was taken from the lathe, the slots were cleaned out and a little piece of brass was fitted in each and silver-soldered.

As for equipment, this consists of an old Drummond lathe of 5in. centre height, an Adept hand shaper and a very light, homemade drilling machine. The handle of this drilling machine can just be seen sticking out behind its maker's head in the cover picture. The lathe has until quite recently, been treadle driven, but now it boasts a motor for special heavy jobs. Most of the turning is still done by footpower, which is preferred except for heavy work and milling in the lathe.

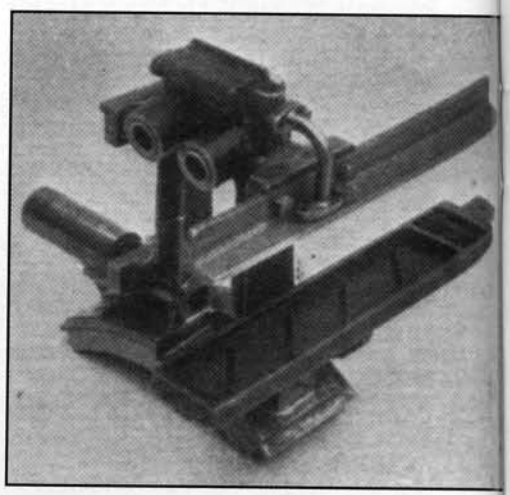
All the turning has been done on this 5 in. lathe, the smaller parts with the help of a very neat attachment specially made to fit in the spindle.



Photograph No. 23. Mr. R. S. Jacques' fabricated cylinders, from the chimney side, with plate removed to show interior arrangement



Eccentrics and straps dismantled to show correct method of construction



Cylinder side of the fabricated motion bracket and slide-bars

This attachment consists of a light spindle with cone bearings, which fits in the Morse taper of the lathe mandrel. The spindle is fitted with collets up to ¼in. and is driven by a shaft which passes through the lathe spindle and is supported in a bearing at the back end. Readers who are familiar with this design of lathe may remember that the flywheel is fitted with a gear drive which takes the form of a small spindle with a rawhide pinion engaging with teeth cut on the largest diameter of the flywheel. The spindle was intended to be driven by an electric motor and is mounted in ball-bearings; but our friend has reversed the process and the flywheel drives the spindle, on the end of which is fitted a three step pulley which, in turn, drives the small spindle above in the lathe mandrel.

To conclude, the preceding description and photographs were prepared some time ago and many readers in the north will have seen the engine turning over under compressed air at the "Northern Models Exhibition" in Manchester, last March. One major job which was still to be done when the photographs were taken was the flywheel, and few who saw the engine in Manchester appreciated the amount of work that had gone into that single component. Fowlers fitted a disc wheel, dished to clear the high gear pinion; it was made from a steel casting. The wheel in the small edition is made from the solid, and this involved a blank 10¼in. diameter and 3 in. thick weighing some 70odd pounds! The finished wheel weighs but a few pounds, though not all the metal removed was wasted. Careful machining enabled a ring to be cut off, and this forms a rim for one of the front wheels.

Next came the construction of the road wheels and the gearing, most of which work has now been finished. Before the road wheels were started, a set of bending rolls was made. Each teeing is formed of two strips of mild steel formed into a circle; one strip has to be rolled on edge and the other on the flat. After fitting together, the two rings are pinned, and the result is a nice strong wheel as seen in Fig. 4.

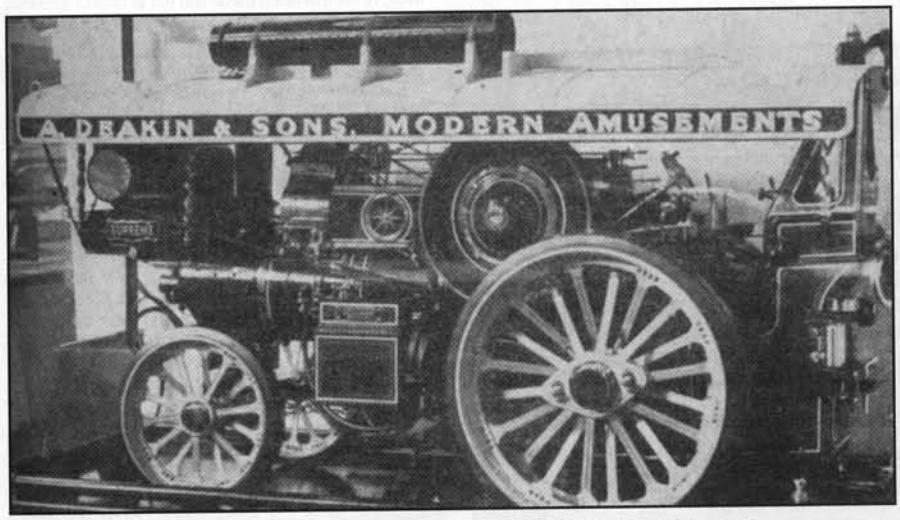
Finally, a few words about the photographs. No warning of my intended visit, with a camera, was given and this accounts for the somewhat untidy appearance of some of the parts. This could have been improved by the addition of a few nuts, split pins, etc.●

September 13 1956

The next Fowler model, to 1.5 inch scale by S T Harris, again went to the Science Museum. The text is from exhibition reports and leaves the reader in no doubt as to its quality. 'One of the most perfect models ever to grace the 31 M. E. Exhibitions so far held'

TRACTION ENGINES
at the M.E. Exhibition

W. J. HUGHES extols the virtues of a Fowler showman's locomotive



Sydney T. Harris' Fowler road locomotive SUPREME; 1½ IN. TO 1 FT

It is impossible to describe the 1½ in. scale Fowler showman's road locomotive built by Sydney T. Harris of North London without the use of superlatives. I had known for a long time that this would be an outstanding model, for Mr Harris has sent me pictures from time to time of various parts. It was obvious from these that the detail would be perfect, but the completed model surpassed all expectation.

The prototype chosen was the last showman's engine ever to be built—it left the Fowler works at Leeds in 1934 to the order of Mrs. Deakin of Brynmawr. The locomotive was called Supreme, and supreme she was in all the glory of her magnificent, but not garish, livery.

It is true that the very liberal chromium plating of her fittings did not meet with everyone's approval; many people prefer the warmth of golden brass to the cold bluewhite of chrome, but it was undoubtedly an extremely practical measure.

During the exhibition I returned to this model again and again, and in the course of close and detailed study I found it impossible to fault it at all.

I venture the opinion indeed that this is one of the most perfect models ever to grace the thirtyone M.E. Exhibitions so far held.

Mr Harris told me that the engine has been steamed, a good performance resulting; she has also run under compressed air for hours. Now, however, further steaming seems unlikely as the model is to go to the Science Museum at South Kensington—a most worthy destination.

Much of the detail work is hidden, of course, as on many models—for example the fully compensated springing mechanism for the hind axle and the interlocking mechanism of the threespeed gear. Visible detail included beautiful scale model steam valves and bibcocks, finely engraved nameplates (including a cover plate for the adjustment of the spring gear), a road licence ¾ in. in diameter and a tool kit. It contains a miniature oilcan less than 2 in. long.

For display purposes part of the canopy has been fitted with Perspex, so that the motion can be seen from above, and so has part of the splash-cover over the crank pit. In addition, mains strip lighting is fitted under the canopy at each side for the same reason.

The model has been built from works drawings of the prototype—and the dynamo is also to the maker's drawings. The body of the painting was done by Mr Harris, but he decided that the lining and lettering were best left in expert hands—a wise decision, in my opinion, for it would have been a crime to risk spoiling the model's perfection. Even here, however, Mr Harris supervised he work personally, and made jigs to assist in lining the flywheel and some other parts.

Tyres too were specially made, and the chromium plating and engraving of the name plates were done commercially, though Mr Harris supplied the plates and drawings for these. The pressure gauge, though a "trade" one, had to be altered considerably to suit the model. Apart from these few examples, the work (six years of it!) on this magnificent engine was Mr Harris' own. ●

February 4 1960

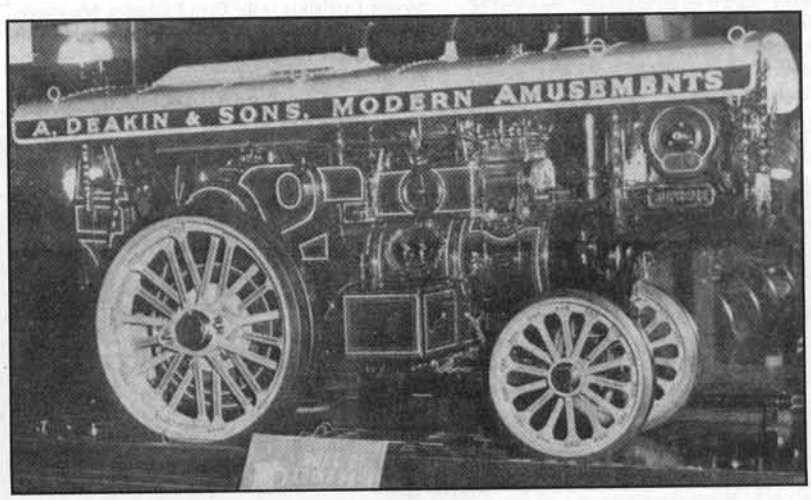
DUKE OF EDINBURGH CHALLENGE TROPHY

By LESLIE B. HOWARD

Once in a generation a model of such excellence is produced that, despite the high quality of anything with which it competes, it remains in a sphere of its own. To this exalted category belongs the magnificent 1½in. scale Fowler showman's engine Supreme built by S. T. Harris (London NW2). It was no surprise that it gained the senior award at the National Models Exhibition.

The greatness of Mr. Harris' engine lies in a happy combination of two factors—a keen eye for intricate detail and a true craftsman's hand in the construction. Only such a combination could produce masterpieces like fully compensated suspension for the rear axle and scale steam valves and bibcocks.

Very rightly, this brilliant example the model engineer's craft is now in the Science Museum. ●



November 15 1968

The third model was 16 years in the making, made all the more remarkable when you appreciate the age of the builder. It was modelled from a Fowler kept locally to Mr Formilli, which is now no longer with us. By my calculations the prototype must have departed this world in the early fifties, not an uncommon occurrence at the time. Hughes is very matter of fact about it all 'both these engines were cut up, and Mr. Formilli was able to check the correctness of his hidden detail', a little macabre. Mr. Formilli seemed to be a great believer in stainless steel, including the fabricated cylinder block and the flywheel.

TALKING ABOUT STEAM

A fine 3 in. scale Fowler Showman's engine

Described by W. J. Hughes

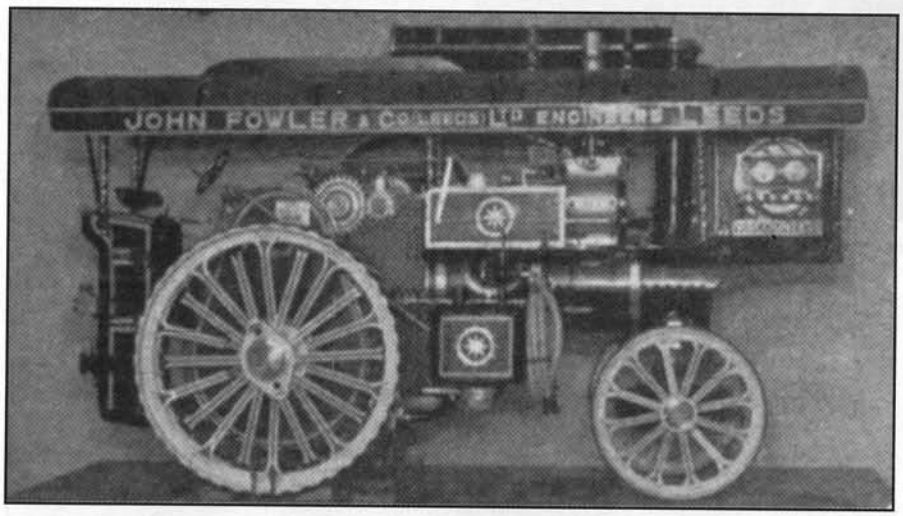


Fig. 1. Mr L. G. Formilli's 3 in scale Showman's engine

Sixteen years ago, Mr. L. G. Formilli of Sale, Cheshire, started on an ambitious task—that of building a 3 in. scale model of a Fowler Showman's engine. Today, at the age of seventy six, he has just completed it, long after he had thought the job would be finished.

This is a very big model, with a length of 5 ft. 3 in., a width of 1ft. 11 in., and a height of 2 ft. 9 in.

I first saw the model in 1955, at the Northern Models Exhibition in the Corn Exchange, Manchester, when it appeared as in Fig. 3. As a result of three years' work, the boiler shell/hornplate assembly was complete, and so was the front end. The tender was nearly completed, Figs. 4 and 5, and could be hung temporarily in place, as could the belly tank.

The hind wheels were almost complete, too, and some of the bearing brackets and other smaller components were assembled temporarily. The inner firebox assembly, Fig. 6, complete with foundation ring and firehole ring, was ready to be inserted into the outer shell.

For his sources of information, Mr Formilli was using my general arrangement blueprint No. T.E.5 (as obtainable from Model Engineer) and also a Fowler Spare Parts Catalogue which contains illustrations of assemblies and separate parts. In addition, Mr Formilli had access to Fowler No. 9720, Viscountess, which was owned by nearby nurseries and used for sterilising soil, as well as another local engine which was hired out to the Cheshire County Council. Subsequently both these engines were cut up, and Mr Formilli was able to check the correctness of his hidden detail.

Reverting to the boiler, the barrel was made ⅛in. thick, being machined inside and out to correct diameter, from a piece of surplus Admiralty high pressure cold-drawn steel tube about ⅝ in. thick. The hornplates are also ¼ in. thick, and these were machined on both sides from ⅝ in. thick steel plate. This machining of the plates and barrel ensured that, later on, the lining up of cylinders and motion, and their squaring with the shafts, was made much easier.

The boiler front (backhead in locomotive parlance), throatplate, and smokebox tubeplate are from ¼ in. steel plate, and their flanges were fabricated by electric welding on a strip of metal on edge, with a good fillet built up in the seam as sketched, Fig. 7. In way of the hornplates, the lower part of the barrel was cut away, as in Fig. 7, the two " flaps " made flat, and the hornplates riveted to these and to the throatplate. At its upper, curved edge, the latter is flanged forwards and riveted to the underside of the barrel. The boiler has been tested to 300 p.s.i.

The firebox wrapper is made from ⅛in. thick copper, with the tubeplate and firehole plate flanged up from ¼ in. copper plate. The four twin roof girders are cut from phosphor bronze, with spacers riveted between and secured to the roof with 0 BA bronze bolts and nuts. There are 18 copper firetubes,¾ in, o.d. by 16 gauge, which are screwed in and expanded into the firebox, but expanded only at the smokebox end. The smokebox shell is ¼ in. thick steel, turned as the boiler barrel from thicker tube.

Builtup cylinders

The cylinder block is fabricated from stainless steel, with all the parts electrically welded together using stainless welding rod. In Fig. 8, the various components are seen (with a mirror behind the low pressure port block to show how the exhaust passage comes right through), and Fig. 9 shows the cylinders with the port blocks and passages welded on. Note that in order to ensure an adequate exhaust for the low pressure cylinder, there is a passage taken right round the cylinder, as well as one discharging to the right. The exhaust pipe to the chimney base is welded into the gap between these two passages.

Fig. 10 shows the next stage in fabrication, with the three vertical webs, the cylinders, port blocks and passages all welded together. The two outer webs form the inside walls of the steam jacket (note the slots above to allow the live steam to pass into the steam dome), whilst

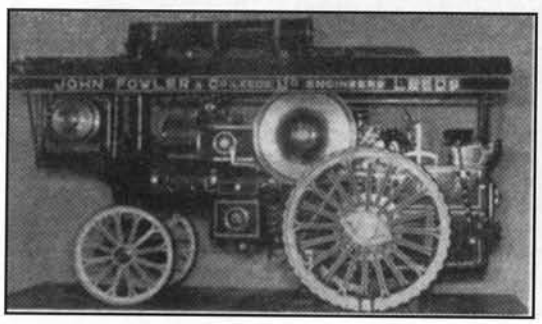


Fig. 2. Near side of the model Showman's engine.

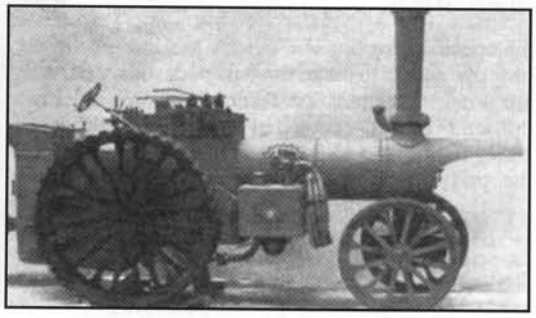


Fig. 3. The engine as it appeared in 1955.

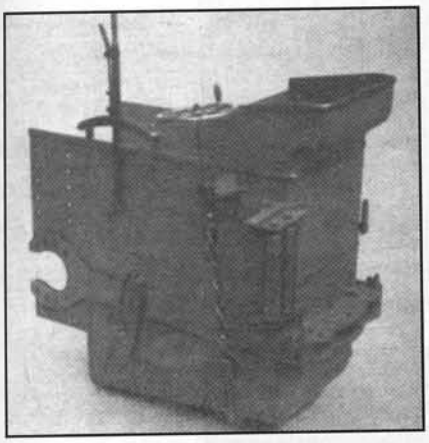


Fig. 4. The tender, as it was in 1955

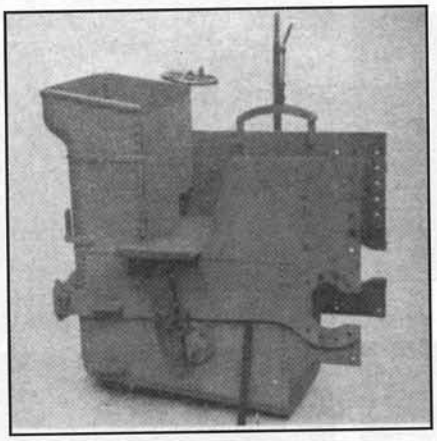


Fig.5. Another view of the tender, showing footplate, steps and drawbeam

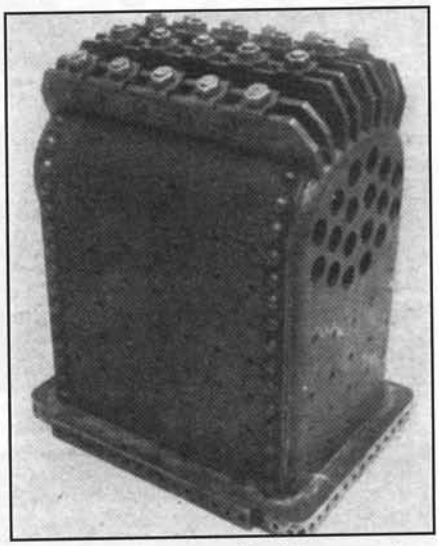


Fig. 6. The inner firebox, with girder crown-stays, is a close copy of the original.

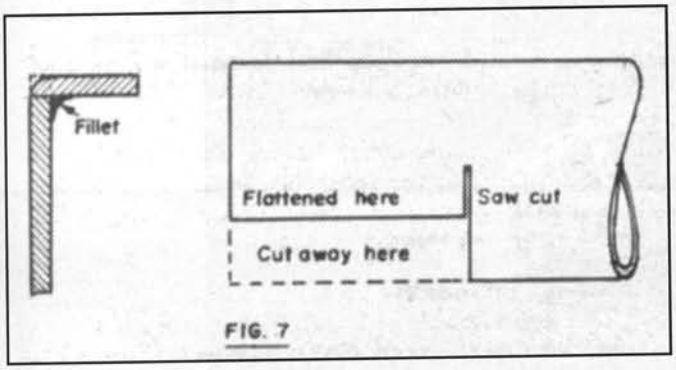
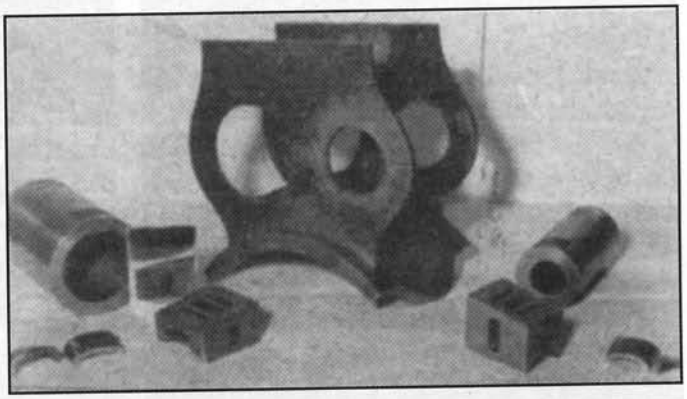
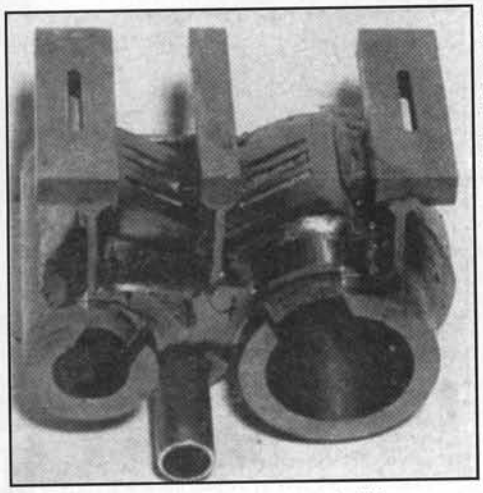
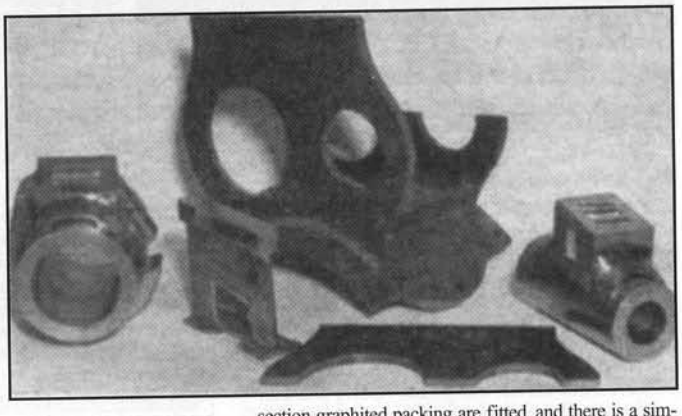


FIG. 7





Figs. 8-10. Three stages in cylinder construction. Top right picture shows the cylinder barrels, port blocks and passage covers. Right: passage covers welded to barrels and central web of block. Bottom: Left: The complete assembly viewed from the chimney



the inner web forms the partition between the high pressure and low pressure valve chests. Reverting to Fig. 8, it will be seen that this web has an orifice through which the high pressure exhaust directly discharges into the low pressure chest. which thus acts as the receiver. Fig. 10 shows the assembly from the chimney end, with the exhaust pipe beneath.

Final assembly consisted of inserting the cylinders into the partly built-up outer casing, adding the outer walls of the steam jacket and the upper coverplate, and fitting the various bosses for valve stuffing boxes, cylinder drains, and the like, and completing the welding.

Following this, the block was clamped by its saddle to a large piece of cast iron, of which the upper surface had been machined to the same radius as the boiler barrel. In turn the cast iron was clamped on end to the table of a vertical borer, and the cylinders were jig bored to final diameters and spacing.

The bores are in fact 1¼ in. and 2¼ in., and the stroke is 3 in. Phosphor bronze pistons with square-section graphited packing are fitted, and there is a simpling valve to allow high pressure steam to be passed direct to the low pressure receiver when extra power is needed temporarily, or if the engine has been stopped with the high pressure crank on dead centre. This is controlled by the usual button on the footplate, Fig. 13.

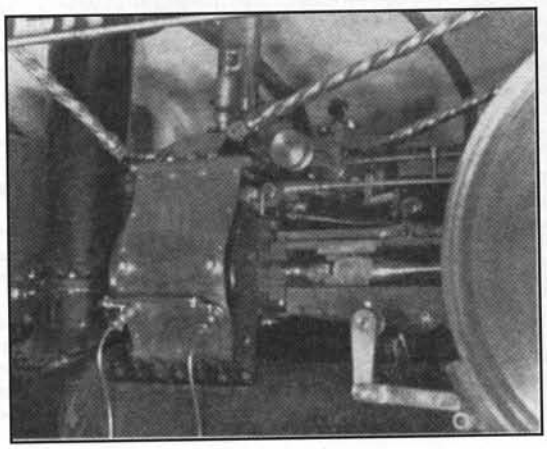


Fig. 11. Cylinders and motion, with side-cover removed. The simpling valve is below the governor pulley.

Stainless steel motion

All the moving parts and the control levers and rods, Fig. 13, are made from stainless steel, and are correct copies of the prototype components. The governor is also of the correct Fowler design, and works properly, whilst the same applies to the displacement and mechanical lubricators.

Besides the cylinders, fabrication was used extensively for other parts: in fact no castings were used at all. This includes the flywheel, builtup from stainless steel to the correct Fowler "dished" appearance, the motionplate, the wheel centres and the perchbracket, turntable and fork of the forecarriage.

The three speed gearing is true Fowler, with the interlocking levers to prevent more than one gear being engaged simultaneously, Figs. 12 and 13. As an example of its size, the spurwheel of the final drive, on the compensating centre, is 13 in. dia., with teeth

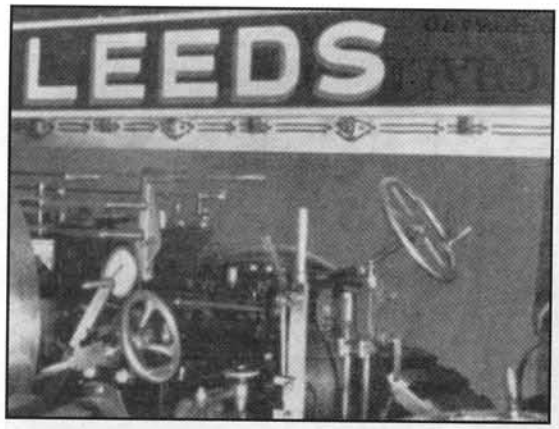


Fig. 12. A view of the controls

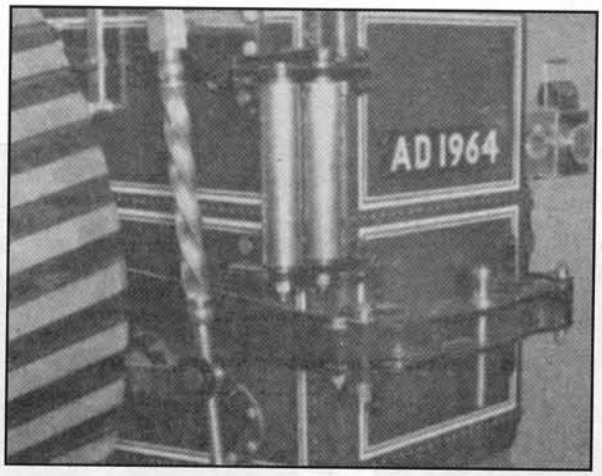


Fig. 14. The tender, showing the brake screw, drawbar and rear lamp.

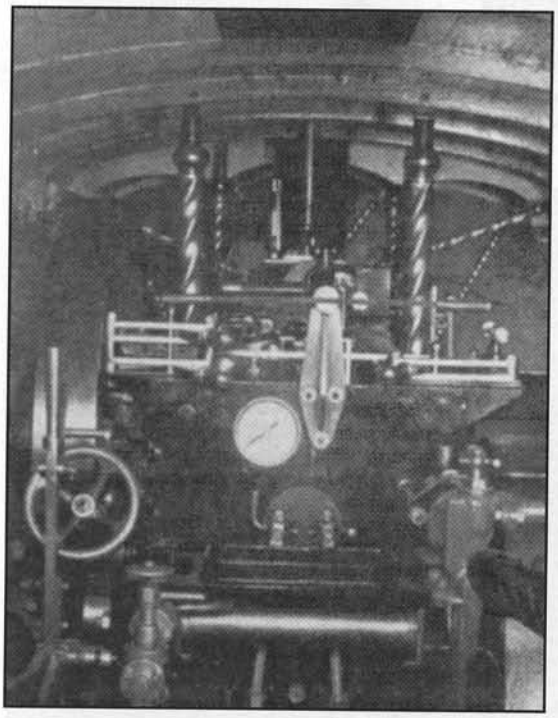


Fig. 13. The controls seen from the tender. Simpling button between left-hand gear levers.

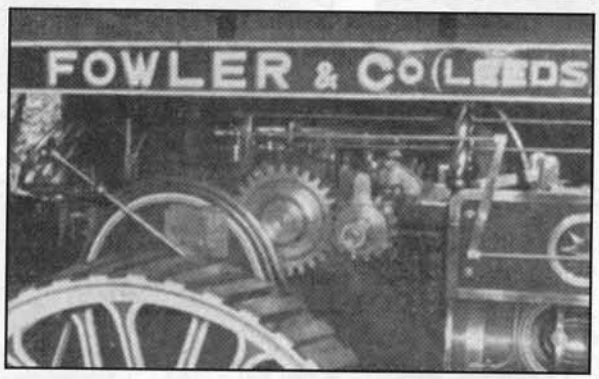


Fig. 15. This view shows the steering wheel and gear casing.

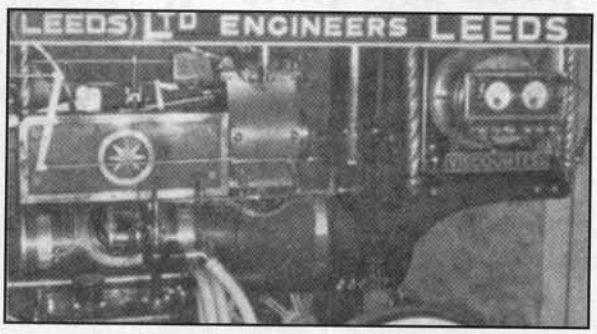


Fig. 16. Motion cover, dynamo and control board.

¼ in. wide. The compensating gear (differential) has two bevel pinions, which is true to prototype. They are cut 6 d.p.

Another piece of mechanism reproduced exactly (though unseen on completion) is the Fowler hind axle-springing with double leaf springs below the axle. These have the scissors action compensating levers of the original, and the hind axle and third shaft are connected by links with the bearings, sliding in channelsection horncheeks bolted to the hornplates. To allow for this vertical motion of the third shaft, the spur wheel of the second motion gearing is connected to it with a universal joint or Oldham coupling.

Construction of tender

The tender, Figs. 4, 5 & 14, and belly tank are constructed from 10 gauge steel sheet, flanged and riveted, with the correct number of rivets on each, all perfectly aligned and at the correct centres. The two tanks are connected by a compensating pipe, but as Mr Formilli has no intention of putting water in the belly tank, the cock in the pipe is kept permanently closed. In the tender the tank is bituminous enamelled inside to prevent rust.

Each hind wheel carries an angle ring on which the brake blocks bear. The shaft carrying these passes through a transverse tube in the tender water space, and the operating shaft screw has a square thread. In addition to these brakes, a flywheel brake is fitted, whose handwheel can be seen between reversing lever and flywheel in Figs. 12 and 13.

The canopy was built using my drawing No, T.E. 5(a), but without the crane attachments. Cross members of steel angle were bent to the shape of an aluminium template, and these are covered with ¼ in. thick tongued and grooved mahogany boards. These in turn are covered outside with fine canvas, painted dull black.

Steel stays support the canopy, and these are encased with highly polished and lacquered twisted brass.

Mr Formilli's canopy has a sliding ventilation panel, and carries the extension chimney in chocks. On the inside of the name boards there are 18 light bulbs, connected in parallel, which are supplied by the generator via a switchboard, carrying voltmeter, ammeter, and tumbler switches, Fig. 16.

The dynamo is actually a 12-volt car dynamo, built into a scale size casing, supplying about 15 watts.

Finishing

Polished brass stars and rings embellish the motion-plates and the sides of the belly tank. The usual "hot parts"-chimney, smokebox, firebox, etc., are painted black, with the main body in maroon, lined out with double lines in primrose, which is also the colour of the wheels.

The five nameplates were made by cutting out the individual letters from brass sheet and sweating them to backplates. On the canopy sideboards is the name of the Leeds firm, in letters 1½ in. high, coloured in primrose and shaded in blue. These were painted on thin paper, cut out with a sharp knife, stuck in place, and varnished. The road lamps—two white and one rear—are fitted, and these are oil burning with adjustable wicks.

For ease of handling, the engine—which weighs over 7 cwt.—is mounted on a duralumin table strongly supported by angle, and carried by six legs fitted with large castors. This proved very useful when I came to take my photographs. Incidentally, to take those of the whole engine, I had to go out into the front garden and focus through the window, which was the only way to stand far enough away!

The reader may have noticed that on these photographs no steerage chain is shown. The simple answer is that none has yet been fitted, as Mr Formilli was not able to find any suitable chain commercially available, and he was contemplating having to make his own. However, thanks to Arnold Throp of Dore Engineering, I have been able to put him in touch with two or three chain makers, and probably by the time this appears in print the chains will be fitted.

Mr Formilli has steamed the engine several times, with anthracite as the fuel. For this purpose he has fitted a jack to the table, by means of which the hind wheels may be lifted clear of the surface. Thus the working of the gears, gearchange and interlocking levers may be demonstrated, as well as the differential action. All runs very smoothly, including the engine motionwork.

It is found that at 75 p.s.i. plenty of power is developed, and even as low as 30 p.s.i. (when the low pressure cylinder cannot be doing any work at all) there is enough current and to spare for the canopy lights.

Mr Formilli asked me to make it clear that he had assistance with some of the heavy machining—for example, the jigboring of the cylinders—but that the smaller work, including the fitting, etc., was all his own.

I feel sure that readers will agree that to build this fine model is a great achievement, especially through a man's sixties and well into his seventies. It is, incidentally, Mr Formilli's first, and last, model, but it makes one wonder just what he would have achieved had he made a start twenty or thirty years earlier. ●

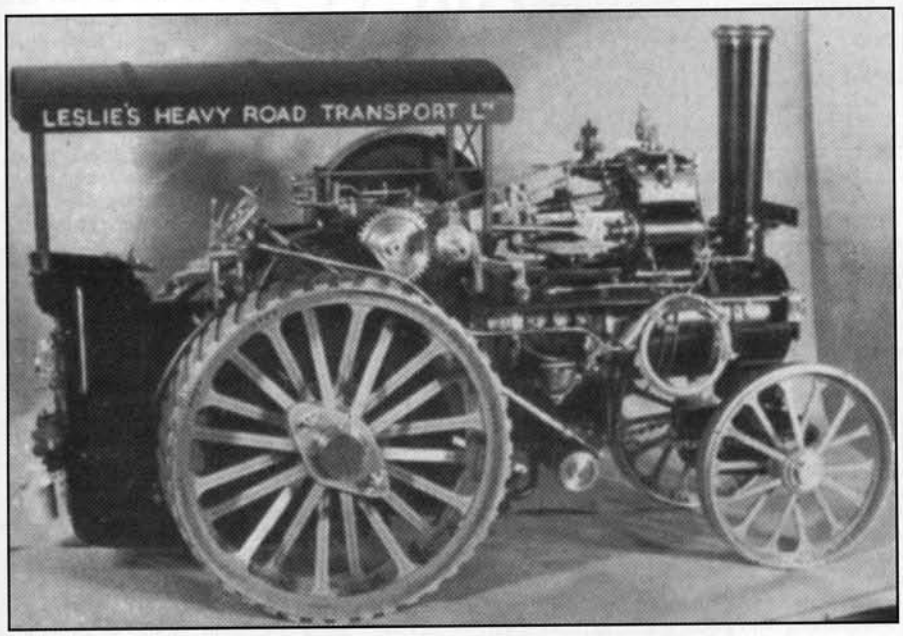
March 7 1969 & April 30 1953

The last Fowler is that of Mr Leslie Tatlock. Mr Tatlock chose to cast his block, an impressive feat in this relatively small scale, Mr Tatlock himself making the sand boxes up and assembling them at his local foundry

TALKING ABOUT STEAM

ANOTHER FINE 'BIG LION'

described by W. J. Hughes



It was quite a coincidence that at the time I was writing about Mr Formilli's 3 in. scale Fowler Big Lion (Model Engineer, November 15, 1968), Mr. Leslie Tatlock of Farnworth, Lancs., was writing to me to say that he had just completed his 1½ in. scale version of the Big Lion. The coincidence was the more remarkable because I had seen both these models for the first time at the same Northern Models Exhibition, in 1952, at which yet another very fine 2¼ in. scale model (likewise part finished) of the same prototype was being exhibited by Mr. R. S. Jaques of Boston.

I recall wondering at the time which of the three—the 1½ in., the 2¼ in., or the 3 in—would be completed first. In the event Mr Jaques "won" by several years, and his excellent model is now in the Science Museum at South Kensington and recently, of course, Mr Formilli came second by a short head—almost, a photo finish—from Mr Tatlock.

The chief part of the latter's exhibit at the 1952 exhibition was a display of the cores, core boxes and castings for the cylinder block of the engine. As will be seen from Fig. 3, which I took at the time, this was a very complex job, and shows that Mr Tatlock has little to learn about the art of patternmaking.

The castings were made at a local foundry, and the first block had a blowhole in a vital place. The foundry then gave Mr Tatlock carte blanche to mould his own and it took a week of spare time to get everything to his satisfaction, but the result was a perfect casting this time. The partly machined block can be seen on the extreme right of the photograph. The cylinder block (shown in the photograph) is made in this way, and another picture shows the core boxes and a set of cores to do the job. These were made by Mr. L. Tatlock, of Bolton, and were also seen at Manchester. This gentleman is not a patternmaker or moulder by profession, as one might imagine, but a textile engineer in business on his own account. (I understand he is also an inventor of some merit, but that is by the way.)

This display will perhaps make the amateur realise I was not talking through my hat! The items are, respectively, as follows: Coreboxes: (a) cylinder back, (b) underside of cylinder, (c) valve chest, (d) cylinder front, (e) steam cavity in underside of cylinder, (f) cylinder bones, (g) cavity in upper valve chest or dome. Patterns are (h) cylinder covers and (j) cylinder sides (the pattern for the other side of the cylinder is on the other side of this pattern). The middle line of various odd looking shapes are, in pairs, the halves for moulding the cores for the various steamways.

On the board in the front of the display is a set of the cores in sand, all baked and ready for assembly, and the whole assembly is seen, nearly off the picture, just behind the cylinder casting. Incidentally, when all the cores are made it takes a week to build them together since the assembly must be baked each time a separate piece is attached. And the patterns and boxes says Mr. Tatlock, took much longer to make than the cylinders did to machine !

Incidentally the casting which was a waster has been put to good use by Mr Lawrence Shepherd of Bolton, who is one of Mr. Tatlock's friends.

He managed to have the blowhole brazed up, and for some time now has been building 1½ in. scale showman's version of the engine, using Mr Tatlock's other patterns and drawings.

For many years Mr. Tatlock was in his own business as an engineer, but much of his work was in developing and building new machines for a large local firm. This did not leave him as much spare time as he might have liked, which partly accounts for the length of time taken to complete the Fowler.

Attaching the hornplates

The boiler and outer firebox were cut integrally from 14 gauge copper sheet, the development being in the shape of a fat letter T. The barrel was rolled, lapped, riveted and brazed, with the firebox sides extended

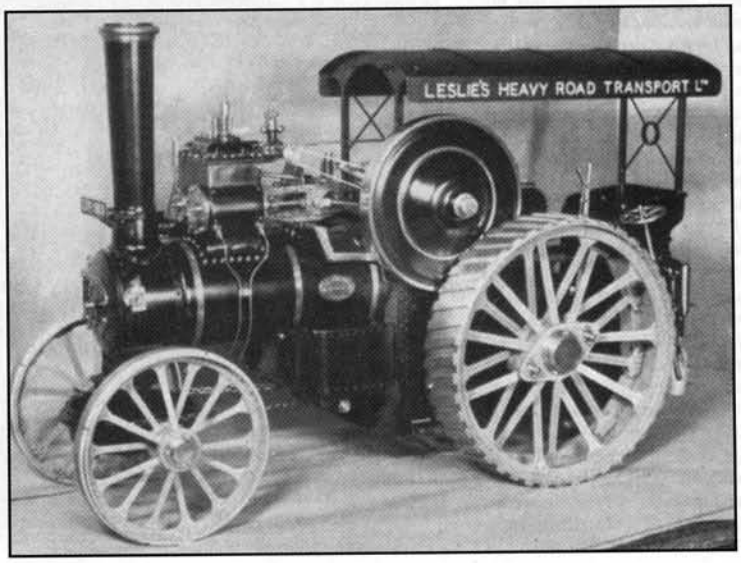


Fig. 2. Near-side view of the 1½ in. scale Fowler "Big Lion" built by Leslie Tatlock. The model won a Silver Medal at the M.E. Exhibition.

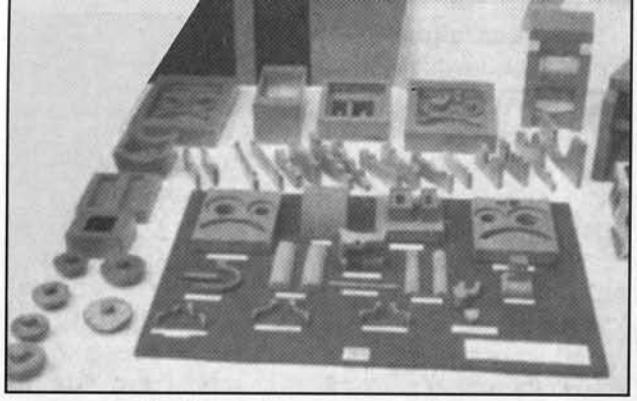


Fig. 3. The patterns, cores and Core boxes.

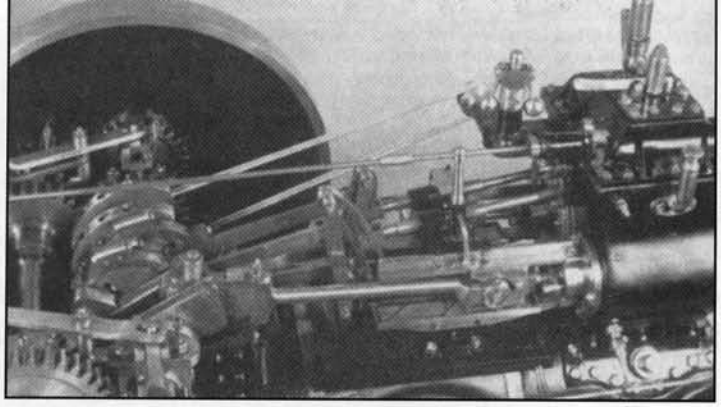


Fig. 6. The motion, seen from the offside and above. Note the govenor, dummy lubricator and cylinder drain cock.

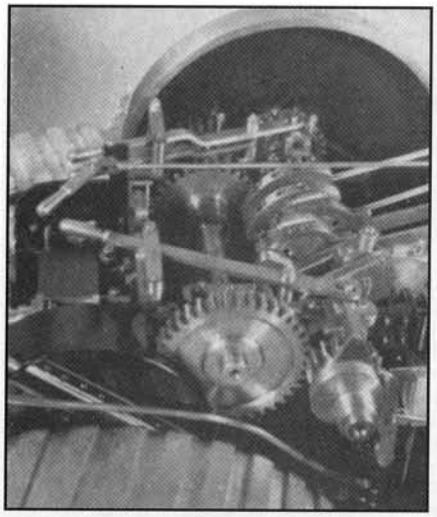
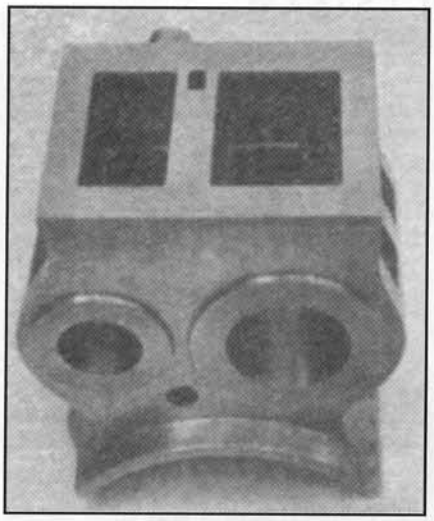


Fig. 7. A close-up of the gearing of the model Fowler "Big Lion" All the gears were cut by the builder, including the bevels of the compensating gear.



Fowler cylinders to 1½-in. scale, with all steam-passages cored out, by Mr. L. Tatlock. The port-faces are inclined forwards, as in the prototype, but not inwards as well.

downwards. In completing the shell and silver soldering in the inner firebox, five headed bushes were inserted in each side, in square formation with a central one, and passing through to the inner box interior.

These not only form extra strong stays, additional to the ordinary sidestays, but are also attachment points for the steel hornplates. Their heads were filed off very carefully until the offered-up hornplates lined up exactly and correctly with the boiler and the lines of motion.

Then with the hornplates clamped in place, holes were drilled right through and countersunk on the outside of the plates. Countersunk socket head screws now secured the plates in position, with nuts inside the firebox. It was not likely that they would need to be removed again, but of course they could be, should it prove necessary. Eighteen tubes ⅜ in. dia. were fitted to the boiler. A point of especial interest is that Mr Tatlock made his own pressure gauge, calibrated against a full-size one. It is, unusually. of the centre-finger type, with quadrant and pinion operation from the Bourdon tube.

The cylinders are compound, of course, with steam jackets and steam passages cast into the block. The port faces are inclined to line up with the crankshaft, but we not inclined inwards as in the prototype. In this scale, with the valve chest integral with the block, the double inclination would have been virtually impossible to machine.

The upper guide bars are angle section and the lower ones are troughs, as in correct practice. The governor is of correct Fowler appearance, too, but is used to control a piston valve, which works very efficiently. Twin spring cords drive the governor. The cylinder covers are stainless steel, but in general the motion work and other parts are mild steel, hardened where necessary.

Split main bearings cradle the crankshaft, which has balance weights strapped on to the crank cheeks. The big ends have split bushes secured by strap and cotter, and the eccentrics are split to fit between the cranks.

Three speed gear

All the gear wheels for the three speed gear were cut by Mr Tatlock, including the two bevel wheels and bevel pinions of the compensating gear. Since he had no "correct" method of machining the bevels, the latter had to be fitted finally by filing, but they mesh and run together very satisfactorily. The main gear ring of the final drive was cast in malleable iron, and after the teeth had been cut, the pins of the bevel pinions were set in small blocks which are riveted in slots cast in the main ring. The sliding pinions of the change speed gear all move on splines which were cut from the solid shafts, using a flycutter and indexing the shafts through 90 deg. for each spline. Corresponding slots in the gear centres were cut by planing in the lathe, and only slight touchingup with fine files was necessary to ensure excellent fits.

Chequered plating, with the diamond line pattern raised, is fitted to the footplate and footsteps. It was made with a single diamond shaped punch mounted in a flypress, with the plate moved forward a space for each separate impression. After a few of these, the tension would put a curve in the plate, which consequently had to be flattened frequently.

A water lifter is fitted on top of the belly tank, but is a dummy; the hose is a metal braid nylon tube. The steerage chain is homemade, with every link brazed at the joint. A bucket hangs from the drawbar; it was turned from solid dural, and sandblasting has given it a very realistic " galvanised" appearance.

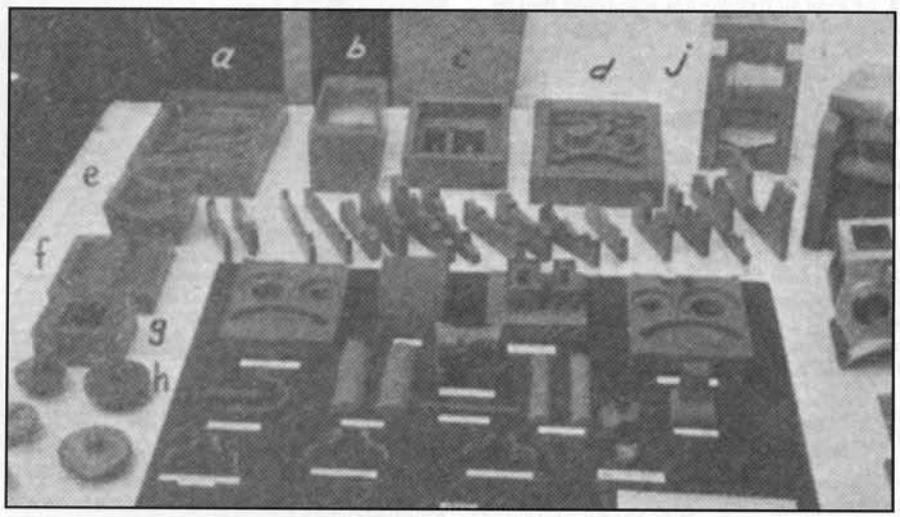
The canopy is made to lift off in one piece for easy driving, and the ends of the four supports fit into four tubular sockets. One of these may be seen in Fig. 6, at the front edge of the hornplate.

Paintwork

Vermilion wheels set off the rest of the engine done in black, which is further embellished by a nice—not too high—lustre on the bright steel parts, and the pleasant gleam of polished brass. The paint is from a local firm—Taylor's Lacquers, of Bolton (usual disclaimer)—and gives a good finish, stoved in an electric oven at a temperature of 220 to 250 deg.

An uncommon finish to the wheel rims is that they are hard chrome plate, but left dull. This looks quite realistic, yet seems to be standing up well to wear and tear. However, as the engine has not yet been steamed many times, it is perhaps too early to be dogmatic on this score.

To sum up, this is a handsome model of a handsome prototype. There are one or two omissions which will rather disappoint the purist: for example the lack of springing on the hind axle, and the interlocking gear for the gearchange levers, especially since the quality of the rest of the work shows that Mr Tatlock would have carried the out excellently. Nevertheless, this model made my journey to see it well worth while, and I look forward to seeing it again soon. ●



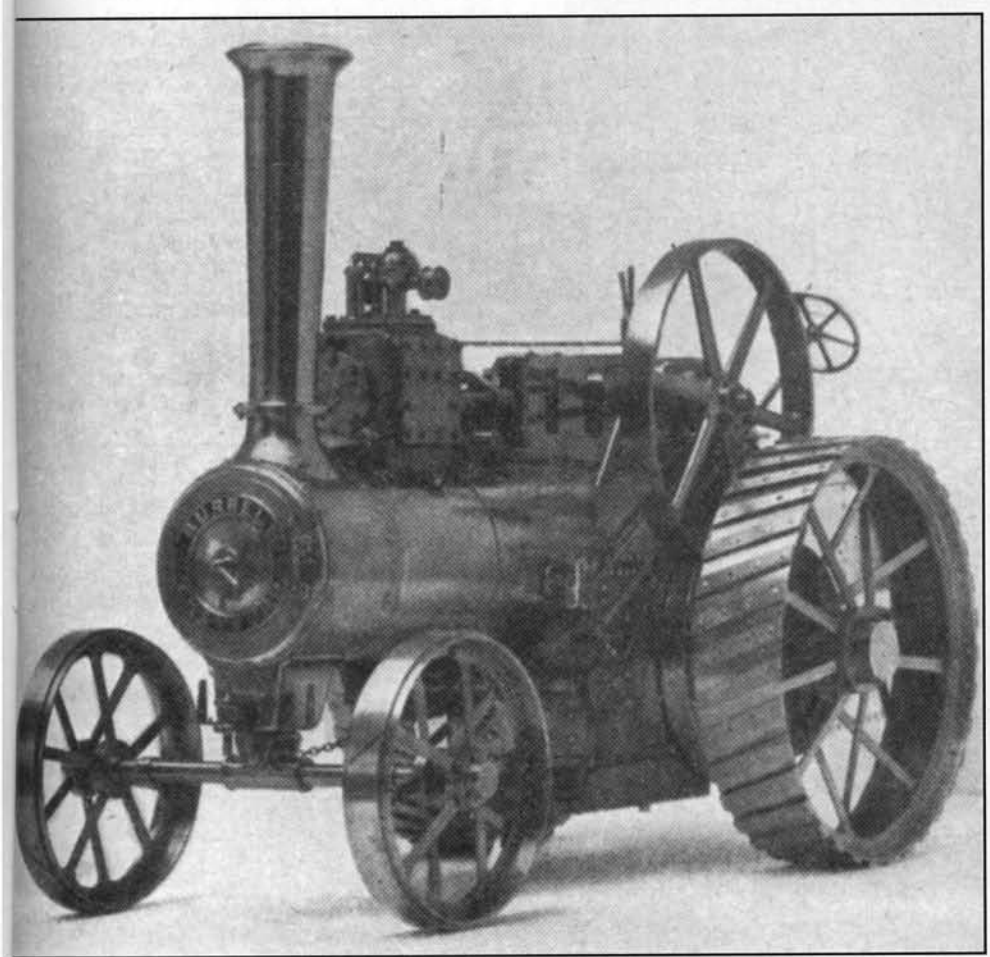
May 22 1952

If Fowlers were designed by an engineer then surely Burrells were fashioned by an artist. I have always felt Burrells to be pretty and well proportioned engines. There were a number of companies marketing drawings, among them the famous, now so sadly defunct, Bassett-Lowke Ltd. (A company of this name is still trading, but not in the traditional model engineering market place). The following article chronicles progress on one of their engines built as a first attempt by Mr. A. Newman. It seems that no castings were available when Mr. Newman started, so many of the parts were cut from the solid. The wheel spokes were 'spiders', a method now superseded by slotted hubs and individually fitted spokes. I inspected one of these Bassett Lowke Burrells at a rally a few years back and mistook it for a scaled down 'Plastow' design; the owner soon put me right! I think my error is understandable as the two designs do have a fair bit in common.

A 1½ in. Scale "Burrell" Traction Engine

A first attempt by A. Newman

(Photographs by courtesy of Bassett-Lowke, Ltd.)



AT a local model exhibition a year or so ago, I was so fascinated by two traction engines which were turning over smoothly on compressed air, that I decided to build a model myself. I possessed a lathe, but lacked the courage to start on anything in the nature of a working model. However, guided by my enthusiasm to own one of these delightful engines, I obtained from Bassett-Lowke Ltd. a set of drawings for a 1½ in. scale "Burrell" single cylinder traction engine. It was quite a simple design of an engine in use fifty years ago. The prints being prepared by an authentic designer were true to scale and gave plenty of detail. I also had the good fortune to find an old "Burrell" engine; although it was of a later type to the one I proposed to build, many of the parts were the same. The rims of the hind wheels were made up from two tee rings, held together by the strakes. I decided to follow this practice and after a good deal of thought a start was made on the wheels.

The local iron works were able to supply four mild steel blanks, 8 in. diameter by 1 in. thick. From this material I turned up the four tee rings for the rear wheels, two front wheel rims, winding drum and flywheel. The spokes were set out in the flywheel whilst it was still in the lathe and then put on one side until I was feeling energetic enough to drill, hacksaw and file it to shape. The hubs for the hind wheels were made from two pieces of 2½ in. diameter mild steel 1½ in. long, turned to the shape of a bobbin with two large flanges and a spigot at both ends, these being screwed with a fine thread for the plates which clamped the spokes in position. A pear shaped template made from 16 gauge material was inserted between the plates, then the hub filed up to shape, two bronze bushes being fitted to each hub.

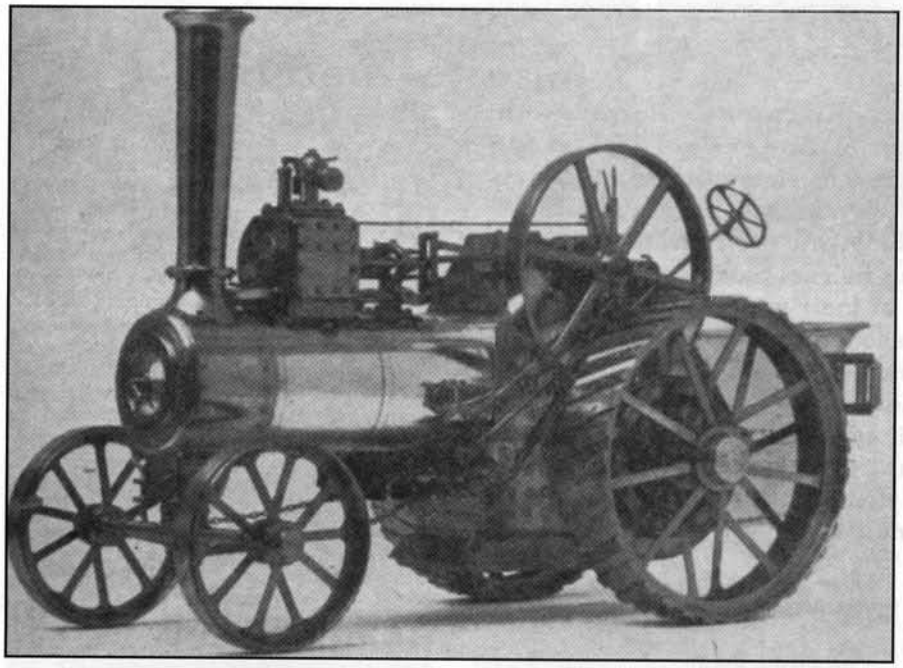
I cut four discs from 16 gauge steel to make the hind wheel spokes, two sizes of discs being necessary, as the rims were not central over the hubs. It is also worth while at this stage, to point out that three spokes in each wheel were longer, owing to the pear-shaped hub. By making a sketch of the wheel and bending some pieces of 16gauge wire to represent the individual spokes, I was able to determine the exact measurements. Two discs were riveted together, set up in the lathe and turned to the diameter of the longest spoke, then after making two cots 1 in. deep, with the hacksaw, a portion was bent back slightly over the face-plate and the discs turned to the size of the remaining spokes. It was an easy matter to set these out by using a changewheel as a dividing head and marking across the discs with a pointed tool. While still in the lathe, the centre was bored out to fit the hub. After a little exercise with a hacksaw, a file and some very careful bending, the spokes took on the appearance of four large spiders and were ready for drilling.

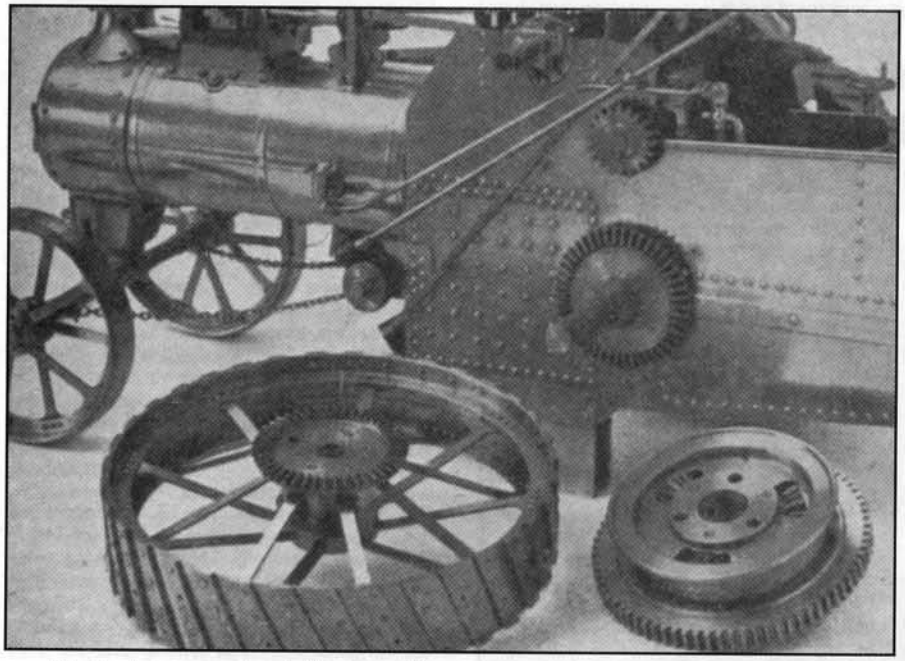
The next step was riveting. Approximately 200 mild steel rivets per wheel were used, but the problem was how to do it without too much noise. I overcame this, by replacing the hardened jaws of the bench vice by two pieces of mild steel 1 in. square and 8 in. long, which extended over the vice about 2 in. at each end.

These were drilled at the ends to take the various shapes of rivet sets, which I made from 5/16 in. silver-steel. A good deal of experimenting was necessary to get these tools just right, but once this was achieved the actual riveting operation was performed by just screwing up the vice.

There is just one more point I would emphasise before we leave the wheels ; when the strakes were fixed, the rivets were not cleaned off flush. I understand this was full-size practice and helped the engine to get a good grip when being demonstrated, although I have no doubt the old flint roads very soon wore them down.

I had two pre-war "Woolworth" hand-drills with nicely cut bevel gears, which were just the right size for the differential. The design called for a spigot on





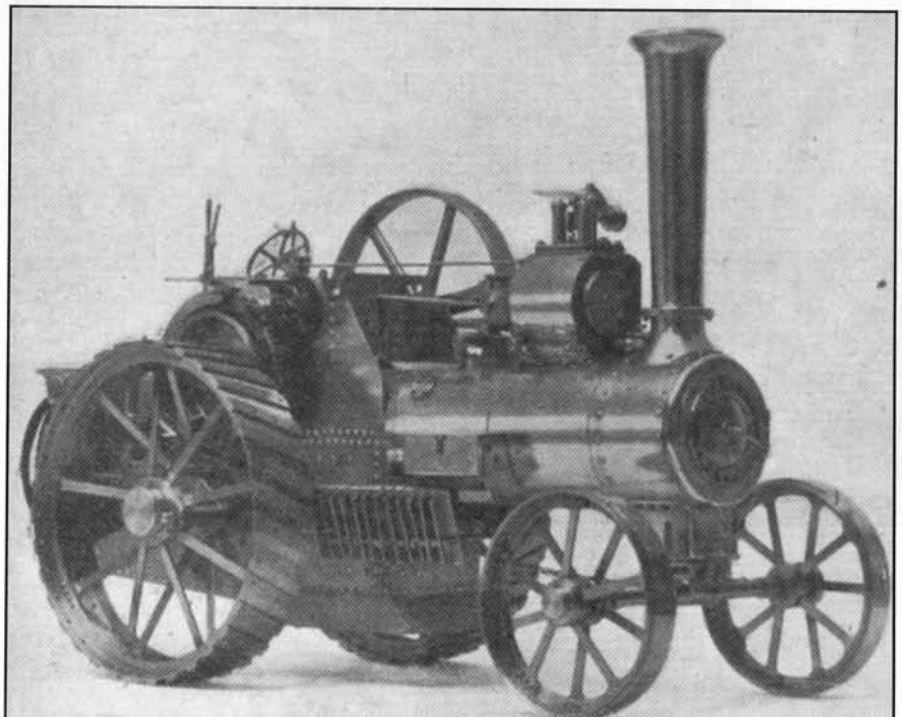
one of the bevels to support the winding drum; this was overcome by boring out one of the gears and screwing it with a fine thread on to a suitable piece of mild steel. After locking it in position, the whole thing was turned up to the drawing. The winding drum which also houses the pinions was bushed with bronze to avoid two pieces of mild steel working together.

Castings were not yet available, therefore I proceeded with the steel formers to make the firebox ends, the boiler throat plate and the front endplate. Paper patterns were cut of all the various pieces of copper required, This enabled me to cut them from the sheet with the minimum of waste. Copper, 16gauge, was used except for the tube plates, which were 14 gauge.

The hornplates were squared up and riveted together with a piece of card between them; this made it possible for me to machine the cut-outs for the crankshaft bearings at one setting. The hornplates were mounted on a large angle plate attached to the slide rest and bored out 1 in., as this was the correct size for the left hand bearing. Then the flycutter was set out in easy stages to cut 1¾ in. for the right hand bearing, and fed through until it cut into the piece of card.

I had to hold up the boring for the second shaft and rear axle bearings until I had decided upon the gears I was going to use. However, I found two lathe change wheels of 20 d.p. which were the correct size in diameter for the fast and slow gears, having 70 and 80 teeth respectively. The pinions with 25 and 15 teeth were cut from mildsteel. For the last drive, two more lathe change wheels of 16d.p. were obtained from an advertiser in THE MODEL ENGINEER. Before any of the gears were altered, I turned up two suitable bushes, with a large flange on them, these were soft-soldered to the hornplates and adjusted until the gears were in correct mesh. A drill was passed through the bushes to drill the holes for the second shaft and rear axle bearings.

The boiler was close riveted with 5/32 in. rivets, all scams being well tinned beforehand. The whole boiler was warmed up and tinned all over the inside before inserting the firebox which, of course, was silver-soldered. Eleven 7/16 in. tubes were fitted and the



The pad on the off-side of the boiler was for a check valve, so that the boiler could be fed by hand pump. Tis, however, was found to bw unnecessary.

5 B.A. copper boiler stays were screwed in at ½ in. centres. Finally, the boiler was tested to 125 lb. per sq, in. and showed no signs of distortion or leak.

The tender was made from 20 gauge brass sheet riveted up with 1/16 in. rivets to ¼ in. angle and caulked with soft solder.

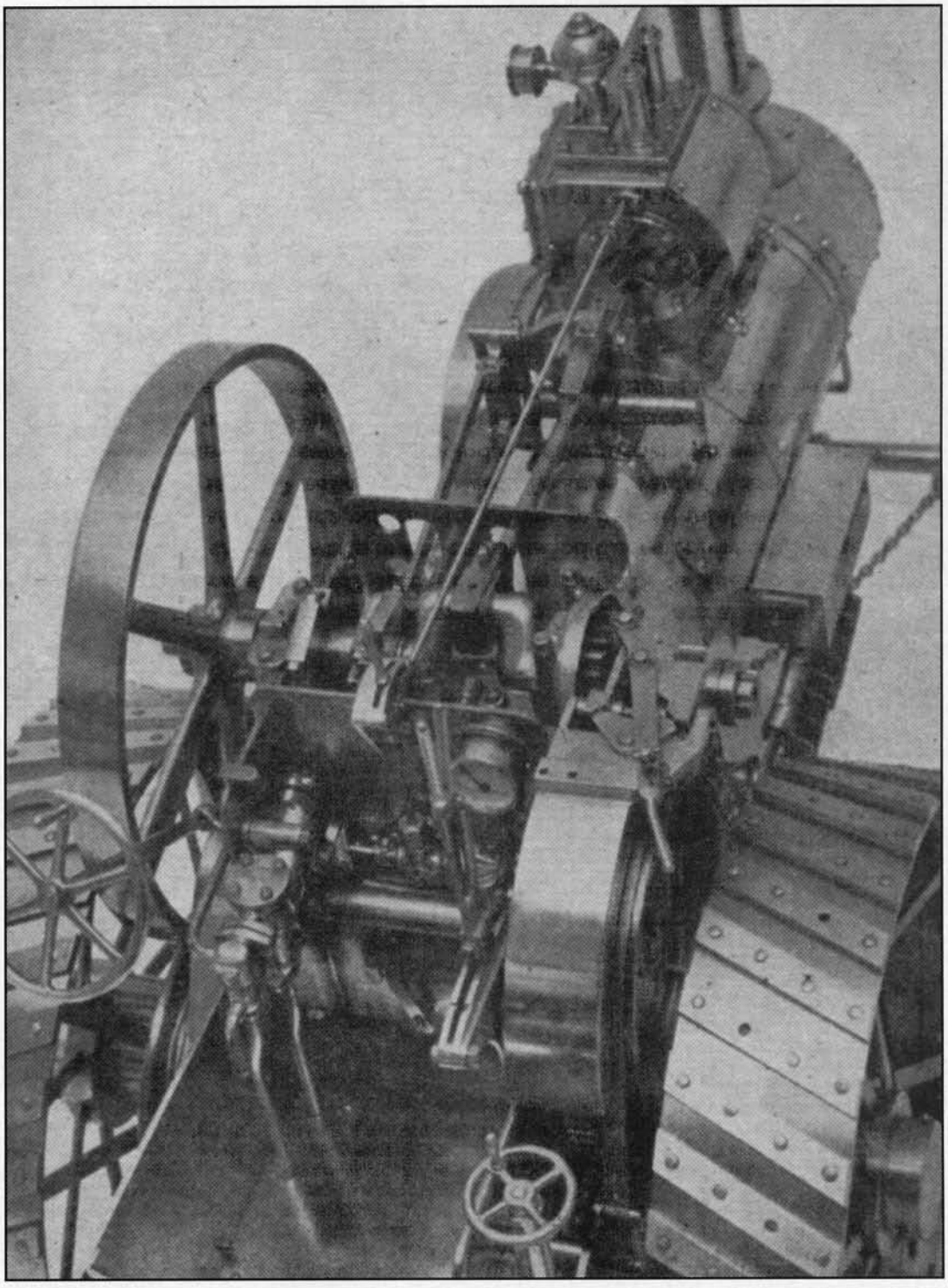
A bent type crankshaft was fitted on these old "Burrell" engines, but as the bends had to be so short I decided to cut the crank out and shape it up from ⅜ in. flat mild steel. After it was turned, the splines were cut by the "planing" method, the shaft being held between the centres and supported with a fixed steady. A suitably shaped tool was clamped in the toolpost and the saddle wound backwards and forwards. Only very light cuts were taken, so that with the tailstock taking the thrust, I avoided undue strain on the crank.

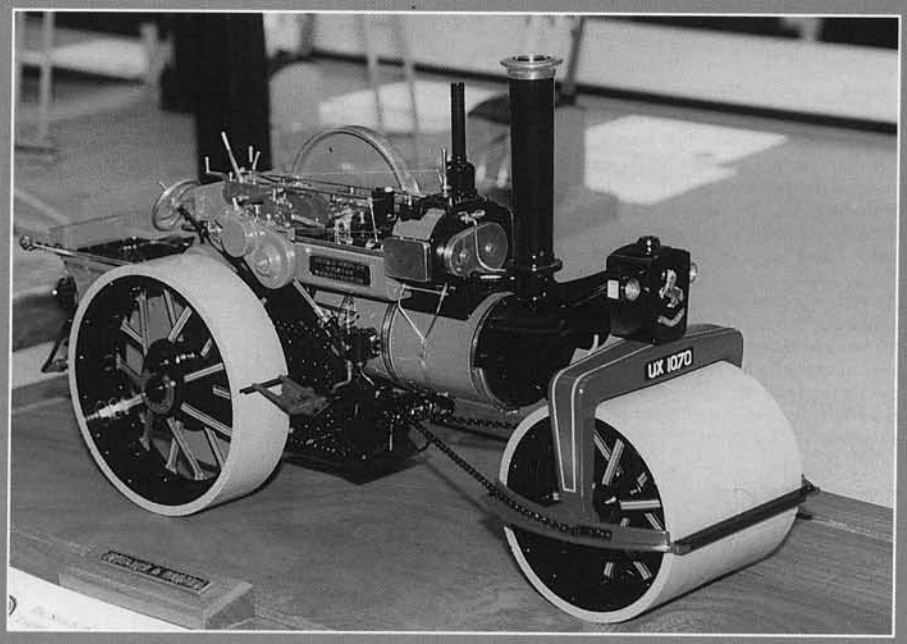
The castiron cylinder 7/16in. bore by 1⅛-in. stroke was a very interesting piece of work. As in the full-size model, it was cast complete with the mounting saddle and valve chests. The portface and also the ports were carefully machined in the lathe, with an end-milling cutter. Great care was necessary with some of the drilling which, because I did not possess a drilling machine, was also done in the lathe, with the cylinder clamped to the vertical slide. The casting was drilled at the base and tapped to take the blower valve. Stainless steel was used for the cylinder end covers, valvechest cover, piston rod, etc., and the screws were 7 and 10 B.A. throughout. A displacement lubricator made to the shape of the enclosed type governor was fitted, the pulley acting as the drain plug.

A water pump situated in the tender on the lefthand side was driven direct from an eccentric on the crankshaft.

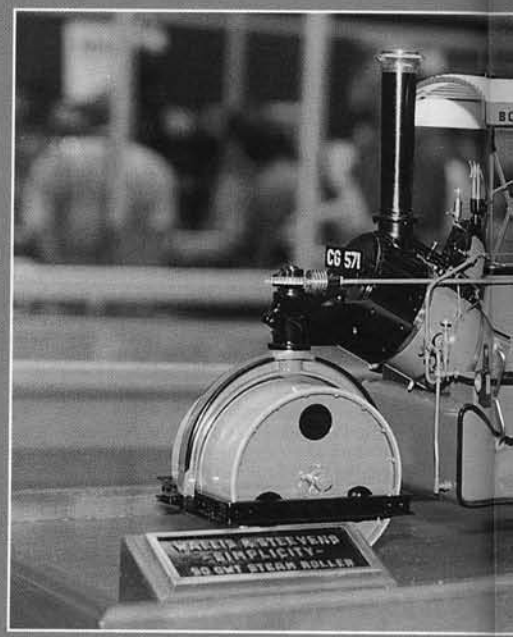
The engine steams remarkably well. When the first trials were in progress, my 8 year old son invited his friend to bring round a four wheeled trolley. This was not a very easy running affair, and when they sat in the contrivance the small wheels sank into the rough grass. However, in spite of the handicap, the engine pulled away quite easily.

In conclusion, I should like to thank the members of the Oxford M.E.S. for their advice and information, which made the construction of this model so interesting. ●



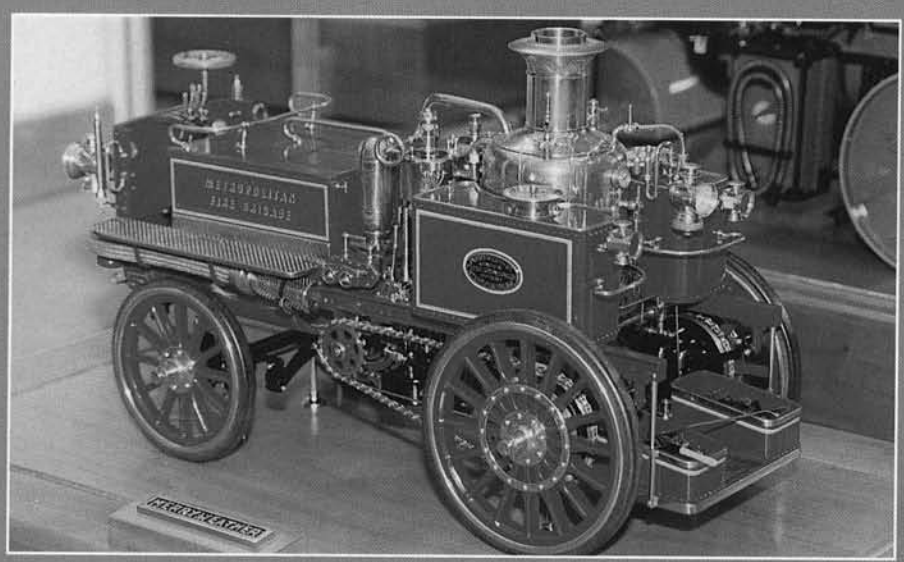


Aveling and Porter 10 ton Road Roller Compound No. 14277 as in 1931.

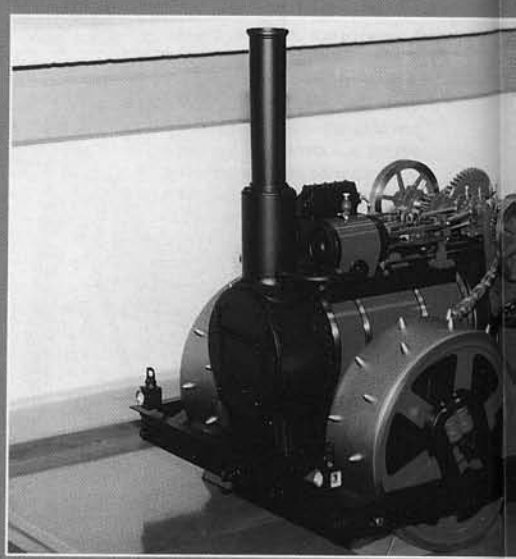


A Wallis and Steevens Road Roller of 50 cwt "SIMPLICITY"

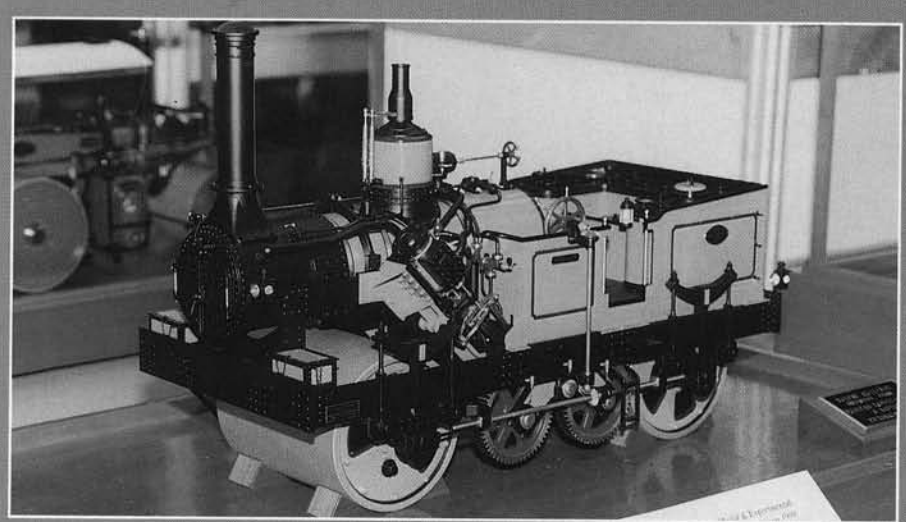
Some of the models mad



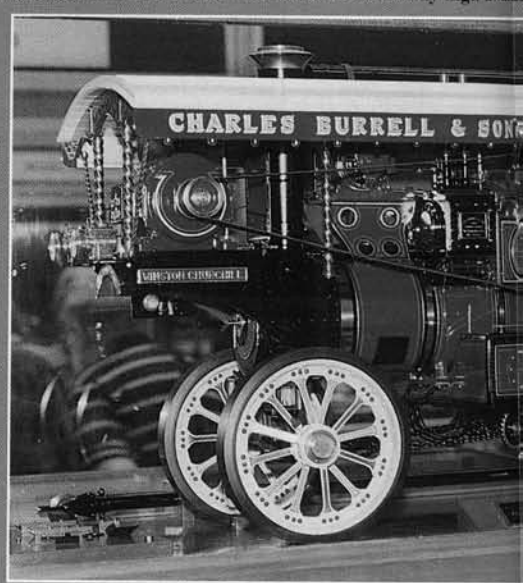
A Merryweather self propelled Fire Engine of 1905. It is steam driven with a twin cylinder engine driving twin pumps 1n 1/16 scale.

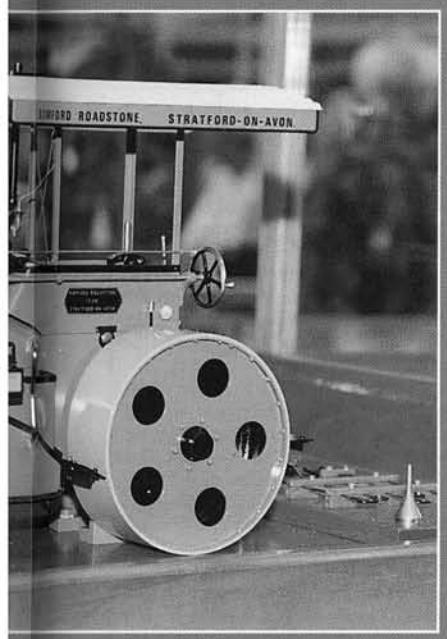


A 25 ton W F Batho Road Roller of 1870. The only available in some line drawings in the Proceedings of the Institute of Mech success, unlike the model which has received many high awards



Eugene Gellerat's 23 tonne Roller of 1881. This model required 6,600 hours in the construction and contains 6,700 parts. All the cocks and taps are operational. Scale 1/16.

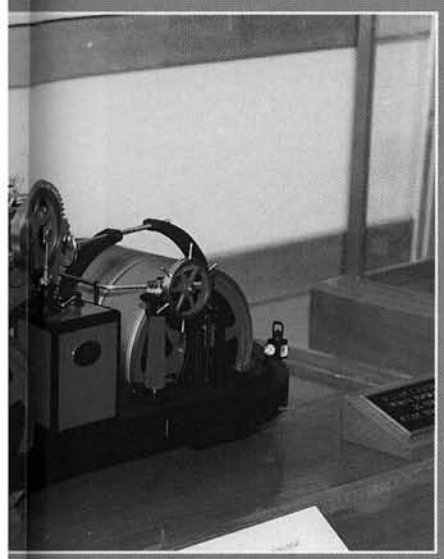




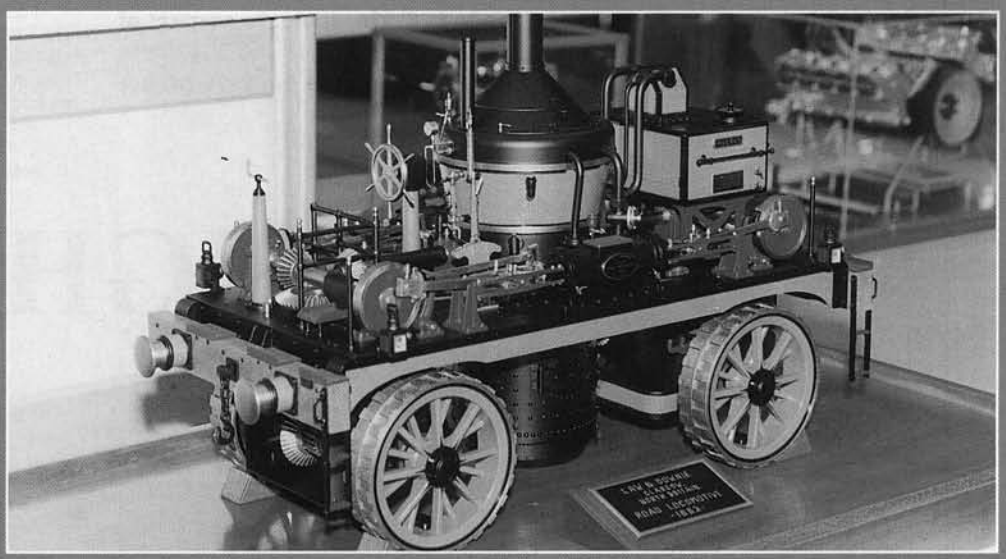
'" Single cylinder No. 8023 of 1930. 1n 1/16 scale.

A James Taylor and Son of Birkenhead Traction Engine. Taylor's Patent "Steam Elephant" of 1862 in 1/16 scale.

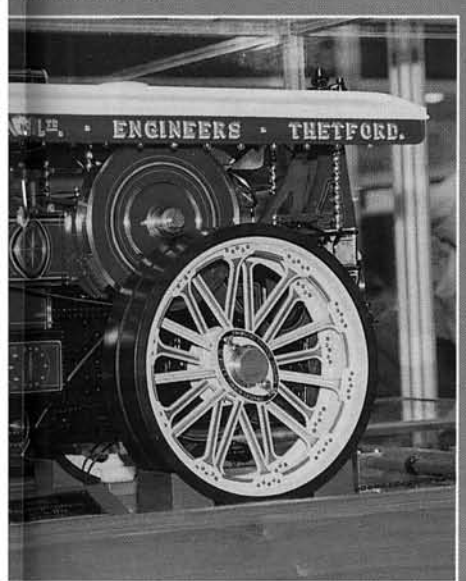
de by Mrs. Cherry Hill



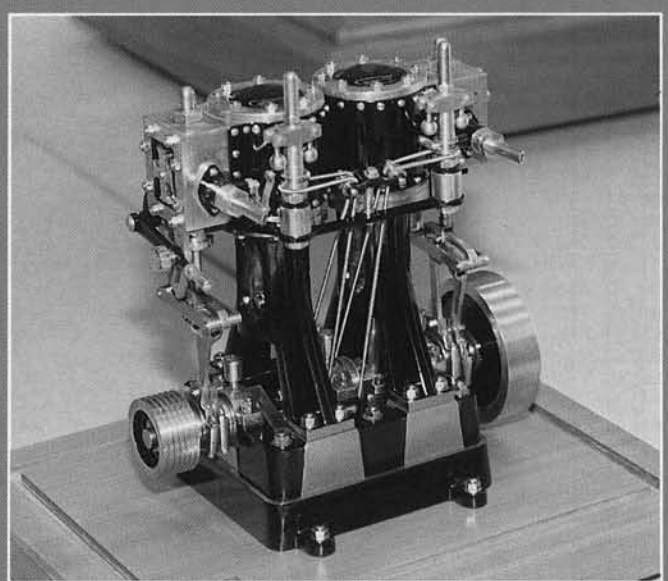
Information of this machine was a photograph and chnical Engineers of 1870. The prototype was not a rd. The scale is 1/16.



Law and Downie of Glasgow, Traction Engine of 1863. This very compact model has 4-wheel drive and 2-axle steering. The design for thwe prototype included several enterprising features, but was never actually built. Scale 1/16.



A Burrell Scenic Showman's Road Locomotive 8 NHP Compound No. 3909 "WINSTON CHURCHILL" as at 1922. Scale 1/12.



This engine was built to clarify the arrangement of the reversing gear to be used on the builder's Merryweather Fire Engine (No. 234).

September 9 1948

So many modellers, including myself, have fallen under the spell of W. J.Hughes' Allchin. Surely it must be the most modelled traction engine design, I wonder if modellers have now made more Allchin models than Allchins themselves turned out from their famous Globe Works in Northampton?. W. J. Hughes was a true traction engine enthusiast and model engineer. He was also a past President of the Road Locomotive Society, Member of the Newcomen Society, of the Society of Model and Experimental Engineers and of the National Traction Engine Club. His first meeting with number 3251, the chosen prototype, was as one of three Allchins and a Marshall in yard in Sheffield, although he seemed at the time more preoccupied with the other two Allchins numbers 1275 and 1407. If Mr. Hughes was looking for a prototype to model I wonder if he was actually considering the Marshall 69256, as he says, 'I hope that before long there will be some special news about this particular engine'. However No. 3251 'won' and on 20 September 1951 the Allchin series began in M. E., the Allchin proved to be so popular that Mr. Hughes was asked by the editor to rewrite the articles, the first of which was published on 3 Nov. 1972. I have seen 3251 in 1½, 3, 4, 4½ and 6in. scales. Cherry Hill's Allchin was ¾ in. scale, Mr. Ware later in this issue mentions one he made to 2¼ in. scale. In respect of scale Mr. Hughes wrote 'For my part, I think 3in. scale is too big for a model'. Mr Stubbs' engine went on to win a silver medal at the 1970 Model Engineer Exhibition.

A FINE SIGHT!

by W. J. Hughes

Photos by Peter E. Hind, Press Photo Agency

It is told that when the raw recruit was asked at musketry practice to define "a fine sight" he answered "six dinners on one plate." Had he been a model engineer, he might have replied " Four traction engines, all in a line—which was the "fine sight," very unusual in 1948, which met my eyes recently in a yard at Gleadless, Sheffield.

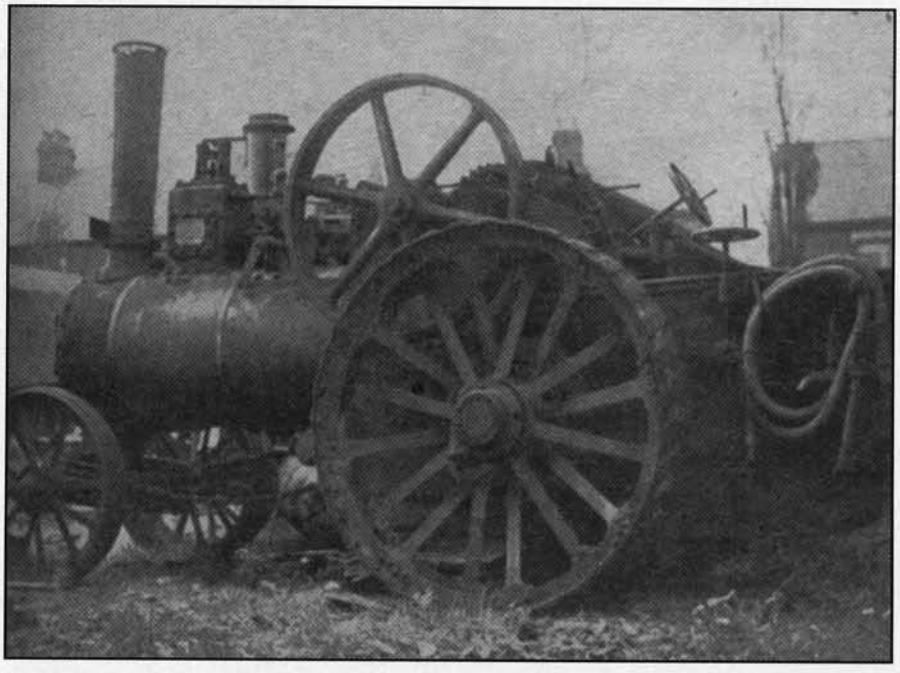
These engines belong to two brothers who are agricultural contractors, and whose lament it is that owing to the fuel problem, it is easier to run a Fordson, than a steamer today. Thus they have several Fordsons in constant use, while the four traction engines stand idle, though in good running order.

Three of the latter were built by William Allchin, Ltd., Globe Works, Northampton, and numbered,1275, 1407 and 3251, respectively. No. 1275 was built just before the turn of the century, No. 1407 in 19t2, and No. 3251 in 1925.

The first two are identical in most respects, but No. 3251, called Royal Chester, differs in several particulars—notably in that both axles are sprung (the other engines being unsprung), while the boiler is 2½ in. less in diameter, and the smokebox is 4 in. longer.

In addition, the driving position is on the near side on Royal Chester instead of the offside.

Unfortunately, owing to lack of time, it was not possible to measure up this engine completely, but the drawing gives the principal dimensions of the other two engines. I feel sure that these, with the photographs, will be of great help to anyone wishing to build a model.



Traction engine No. 1275 built by Messrs. William Allchin, Globe Works, Northampton. This is the last photograph which will ever be taken of this old-timer.

Differences in the Engines

Photo No. 1 shows a general view of engine No. 1275, with part of Royal Chester's chimney showing beyond. All the other photos are of No. 1407, and one or two of the slight points of difference may be noted by comparing them. For example, the former has a " spudpan " on the front axle, while on the latter, the steering chains are attached to clips fastened round the front axle near the wheels. (See photo No. 2,)

On photo No. 4, three different features are apparent—first, the comparatively large lubricator mounted on the valvechest ; secondly, the pipe and stopvalve leading backwards from the top of the valvechest. This is not a standard fitting, but was added by a former owner to obtain really dry steam for the injector in the cab. Thirdly, a steam pipe and stop valve lead from the bottom of the valvechest forward to the blower.

Again, No. 1275 has no flywheel brake, while on photo No. 3 may be seen that fitted to No. 1407. It consists of a hardwood block sliding in a square section tubular guide behind the flywheel. On turning the small hand wheel, which can just be seen, a screw forces the endgrain of the block on to the flywheel rim.

Other Useful Information

Further particulars of No 1275 and No. 1407 are given below, with particulars of No. 3251 in parentheses (where obtained).

Rear Wheels: 6ft. diameter, 16in. wide on tread, 16 spokes, one driving pin. (No. 3251 6ft. 18½ in. wide, two driving pins).

Front Wheels : 3 ft. 10 in.. diameter, 9in. wide on tread, 12 spokes. (No. 3251, 3ft. 9in., 9in. wide, 10 spokes).