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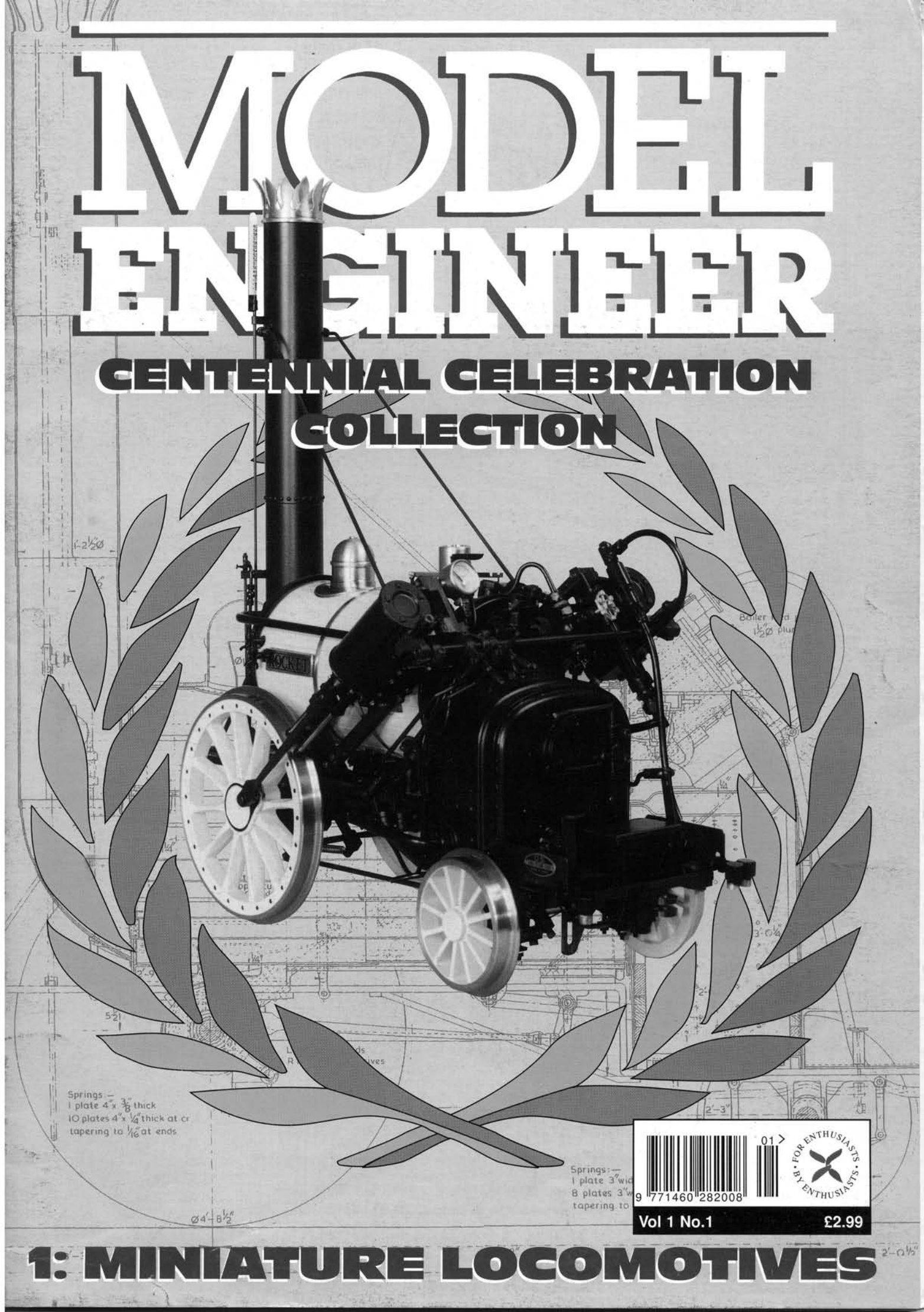

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FOR ENTHUSIASTS BY ENTHUSIASTS
NEXUS

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Miniature Locomotives over the last 100 years

Jim Robson introduces his review.

What are my qualifications for editing this Special Issue? A good question and one I asked myself of Mike and Ted when asked to perform this task. "Just write it from your aspect as a reader of Model Engineer." they said. This I have tried to do. (Any comments in brackets are purely my own opinions, and I hope will not be taken too seriously—Jim R.)

I first discovered M.E. in December 1943. In that first-to-me issue someone called LBSC was describing how to braze Austere Ada's boiler and there was a History of Cosmo Bonsor. I was hooked. Even though I had no workshop, no ability, no money and no thought of attempting to produce a loco, I still turned to LBSC purely for the pleasure of reading his articles, particularly his Lobby Chats. Thus I had a fair idea of the contents of the journal from 1943 onward, but little idea of prior to that year.

So I went back to 1898, to the first issue of Model Engineer & Amateur Electrician and worked forward, aided by the index compiled so painstakingly by Geoff Wilkinson and Malcolm Mitchell. One thing was immediately apparent, many locos of various gauges were already about. These fell roughly into three categories: those produced by gifted amateurs, others by commercial engineers (for rich amateurs) and those made for display or other commercial reasons. I suspect that the latter had been around from shortly after Stockton & Darlington—Directors liked to display a replica of the current pride of the line and for those in the business of producing locos models were probably made to show to prospective customers, full size engines being rather unwieldy to cart around, especially abroad!

While Model Engineer & Amateur Electrician may not have instantly changed the shape of miniature locomotive building, it did become a focal point for information and opinion and, together with the SME (later to adopt another E), it had an increasing influence. Before the turn of the century the SME had suggested gauge standards which are still in use today. This is the norm today but it was some time before they were generally used; some folk went for exact equivalent gauge, others rounded up or down. So long as they had their own track and were not bothered about running on other peoples' there was no problem. (Even today there are folk building to odd gauges—and why not!)

We get off to a good start in the first issue, with a report on the already famous Como.

The first general meeting of the SME took place at the Memorial Hall, Faringdon Road on 2 November 1898. They were to have much influence on the design of locomotives; their membership list is like a roll of honour. (That should take care of my application!)

Many photos, descriptions and articles on locos appeared over the next two years but no fully described designs with drawings such that anyone with the necessary equipment and ability to read a drawing might attempt to build.

The first of these appeared in 1900. This was quite a watershed year, a pattern was emerging and many of the techniques proposed then are in use today. We start in January 1900 with a design, complete with a pullout drawing by Mr E L Pearce for a spirit fired 2⅞ in. gauge 2-2-2 'Lady of the Lake' Class LNWR loco. In December 1900 Henry Greenly had a design for Lily a 4-4-0 tender loco. Although drawn for 2½ in. gauge, he suggests that it can be built to other gauges as required. Although not purporting to be of a prototype, it is very nicely detailed, as was Mr Pearce's loco, and I do not feel anyone would have difficulty with the drawing today (apart from me!)

Designs continued to appear. In 1901 we have Mr E L Pearce again, with a 3½ gauge Dunalastair No. 3. (I find his draughtsmanship to be works of art.)

In January 1904 the first of a series of M.E. commissioned designs appeared, with colour washed frontispiece drawings. These were on various subjects, but the first was a 3¼ in. gauge 0-4-4T loco, very similar to the LTSR tanks, spirit fired with a Smithies boiler. In January 1905 there was another 3¼ in. gauge Greenly design, this time a NER electric loco, collecting current from a third rail.

Jumping forward to 1922, although many locos had been designed and built in the interim, World War One had come to pass, from which many did not return, some of whom might have made great changes, had they survived.

Even so, I have the impression that not much had changed in the thinking of those who designed and built locos. Liquid fuel was still supreme in the smaller gauges. The general thinking still appeared to be that there wasn't much chance of passenger hauling below 7¼ in. gauge and as for a 2½ in. gauge solid fuel passenger hauling engine—forget it! All that was about to change as we were to see in the Battle of the Boilers. Both sides thought they had won. Both sides wrote accounts. (I always thought LBSC won, he certainly did in the long run. Biased, moi? Just because I unroll my prayer mat respectively in the direction of Purley Oaks and Swindon, it doesn't make me biased!)

One of the results of the Battle was that Percival Marshall invited LBSC to be a regular contributor and Shops, Shed and Road, A Column of Live Steam, first appeared in the 18 September 1924 issue. The rest is history.

(I shall cease my chatter at this point and let you read on, since, I hope, in the words of yesteryear, the following pages are largely self explanatory, with the odd note from myself, or should it be ourself?)

The references, e.g. 1/11/1898, indicate volume/page number/year. ●

Engineers and their work. I

Dr. J. Bradbury Winter.

We wonder how many of our readers are so devoted to the hobby of model-engine building as to spend thirteen years in the construction of one engine. Yet such is the record of the subject of this sketch, Dr. J. Bradbury Winter, of Brighton. The engine on which Dr. Winter has been so long engaged is a scale model of the London, Brighton and South Coast Rail way's engine, the "Como", a locomotive belonging to the D2 class. It occurred to us that an account of this unique piece of model engineering work would be of interest to our readers, and knowing that the model had quite recently received its finishing touches, we asked Dr. Winter to favour us with the necessary particulars for publication in this issue. His response came in the form of a kindly invitation to run down to Brighton and inspect the model for ourselves, a suggestion of which we were prompt to take advantage.

A remarkable model it is, too, for it is absolutely complete, and to scale, even down to the smallest nut and check pin. When we looked into the details of the engine and observed how conscientiously and accurately even the minutest details were carried out, we began to understand the reason why thousands of working hours had been absorbed in the completion of the task. But no amount of mere inspection of the work would convey an accurate idea of the exceptional pains which the doctor has taken to obtain the best possible result so we will let our readers into a few of the secrets of his work.

Perhaps the best instance of his subordination of labour to accuracy and appearance occurred in the construction of the wheels. In the early stages of the building of the model, wooden patterns were made for the wheels, and from these iron castings were obtained. These, however, proved unsatisfactory, for the corners were all rounded and no amount of filing made the spokes look really clean. The castings were, therefore, put aside, and the wheels were cut out of the solid from forged discs of Bessemer steel. These discs were first of all faced up to fit templates and the holes bored. Then the spokes were marked out, holes drilled round the lines, and the spaces chiselled out and finished with a file. This method of making the spokes necessitated the drilling of more than 700 holes in each wheel, and the time occupied in completing the six wheels was over 500 hours. Thus, on the assumption that Dr. Winter spent two hours a day in his workshop, it must have taken him the best part of a year to make the wheels alone.

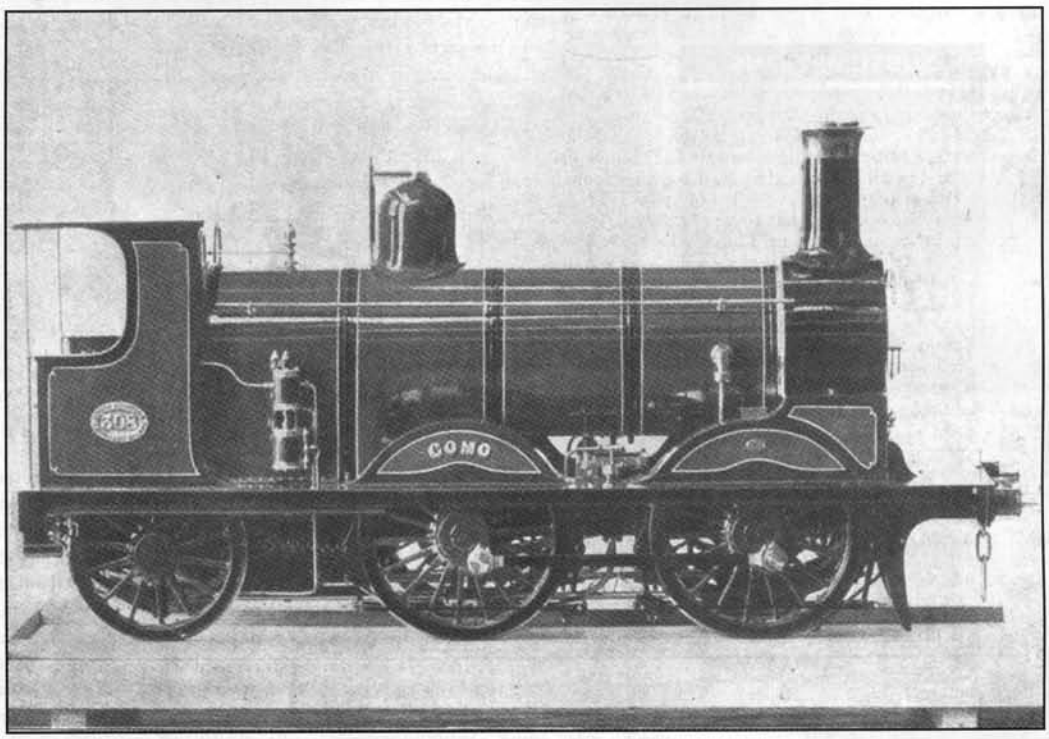
But certainly they look very different from the cast iron wheels, and this patient worker feels well repaid for his trouble. Steel tires were shrunk on, and fixed in the usual way with a screw in each alternate interval between the spokes. The wheels were driven on the axles in accordance with the usual practice in the Brighton Railway Works, and no keys were used.

The engine has inside cylinders with a common steam chest placed between them; the steam pipe dividing in the smoke box into two branches, one for each end of the steam chest. Part of the exhaust passes upwards to the blast pipe, and part is carried downwards to a pipe which runs on each side underneath the motion and ash pan to the feed water in the tender, which can be heated by this means. The stuffing boxes for the piston-rods do not project outside the cylinder covers, but the covers are of a conical shape inside, which makes them sufficiently thick in the centre to contain the stuffing box. The pistons are dished out to a corresponding shape.

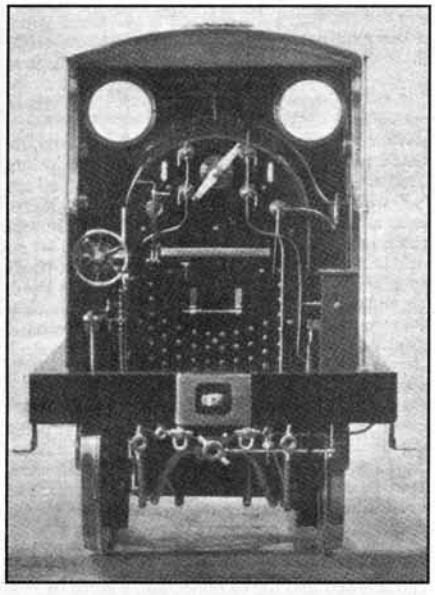
After we had completed our inspection of the model itself, Dr. Winter invited us to look round his workshop, and thither we accordingly adjourned. Doubtless, many of our readers, after perusing the foregoing description, have conjured up visions of an elaborately-equipped sanctum replete with all the refinements of the modern tool-maker's art; but such we did not find. Instead, we entered a modest little building erected at the rear of the doctor's house, containing three foot lathes, a small foot-power planning machine and a substantial vice bench.

While in the workshop we inspected the framework of the tender to the "Como", which is now in course of construction, and which another five years will probably see completed.

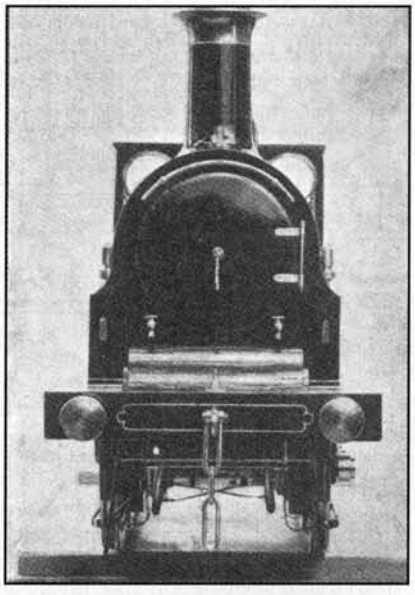
When he commenced to build the "Como", he prepared a complete set of working drawings to scale, these being compiled partly from details published in the Engineer and Engineering, and partly from drawings kindly lent to him by the L.B. & S.C. Railway. The now famous model was commenced on December 24th, 1884, and completed in March, 1897, making a total of nearly thirteen years spent in its construction. This, of course, is thirteen years of spare time, for the doctor is a busy professional man, and has but scant leisure to devote to his hobby of model-making. He estimates, however, that he has managed to spend 1000 hours per annum in his workshop, so that the grand total to be put down to the account of the engine we have illustrated must be nearly 13,000 hours.



Dr. Bradbury Winter's Model Locomotive.



Rear View, showing Interior Of Cab



Front View Of The Model "Como"

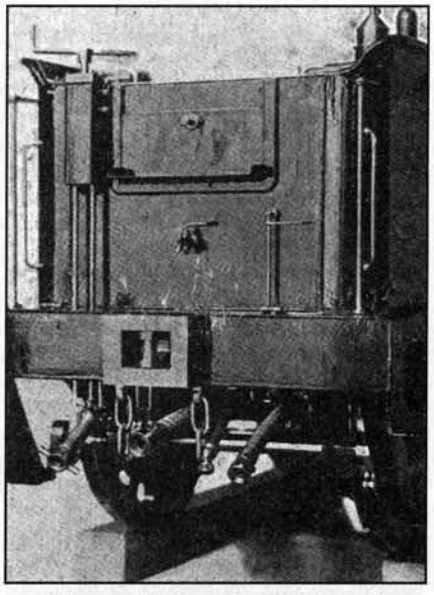


Fig. 5 – The Footplate Of "Como"

The Tender of the model Locomotive "Como"

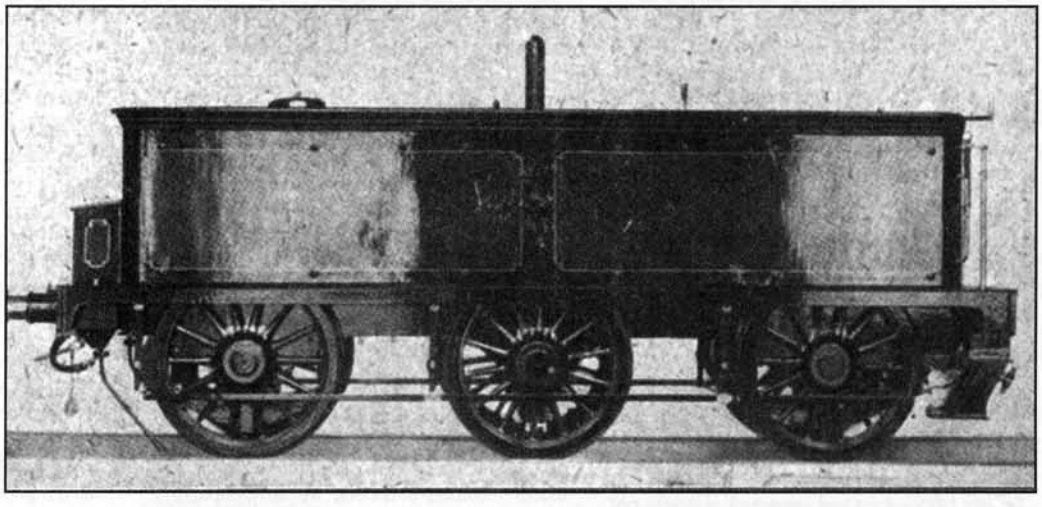


Fig. 1. – Side View Of Tender For Locomotive "Como"

At the head of the main staircase in the Brighton Museum stands one of the very finest -if no the finest- example of an amateur-made model locomotive in existence. It is the model of that fine old L.B. & S.C.R. locomotive "Como", No. 308, built by Dr. Bradbury Winter - an illustrious resident of Hove.

Readers of The Model Engineer from No. 1 will remember that we described the building of the engine in a very early number, but at that time Dr. Bradbury Winter had not commenced the construction of the tender, and it is with the tender that this article is concerned.

For the benefit of our newer readers, we would point out that Dr. Winter's great aim has been to secure absolute accuracy in every minute detail, and he has certainly succeeded in producing a most wonderful example of patience, and an unshaken fidelity in reproducing with absolute accuracy each and every part of the original.

The scale chosen was 1 in. to 1 ft., and in the engine itself there are many thousands of parts, each one in its proper place -correct to scale size, and capable of working, if need be. Over 13,000 hours' work was put into the construction of the engine, while the tender required another 5,000 odd hours for its completion, despite the many interesting and helpful time-saving methods adopted by Dr. Winter to expedite the work and guarantee its accuracy.

Fig. 1 is a photographic reproduction of one side of the tender, and clearly shows the completeness of the work, but a better idea of the perfection of detail of the original being included, and reproduced with a perfection of workmanship unexcellable.

Notice especially, the accurate spacing and straightness of the rows of rivets heads, and the beautiful work of the lubricator for the wheel journals. The small tap, although less than 1/16 in. bore, can be turned on and off, has proper nut and washer, and is ground in cored joint; the unions are real unions, and can be opened when needed.

An edited account of a description of "Como" with a footnote jumping forward to 1917. It is interesting to note the working tap on the tender, something which "LBSC" fitted to "Grosvenor" many years later. Although everyone who has seen even a photo of this engine cannot have failed to admire it, but I suspect few would attempt to emulate it. (One latter day lady perfectionist who springs to mind, but she doesn't build railway locomotives. So far. One builder, who is in my opinion comes very close is Mac Gower and his fantastic half inch scale "Jubilee".) Dr. Winter's time averages out to 2.7 hours per day!

Queries and Replies

Our Postal Reply System

It is a generally acknowledged fact that the "Queries and Replies" column is one of the most interesting and popular features of an amateur's journal, but in the case of a monthly publication, such as *THE MODEL ENGINEER AND AMATEUR ELECTRICIAN*, there are difficulties in the way of conducting the columns on the usual lines. A reader who is in want of information and advice concerning some piece of work on which he is engaged, is not likely to derive much benefit from this portion of the journal if he has to wait a month or even two months for the publication of the particulars requires. To solve this difficulty we have decided to reply to readers' queries by post, provided such enquiries are accompanied by a stamped addressed envelope. We shall, however, publish in each issue all queries and replies given during the preceding month which we consider likely to be of general interest, and, thus, while giving the individual enquirer his information promptly, we shall still retain in the journal the useful miscellany of matter which the "Queries and Replies" column always afford. We have arranged for a staff of experts in mechanical and electrical matters to give the benefit of their knowledge and experience through this channel, and we accordingly hope that our readers will take every advantage of the facilities thus afforded. It will greatly assist us in carrying out this portion of our programme, if senders of queries will bear the following points in mind:-

(1) Queries dealing with distinct subjects should be written on separate slips, on one side of the paper only, and the sender's name should be inscribed on the back.

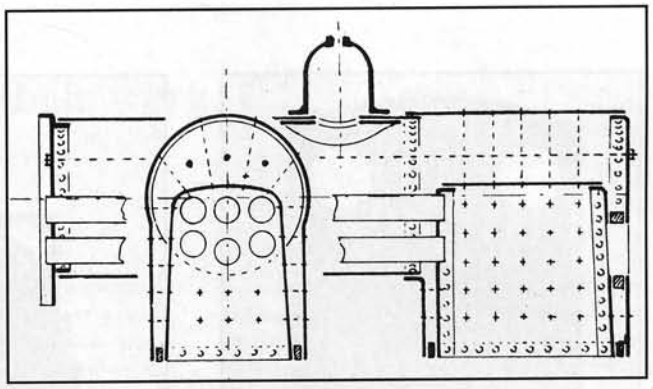
(2) A stamped addressed envelope should invariably be enclosed.

(3) Queries will be answered as early as possible after receipt, but an interval of two or three days must usually elapse before the reply can be forwarded.

(4) All queries should be addressed to The Editor, The Model Engineer, 6 Farringdon Avenue, London, E.C.

[153] **Model Loco Boiler**. C.B. (South Shields) writes: Will the following dimensions of model boiler steam suit a pair ¾ in. bore 1½ in. stroke cylinders for a loco? If I build the boiler of copper-plated 1-16th in., what pressure ought it to stand rivetted, and also what pressure if I brazed the joint only? Boiler barrel, 8 ins. long 3 ins. diameter; raised outer firebox from front to back 2½ ins., side to side 3¼ ins., height 5½ ins.; inner firebox from front to back 2 ins., side to side 3 ins., height 4 ins.; dome 1½ in. high, ⅞ in. diameter (inside); tubes 6½ in. Should any part of firebox be thicker to stand pressure in proportion to rest of boiler? I would like to get about 40 lbs. or 50 lbs. pressure if possible.

The boiler is the right size for the cylinders; copper 3-64ths in. thick will stand a pressure of 40 lbs. if riveted or brazed. Rivets ⅛ in. diameter, ⅜ in. apart; stays about ¾ in. apart; inside firebox 1-16th in. thick. The outside firebox would be better proportioned if 3 ins. wide and 4 ins. long, with a ¼ in. water space between inside and outside box at bottom. The dome may be 1¼ in. diameter inside.



Section of Model Loco. Boiler *(See note below)*

[160] **Model Loco boiler.** T.J. (Dublin) writes: Would you most kindly give me some instructions for making a boiler for a locomotive, cylinders 1in. bore 2 ins. stroke? also thickness of brass and size to burn charcoal?

The barrel of boiler may be of sheet brass or copper 4½ ins. diameter and 10½ ins. long; outside firebox, 6 ins. long, 4½ ins. wide, and 5 ins. deep from centre line of boiler; inside firebox of copper, 5 ins. long, 3½ ins. wide, and 5¼ ins. deep inside, 1-16th in. thick; tube plate ⅛ in. thick; rivets, ⅛ in. diameter, about ½ in. apart; firebox stays, 3-16ths in. diameter, about ¾ in. apart; six brass tubes, ¾ in. diameter, about 11 ins., long; pressure, 40 lbs per square inch. The smokebox tube-plate may be a brass casting ⅛ in. thick, with flanges for barrel and smokebox. Also the fire door ring and foundation ring for firebox, ⅜ in. square.

[175] **Model Loco Boiler**. F.S. (Urmston) writes: for a locomotive boiler, 8 ins. diameter to 22 ins. between tube plates, working pressure 80 lbs., sq. in. (1) what gauge of copper plate is suitable? (2) Kind of joint, size and pitch of rivets. (3) Diameter, gauge, and number of flue tubes. (1) Shell plates ⅛ in. thick, tube plates 3-16ths in. (2) Double rivetted butt, with cover plate 2 ins. wide for longitudinal joint in barrel. Firebox lap joints single rivetted, rivets 7-32nds in. diameter, ¾ in. pitch. (3) brass tubes 1 in. diameter, 3-64ths in. thick; from 11 to 13 may be put in according to form of tube-plate.

Model Loco. Boiler.- In view of the number of queries we have received on the subject of model locomotive boilers, we have thought it advisable to prepare the illustration given above, which shows a good type of boiler for this purpose. The drawing represents a longitudinal section and a cross section of the boiler described in the reply to query No. 160 (May issue), and is to scale of 3 inches to a foot. It is suitable for a locomotive with cylinders 1 inch bore and 2 inches stroke.

[284] **Model Loco. Boiler.** T.H. (Cambridge) writes: I have made a model loco boiler, but I cannot get any draught, so the fire will not burn. I've tried charcoal, coal, coke, methylated spirits, and a Bunsen gas-burner; but directly I shut up door they all go out. The dimensions of boiler are below: Chimney height, 8½ ins.; disc of smoke box, 3½ ins.; depth of smoke box, 1½ ins.; three tubes, ½ in.; length of barrel, 8 in.; diameter of chimney. ¾ in.; height of firebox; 4in.; width of same, 3½ ins.; breadth of the same, 3 ins.; firebox, 1 in by 1¼ in. This is made of ⅛ in. brass; all joints are brazed. What pressure will stand?

The draught may be improved by replacing the ½ in. tubes with ¾ in. tubes, or by adding a steam blower to chimney. This consists of a small steam cap screwed into top of boiler, and a piece of ⅛ in brass tube soldered to tap and taken into smokebox, so that it points direct up chimney. Close in end pipe to the size of a pin point. In using methylated spirits or charcoal, leave firedoor open till you get a slight pressure of steam, when the tap of blower can be turned on a little, and the fire should burn with the door closed. The boiler should stand a high pressure if properly stayed, but as none are shown in sketch, 25 lbs. per square inch should not be exceeded.

[310] **Small Loco Boiler**. J.M. (Chorley) writes: I am making a small power boiler of the locomotive type, and I would be very much obliged if you would give me dimensions of the same. I have, however, flanged two plates for the firebox shell, the length of which is 2 ft. 6 ins. and the breadth is 20 ins.; the plates are ¼ in. thick, and mild steel. The length, however, seems, too long in proportion to the width, so what would be the right length for 20 ins. broad? I also wish to know, if the barrel was made of a 3-16th in. plate and double riveted, would it be strong enough to stand a pressure of 100 lbs. and also what would be the best rivet thickness and pitch for ditto, and where it is joined to the firebox shell plate? The other dimensions are: water space round firebox, thickness of tube plates, diameter and number of tubes, width of plate for firebox shell, length of firebox shell, etc., to be in proportion to the firebox shell plates above - viz., 20 ins. broad.

The proportion of breadth to length of firebox shell is right for a locomotive type of boiler - viz., length equals 1½ times the breadth. The barrel of boiler is generally the same thickness as firebox plates, but 3-16th in. mild steel will stand 100 lb. if double riveted. Rivets ⅜ in. diameter and 1 in. pitch. Water space round firebox 1½ ins. at bottom, 2½ ins. at top. Tube plates ⅜ in. thick. Twenty-two tubes, 1¾ ins. diameter outside, about 4 ft. 6 ins. long. Barrel 4 ft. long, height of inside

From issue 1 help was proffered in the Queries and Replies section. here are few loco examples from 1898. (I don't much care for the idea of sheet brass for a boiler barrel but it was in common usage. Also brass flue tubes. Having looked at No. 310, I wonder what size a Large loco boiler would be.)

firebox 2 ft. 3 ins. Depth of firebox shell 2 ft. from centre line of boiler.

[258] **Blast Lamp for Model Loco**. T.B.P. (Durham) writes: My blast lamp does not heat enough. It gives off during the whole time of working dense paraffinic smoke, gets clogged with soot, and will not raise enough steam to lift the valve, or move the engine. What is wrong? I am told there should be no smoke after once properly lit. I get good pressure of air in tank, in tender of engine, and can regulate air supply with cock. The paraffin is supposed to be forced through a coiled pipe in burner until turned to gas, and then give off a great heat. This it does not do. It was at work two hours yesterday and this awful smoke was going on the whole time, and no steam at end of it. Copper rivetted boiler, water round fire hole door, five flues, ½ in. diameter (bare). I light lamp by little methylated spirit on tray under coil, which is supposed to heat and ignite the paraffin gas.

The probable cause of the paraffin blast lamp making so much smoke, is, insufficient draught. The confined space of the firebox prevents products of combustion getting away, so that oil vapour does not get enough air to make combustion complete, and the coiled pipe does not get hot enough to vapourise the oil. The remedy will be to induce a draught through the flue tubes to chimney. This may be done by fitting a piece of tube about 6 ins. long into top of chimney, in which a smaller tube about 3-16ths in. diameter passes through one side near the lower end, and is turned up so that it will direct a jet of air up the temporary chimney, and cause a draught through firebox and tubes. The small tube can be connected by rubber piping to compressed air reservoir or pneumatic tyre pump. It will only be necessary to keep the temporary blower going until few pounds of steam are raised if the engine is fitted with a steam blower in chimney, or until it is started, when the exhaust will maintain the draught. perhaps too much paraffin is forced into the burner at first.

Practical Letters from our Readers.

[The Editor invites readers to make use of this column for the full discussion of matters of practical and mutual interest. Letters may be signed with a nom-de-plume if desired, but the full name and address of the sender must invariably attached, though not necessarily intended for publication.]

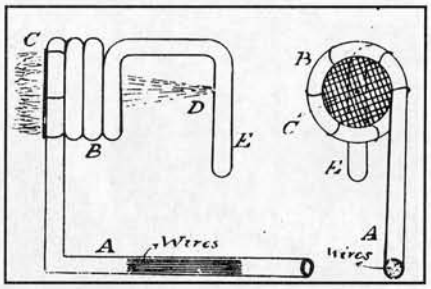
Petroleum Blast Lamp for Model Loco.

To the Editor of The Model Engineer.

Sir, We have read with interest the account of the difficulty experienced by "T. B. P." (query No. 258 in your July issue), and we think that possibly our experience may be of some use to him.

The principle on which the production of a blue flame depends is as follows:

A jet of petroleum vapour, in air, issuing from a nozzle at a velocity greater than that due to a pressure of about one pound per square inch, will not burn unless some interruption is held in its path, as, for



instance, a sheet of gauze, a truncated cone, or a plate of metal, or unless a flame is in constant contact with the stream of vapour.

The method almost invariably adopted is the former, and the most general interruption is the vaporiser itself, or that and a truncated cone combined, as in the Wells light. Now, if the interruption takes the form of a sheet of gauze placed close to the nozzle, the flame will be yellow and inclined to smoke if not very liberally supplied with air. If this gauze be now moved further from the nozzle the flame becomes less and less luminous until it is quite blue. The distance at which this result is attained depends on the size of the nozzle. With a nozzle of 1-16th in. it is about 8 ins. In the case of a nozzle of 1-32nd in. the distance will be about 3¼ ins., and this, we take it, will be the size of the nozzle used by your correspondent. The 1-16th in. nozzle will pass the vapour of one gallon of oil per hour at an oil pressure of about 8 lbs. per square inch, whilst the 1-32nd in. nozzle will pass about one to two pints at the same pressure. We cannot say for certain what is wrong with "T. B. P.'s" burner, but we think that probably the nozzle (or aperture from which the vapour issues) is too close to the first interruption. This error would have the effect of giving a yellow flame, and would render the keeping of the coil hot enough a verydifficult matter.

The following is a description of the coil we use for the starting lamp of our burners:

The coil is formed of standard ⅛ in. gas pipe (Lloyd and Lloyd), but it can be made of copper pipe equally well, and for your correspondent's use would probably answer better of copper than iron, as it would be more easy to heat up before starting and easier to make.

The upper pipe should be ¼ in. outside, solid drawn, and should be annealed before bending.

The tube should be coiled up so that the hole through the convolutions is about 1¼ in. diameter.

Referring to the sketch, A is the supply pipe, and B is the coil, which terminates in a piece of pipe turned at right angles with a thin hole (D) bored through it. The drill in boring this hole is passed through the coil.

This hole, which is about 1-32nd in. diameter, is the nozzle from which the vapour issues and passes through the centre of the coil.

At the end of the coil farthest from the nozzle (at C) a piece of iron wire gauze, formed of stout wire, is placed. This is usually made of about 1-16th in. wires, with holes about ⅛ in. square between the wires. The essential part of the burner is that the distance from the nozzle (D) to the gauze (C) should be correctly arranged.

As started above, this depends on the size of the nozzle, and for about 1-32nd in. nozzle will be not far off 3¼ ins. If this is correct the gauze will become bright-red hot, and the vapour will burn with a blue flame of great heat, which will not smoke under any conceivable circumstances after starting. If the coil is not hot enough, or if the nozzle is too large for the heating surface of the coil, liquid oil will come through and will burn with a very luminous and smoky flame. To prevent the burner pulsating about 2 in. of the oil supply pipe should be filled completely with small straight wires, laid parallel to one another in it. This also acts as a filter. If the first result is not correct, the character of the flame will indicate what alteration to make. If it is yellow the nozzle is too near the gauze; if it will not light at all the nozzle is too far away. If the burner spits oil the coil is not long enough - i.e., there is not heating surface enough.

As far as our experience will allow, we shall always be glad to answer, through the columns of your paper, any questions on the subject of petroleum vapour burners that you Sir, or your correspondents may submit. We have had some years experience with petroleum burners for steam-raising in small boilers.

We have the honour to remain, Sir, yours faithfully,

THE BICKFORD BURNERS COMPANY
Camborne.

In August 1898 we have the first Practical Letters from Our Readers section, still going strong as "Postbag". This is of course the section which contained some very interesting back and forth in 1922-4. I could not resist including one more letter from "Queries" since No. 258 relates to the reply from Bickford Burners Co. I love the "paraffinic smoke" and the "cable-ese" (shortening of sentences by leaving out words not essential to conveying information, tends to make the sender appear foreign, ah so!) so often used by corespondents to get more message into less space.

(Having read both letters I keep getting a vision of "WHOOMPH", accompanied by smell of singed hair!)

(Way back in the 60's and 70's, nineteen sixties, I was writing Test Schedules where space was at premium and one tended to dispense with "ands" and "the's". When they were short of effort in Tech. Lit. I was asked to write the "Test Section Manual for an instrument for which I had just written the Test Schedule. I promply had my knuckles rapped for using "cable-ese", the first time I had heard the term. "We like our Manuals to be grammatically correct!")

An American Model Locomotive and Train.

The diminutive train which forms the subject of this illustration was constructed by Thomas E. McGarigle, Of Niagara Falls, who claims that it is the smallest train ever built for the conveyance of passengers in seated cars. It was built for use in the grounds of the Trans-Mississippi and International Exposition at Omaha, the space devoted to the miniature railroad being located in the main thoroughfare, where it extends for over 1000 feet.

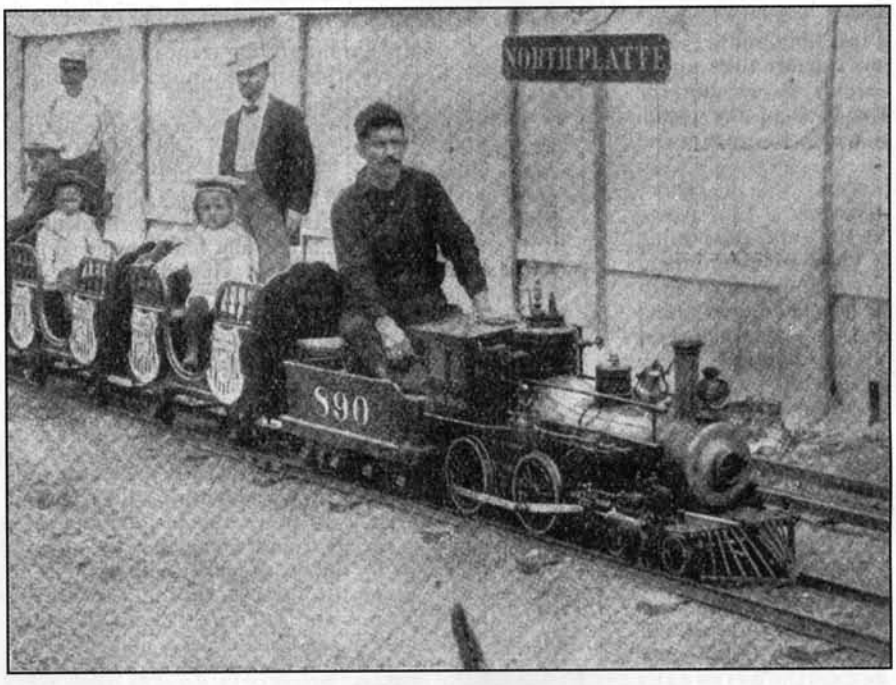
The greatest interest naturally centres in the locomotive, which is in every respect a faithful reproduction of the parts and working of a full-sized passenger locomotive. It is of standard the eight-wheeled American type, with a leading truck, four coupled drivers, and a tender carried on two trucks. The gauge of the track is 12½ ins., the top of the smokestack is 25 ins. above the rails, and the toal length from the point of the pilot to the end of the tender is 7 ft. 3 ins.

Steam to drive the little fellow is raised in a waggontop boiler 10 ins. in diameter, in which are eleven 1 in. tubes 24 ins. in length. The grate surface is 54 sq. ins. and the steam pressure is 125 lb. The boiler is built of steel and was tested to 300 lb. pressure to the square inch. It is equipped with two injectors and holds 12 gallons of water.

The driving wheels are 10 ins. and the wheel of the truck 5 ins. in diameter. The cylinders are 2 ins. in diameter, with a stroke of 4 ins. The weight of the engine is 600 lb. The firebox is 10 ins. in depth and 10 ins. in width, and hard coal is used as fuel. The fittings of the locomotive are all complete, and include sand-box, bell, whistle, and even a steam brake between the drivers. The engineer has to utilise the whole tender as a foot plate, and he must, perforce, remain at all times seated in order to get at the throttle, reversing lever, etc. The tender is one of the two truck type. Its wheels are 5 ins. in diameter, and its capacity is 15 gallons of water.

Passengers are carried in two seated cars of the design shown in the illustration, and the hauling capacity of the locomotive is ten such cars, conveying twenty passengers, a total load of about 4000 lb. The scale on which the locomotive is built, is about one-seventh the size of one of the largest engines of the New York Railroad.

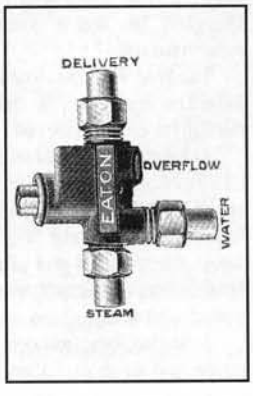
Scientific American



An American Model Locomotive And Train.

Small injectors.

Mr. W. Eaton, of Whitestake, near Preston, has set himself the task of overcoming the prejudice which has hitherto existed against very small injectors, and he goes to work by placing on the market a thoroughly simple, but automatic and self-regulating, injector named the "VIC". One of these we illustrate herewith, and from testimonials we have seen, and an inspection of a sample article, we think our steam engineering readers will find the "VIC" well worth their careful attention. We understand that these are entirely self-acting, and when placed above their water supply are self regulating, and require no manipulation beyond simply turning on steam. Mr. Eaton claims that they are only injectors on the market which regulate their own water supply, and work equally well at the lowest as well as the highest pressure for which they are made. They contain no moving cones, nor any part liable to get out of order, and can be easily taken to pieces, cleaned, and put together again in a few moments by any amateur. The "Vic." injectors are made in several patterns to suit vertical, horizontal, locomotive, or other boilers. Readers should send a stamp to Mr. Eaton for a copy of his new price list, which contains particulars of a number of different type of injectors.



For Amateur Photographers.

There are probably many of our readers who dip more less deeply into mysteries of photography, and to those who are in need of convenient dark room, we can confidently advocate the claims of the "Ever-ready" pattern, as shown in the accompanying illustration. This is made in sections, so that it can be packed flat for travelling or storage, and can be readily put together, when required, in about five minutes. The roof is provided with a ventilator, while the floor is raised about two inches above the ground to admit air. the fittings include two shelves, a lead-lined sink, with bench at either side, and a sliding window, with either ruby or orange glass. If it is intended to use the dark room out of doors, a special roof is provided. This convenient type of dark room is made in various sizes, at prices from £2 2s. upwards, the smallest size being 6 ft. 6 in. by 3 ft. 6 in. by 3 ft. the makers are The Surrey Manufacturing Company, 60, Gravel Lane, Southwark, London, S.E.

The "Ever Ready" Dark Room

We close 1898 with a glimpse of an American Loco, a selection of adverts and an ingenious model which had been entered for one of the prize competitions. The adverts indicate that there was a ready source for those who wished to own a loco but not to build one. Quality dependent on the depth of the pocket. please note the original "Vic." injector, which was offering such perfection in 1898 that one wonders why some of us, occasionally, are still in trouble with them today!

I think young "Curly" would have approved of the loco with the Liptons wheels, very reminiscent of his first model of the borough roller. I realise that the Ever-Ready darkroom has nothing to do with loco's but I couldn't resist it. I think, had I owned one, I would have placed a notice making clear the purpose of the structure!

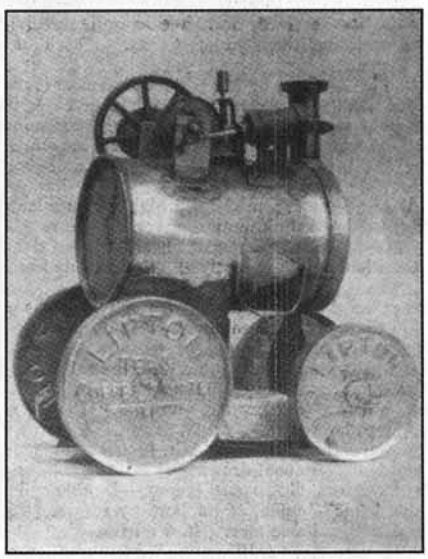
An Ingenious Model.

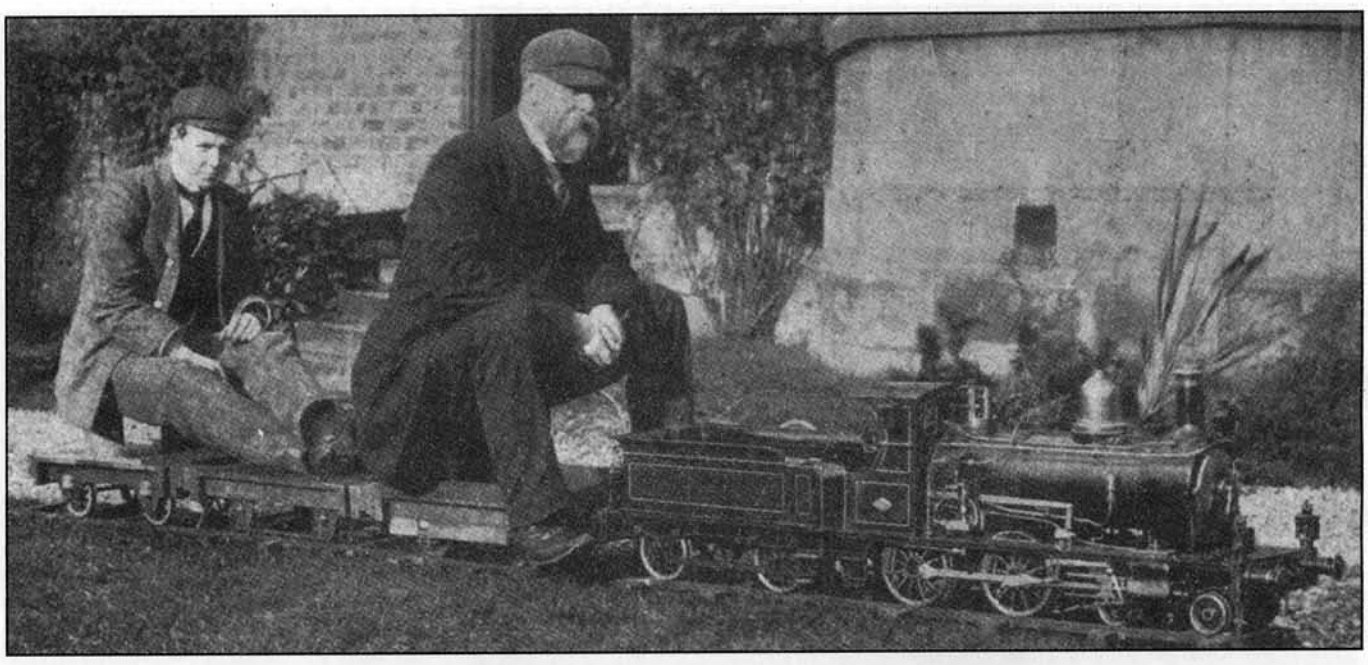
If ingenuity alone had been the deciding merit in this competition, the prize would undoubtedly have been carried off by Mr. G. Hayler, of Long Eaton, Derbyshire. This reader, in sending in his competition, writes: "I beg to state that I am not able to draw the different parts, nor in a position to have it photographed, so I have taken the liberty of sending it to you for inspection, as I think you will be able to judge better from seeing the actual engine than form my description. I can produce plenty of evidence to show that it will work for about an hour without attention. The different parts are made with:

Boiler	¼ lb. coffee tin.
Wheels	¼ and ½ lb. tin lids.
Chimney	Umbrella top.
Fly-Wheel	A toy wheel.
Crank Disc	A metal polish tin lid.
Steam pipe	India rubber tube.

and also a knitting needle, bicycle spoke, piece of brass lamp, piece of gas piping, screw and stopper out of an oil tin, a cartridge end (the driving pulley), the end of a horsehair watch chain, and the spring form a tobacco pipe top. The cylinder I had given to me."

Although we have not had this model under steam, our inspection thereof gives us no reason to doubt its capacity for steady work, and we think the matter is entitled to no little praise for the ingenuity and patience he has displayed in apparently incongruous collection of materials. We have thought sufficiently well of his efforts to take we reproduce herewith for the benefit of our other readers.





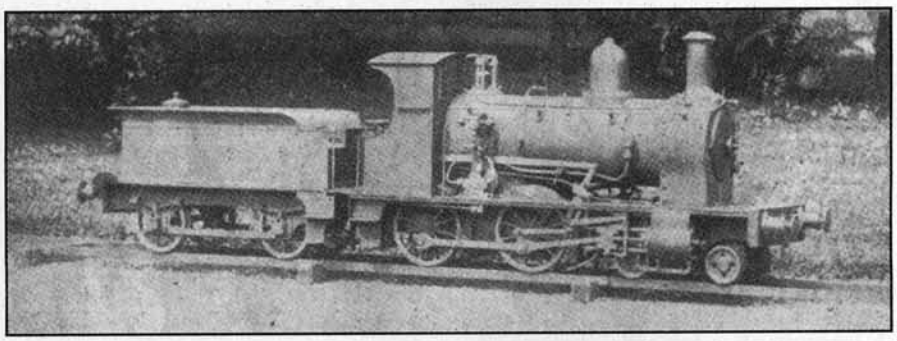
Mr. S. G. Copestake's Model Locomotive With Passenger Load.

A Powerful Model Loco.

One of our readers, Mr. S. G. E. Copestake, of Glasgow, has kindly furnished us with the accompanying photographs and particulars of a model locomotive which he has recently completed. As the engine will pull a load of two persons along the level, it must be admitted that this is a powerful model for its size.

The locomotive is not a model of any particular engine, but is of original design; there is no novelty in its construction, but it is made to work and perform some service. It took about two years of leisure hours to make.

The boiler is of copper, the work of a coppersmith, and cost £5. The driving wheels and frame were made at Messrs. Dubs & Co.'s locomotive works, Glasgow; all the rest was made at my small workshop at home; having only a 4 in. foot lathe, I could not manage the wheels. The boiler has seventy-nine brass tubes, ⅜ in. outside diameter, as thin as possible, but thick enough to take a fine threaded screw at the firebox end. The flat surfaces are supported in the usual way by 140 screw copper stays, 3-16ths in. diameter; the firebox has the usual door and adjustable deflector plate. The boiler has the usual mountings: - Safety valve (double), glass gauge, gauge cocks, whistle, pressure gauge, steam brake and steam blower, and auxiliary pump cock, and two pump valves or clack boxes, also team regulator and handle; there is no ash-pan. The boiler feed water is supplied from a pump worked by the engine when running, and an extra steam pump standing on the platform. The cylinders are outside, and valves on top, worked by an outside gear for the obvious reason of accessibility. The steam brake blocks acting on the four driving wheels are of hard wood. the boiler pressure is about 40 lb. per square inch, and the engine will take one person up one in ninety, and on the level, two, as shown in the photograph. The gauge between rails is 7 ins.



Another View Of Mr. Copestake's Model.

The tender, on four wheels, is supplied with a tank of stout tin, holding 2½ gallons, a hand brake, and the usual bearing spring gear and feed cock.

Principal Dimensions

Diameter of cylinders (brass)	1⅝ in.
Stroke of pistons (brass, with steel red)	2¼ in.
Diameter of driving wheels (brass)	6 in.
Diameter of bogie wheels (brass)	2¾ in.
Wheel base between driving wheels	9 in.
Wheel base (total)	24 in.
Thickness of frame (steel)	⅛ in.
Height of platform from rail	5 ½ in.
Width of platform	11½in.
Water in boiler	1½ galls.
Diameter of boiler	6 ⅝ in.
Length of boiler, including firebox	20½ in.
Heating surface, firebox	137 sq. in.
Heating surface, tubes	1.066 sq. in.
Grate area	40 sq. in.
Chimney diameter	1¾ in.
Thickness of boiler plates	1/16 in.
Chimney, height from rail	18½ in.
Diameter of pump rams (2)	5/16 in.
Weight of engine in working order	145 lb.
Weight of tender	66 lb.
Extreme length of engine and tender over buffers	63 in.

Mr. Walter Alcock And His Midland Loco

The rails are of iron, ¾ in. deep by ¼ in. thick, fixed by wedges to pine sleepers 1½ in. by 1½ in. square and 12 in. long. The fuel used is hard wood charcoal, and steam to a pressure of 40 lb. per square inch is raised from cold water in about half an hour.

A Model Midland Express Locomotive.

We are indebted for the accompanying photographs and detail of the engine therein depicted to Mr. Walter Alcock, Mus. Bac., who may be known to many of our readers as the highly-talented organist who officiates at Holy Trinity, Sloane Street. S.W., and also occupies the responsible post of assistant organist at Westminster Abbey.

Locomotive engineering is Mr. Albock's hobby and he is quite as keen as well versed in the doings of the real engines as in those of models. That his own model is a fine piece of work we can testify as the result of a very interesting visit of inspection on our part, and we can also answer for its ability to pull a dead weight of some 14st., for its task it easily performed when it pulled the Editor of M.E. from end to end of Mr. Aldock's track. It is a point to be scored to Mr. Alcock's credit that he obtained his Mus. Bac. degree while this engine was in progress. Probably the mental relaxation gained in model-making helped him to pursue his musical studies to so successful an end. But enough from the editorial pen. We will let Mr. Alcock tell us about his model in his own words. He writes:

I began building engines at the age of 14. For the boiler I generally used a cocoatina tin, and made the oscillating cylinders of odd bits of brass tubing. My only tools were a soldering-iron, my mother's best pair of scissors, a file or two, a hammer, and a centre-bit, which latter, in conjunction with the handle end of a file, was used for boring holes! The engines thus erected were, on the whole, successful, but my ambition was to build an engine which would pull me along, and burn coal. The subject of this article is the result of that early determination. I began this engine in 1894, and though it is some few details incomplete, it reached its present state in 1897.

"My first step was to try again and obtain the working drawings, which I believe appeared in Engineer and in Engineering I enquired at both offices, but found they were out of print. However, I at once decided to attempt the model without drawings. Many were the journeys I paid to St. Pancras, and innumerable the questions I put to the luckless drivers. But I got what I wanted - viz., the sizes of the wheels, length of the engine, and wheelbases. I then started on the frames. These I made of 3.32nds in brass sheet. The wheels were made and turned, axles fitted and crankshaft supplied by Mr. Lewis, then of New Oxford Street, now of Bath House, Twickenham.

The axle boxes I made from brass bars, cast square, and I always remember these as the hardest work of all, with little to show for it. "Then came the cylinders. I built them up with a soldering iron, the body being of 1½ in. drawn brass tube. The stroke of piston is 2 in. "I now occurred to me that I ought to make some provision for getting at the motion in case necessity. I therefore decided to put the cylinders on a separate frame.

This I bolted between the main frames, and I have had reason to be thankful for this arrangement; for the repacking of glands, etc., is quite an easy matter. Having finished the working parts, I started on the boiler.

This I made of 16th in. copper, and it consists of the usual parts - boiler barrel, firebox shell, with ⅜ in, water space between the two latter. I, of course, rivetted all the joints, and made the whole steam-tight with solder. There are five tubes, 3/4 in. inside diameter. When I add that on one occasion I left the blower full on by accident while I went in to tea, and the pressure went up to 60 lb., I think this part of the engine may be considered satisfactory; for nothing gave way though I must say I never expected it would stand more than 45 lb. The dome and chimney were cast from my patterns.

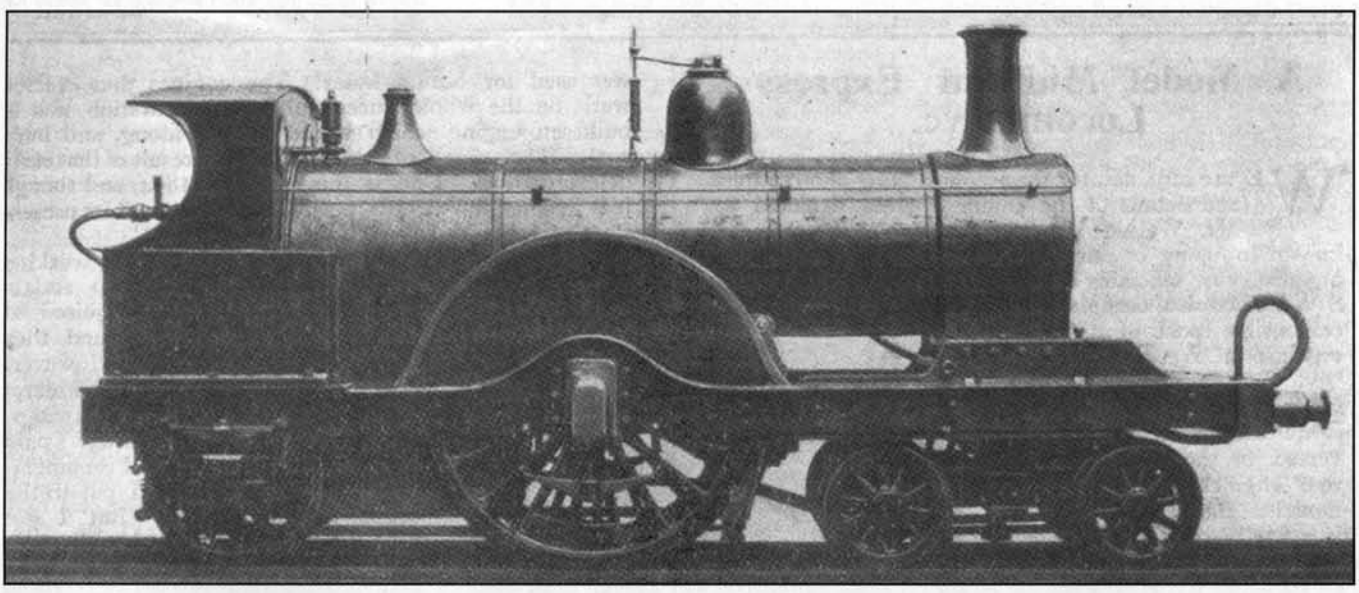
"I fitted a steam brake, ring blower, pet-cocks to cylinders, and, of course, steam and water gauges. The trailing springs and bogie general spring are real, and of phosphor-bronze; while the driving springs are only imitation, for I was afraid of the link-motion being disturbed. The firebars drop out in one piece on drawing a pin, for the sake of convenience.

"I can get up steam from hot water in about ten minutes, the fuel being ordinary coal. I attach a bicycle pump to the clack pipe, and having lighted the wood, which is laid on the grate with the coal above it, open the blower, and work the bicycle pump. As soon as steam is up, the pump is detached, and the steam does the rest.

"I find coal much better than charcoal, and it is more easily regulated and lasts longer, besides which it seems more real, and smells more correct. To be sure there is a deadly smoke until steam is up, after which there is little trouble.

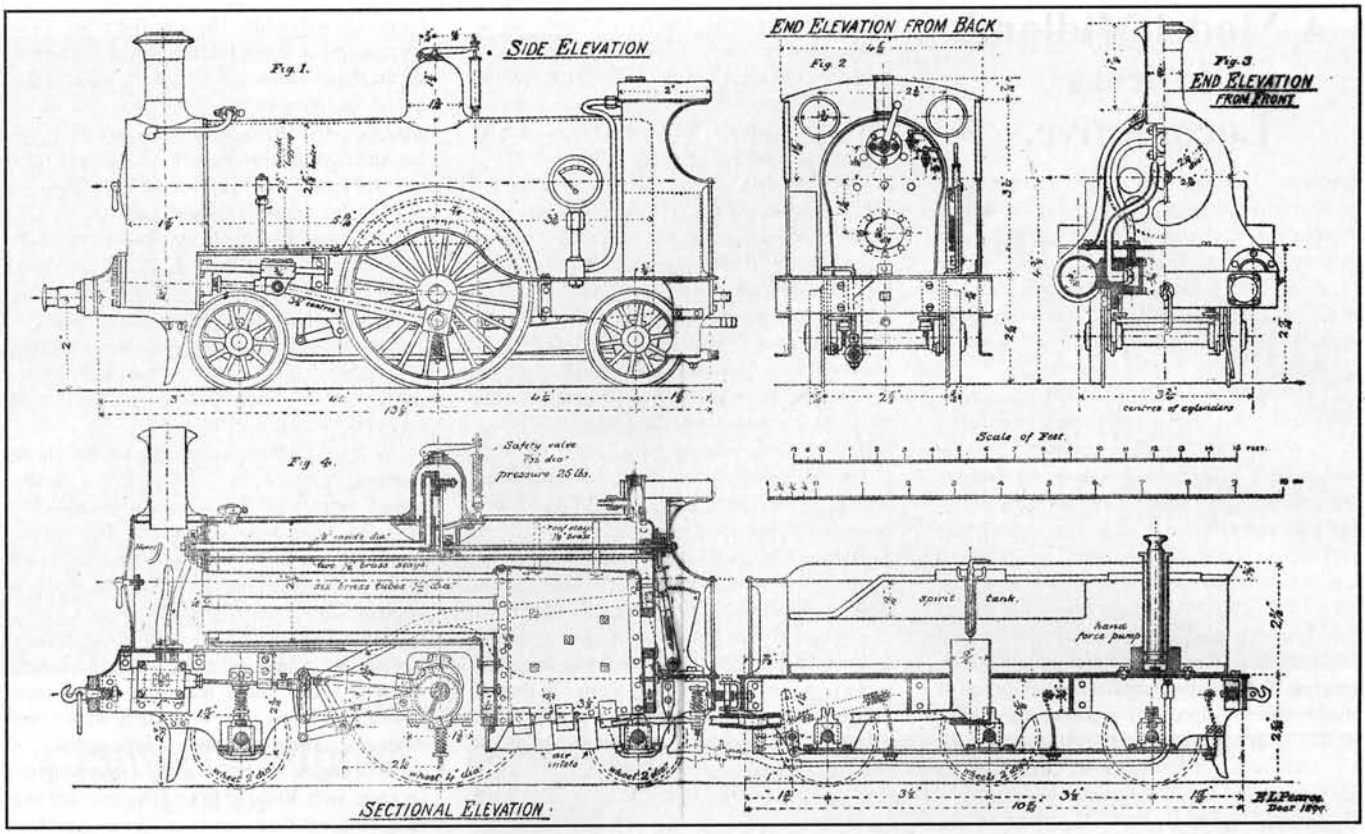
"The engine has pulled along a man weighing 16 stone, with 30 lb. of steam. The lines are only 40 ft. long, but I can ride to and fro as quickly as I like, and there is generally more steam than I want.

"I am certainly blessed with kindly neighbours, for they do nothing except shut their windows when I get up steam (and smoke!), but that may be to prevent my hearing their opinion of my hobby."



Side View Of Mr. Alcock's Model Loco.

This loco by Mr., later Sir, Walter Alcock is a fine model and all the more creditable bearing in mind the lack of drawings. One of the things that is unusual, particularly bearing in mind the trouble the builder went to in getting details correct, is that no tender was built, either for this loco or the subsequent Stirling Single he built. The Midland loco can be viewed at the South Devon Railway museum at Buckfastleigh. For more details see the very interesting articles by Harold Burton in the 1996 ME, Feb., p175 and Dec., p969. (Looking at the photo on the preceding page I am struck by the somewhat precarious position and the impression that model engineering is a very serious hobby, not to be taken lightly or irreverently.)



Design For A Model Single Express Locomotive

Design for a Model Single Express Locomotive.

By E. L. Pearce.

The model locomotive I am about to describe, which is shown in the accompanying photograph and by the drawings in the supplement, was built about sixteen years ago, and is still in excellent running condition. It was the first complete engine I made. My previous experience consisted in repairing a small horizontal engine, ½ in. bore and 1 in. stroke, and helping a friend to finish a ¾ in. by 1½ ins. horizontal engine, which had link motion, and rebuilding an old vertical boiler by fitting inside firebox with water tubes. I mention these facts merely to show that this engine can be built by any reader of this paper, who has had only a slight amount of practice in model-engine making. I had studied locomotive construction and made many drawings before starting on this model, and my idea was to make an engine that would run well while keeping to general proportions.

The general outline resembles the "Lady of the Lake" class of the North Western Railway, which was one of the best proportioned and prettiest engines of its time. The model is built to scale of nearly ⅝ in. to 1 ft. or one-twentieth full size. The driving-wheels being 4 ins. diam. and cylinders ¾ in. bore and 1⅛ ins. stroke, represent a 6 ft. 8 ins. driving-wheel and cylinders 15 ins. by 23 ins.; so that the boiler could be made larger relatively to the cylinders and wheels. The position of dome with spring balance safety valve on top, form of regulator in dome, and the tender with inside frames, etc., is after Mr. Stroudley's practice on the Brighton Railway. The cross head and single slide bars are similar to those put on the S.W.R. locomotive by Mr. Adams.

I commenced the engine by buying a pair of cylinders bored out and ports cut, the other parts being in the rough; but I found that the boring had been badly done, and so took a rough cut through them and lined them up with best drawn brass tube ¾ in. inside diam. and 1-32nd in/ thick, and sweated them in. Then I finished off the cylinder covers and steam chest, valve, and ground the faces true.

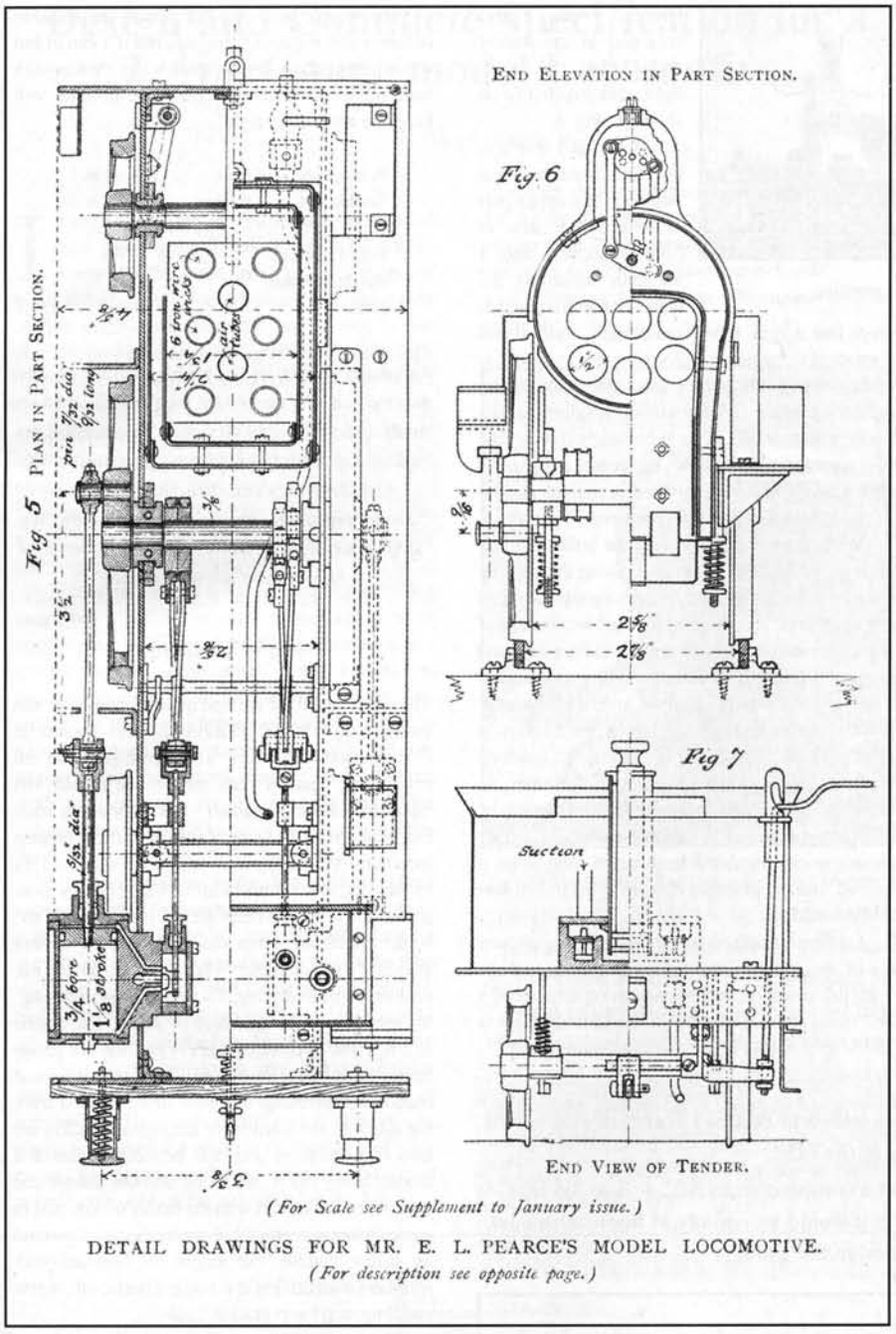
The pistons were turned to just slick easily in cylinders and a groove turned ⅛ in. wide and 1-16th in. deep and filled with cotton. They have not been repacked since, and work with very little friction and seldom get any oil. the side frames were next put in hand. The outline was accurately lined out and holes drilled just outside, ⅛ in. diam. and 1 16th in. apart, the metal left between them cut through with chisel, there being less distortion to the metal than if they had been cut out entirely by the chisel. The two plates were then flattened and rivetted together in two or three places; then filled up true to shape, taken apart and extra pieces of ⅛ in. brass rivetted on to form the axle-box guides.

Patterns were made in wood for driving and carrying-wheels, eccentrics, and straps, and cast in brass. The castings for driving-wheels were mounted on a wood face-plate for turning flange thread and face of wheel, and bored for axle; a recess was turned in another wood chuck to take rim of wheel for turning inside face, and slightly tapering hole for axle.

The axle came next, and were turned out of best iron rod,, the seating for eccentrics being left slightly larger than wheel seat, and the journal for bearings made 5 16ths in. diameter and ⅜ in. long. Before fixing the wheels on to the axle the eccentrics were turned up and bored; holes were drilled through thickest part, and tapped for ⅛ in. screws for fixing to axle when adjusting slide valve.

The straps were first cut in half through the lugs, filed flat, and soldered together; holes were then drilled through the lugs, the strap held in self-centreing chuck, and bored out to suit eccentrics; they were unsoldered, and the holes through lugs tapped for screws on one half and enlarged to clear screws on the other half.

The link motion was next fitted up. Each link was made from two pieces of ⅛ in. brass sweated together. Holes were first drilled along the centre line of curved slot, and the metal between them filed out, and finished by screwing link on to a wood faceplate a distance from lathe centre equal to centres of eccentric rod, the lathe head being worked backwards and forwards, the slot finished up true with a hand tool. The link was made about twice the usual width, to obtain larger wearing surfaces for die and to dispense with forked ends to eccentric rods. Each end of link has a slot 1-16th in. wide for the ends of rods; the latter were made from ¼ in. by 1-16th in. steel. The pins are 3-32nds in. steel wire, and a tight fit in rod and easy in the link. The eccentric straps have a lug projecting forward, which is recessed at one side to take the end of rod and fixed with a screw so that an adjustment is available for setting slide valve.



(For Scale see Supplement to January issue.)

DETAIL DRAWINGS FOR MR. E. L. PEARCE'S MODEL LOCOMOTIVE.

(For description see opposite page.)

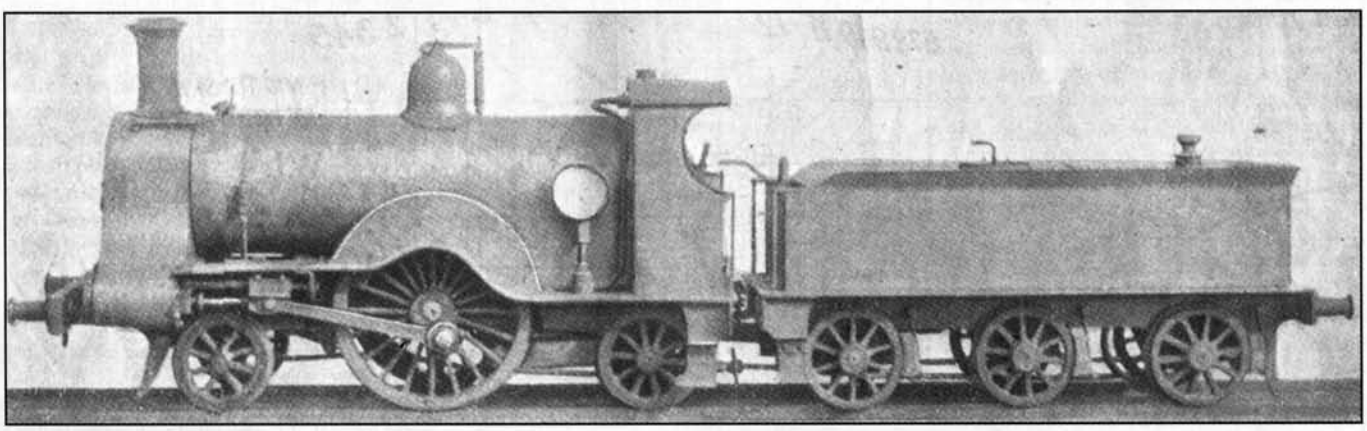
Detail Drwaings For Mr. E. L. Pearce's Model Locomotive

The reversing gear was first made with a screw and wheel, but it took too long to reverse the engine, so it was replaced by a lever, sliding catch, and notched sector. There are four notches each side the centre one, and the engine will run when linked up to the fourth notch in forward gear.

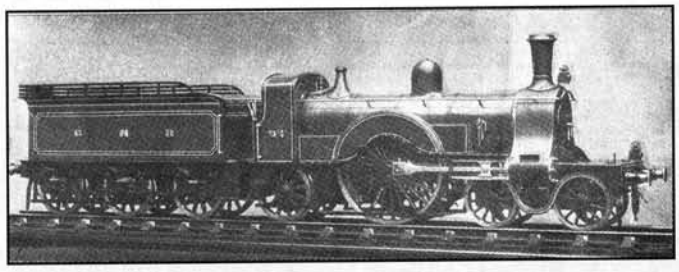
The whole of the frames and running portion of the engine being finished, the next thing to tackle was the boiler. this was made from best drawn brass tube, 2⅝ in. diameter outside and full 1-32nds. in. thick and 11 ins. long, including 1½ ins. for smokebox and 3½ ins. for firebox.

The tube was annealed, split along centre line a corresponding distance from each end, and opened out to form smokebox and outer firebox, extra strips being rivetted to latter to get the requisite depth. The throat plate and back plate are of sheet copper, 1-25th in. thick, and were flanged on a block of beech wood cut to proper shape and rivetted to shell. the inside firebox was made of copper of the same thickness, the tube plate being 1-16th in. thick. The end plates were flanged on a block of beech cut to the shape of inside of firebox, the sides and top being in one piece bent to shape round the block of beech and rivetted to flanged end plates. The top of firebox was curved slightly at forward end, and increasing towards back.

It was thought best to braze the joints in inside firebox as they would have to stand the intense heat of fire, and would not melt when the tubes were soldered in. I first made a blowpipe for gas with an air-jet in centre, and procured from the neighbourhood of Smithfield a large bladder, the burner being connected up to the gas by flexible piping; the bladder was blown out and attached to air-pipe, a board was placed on top and weighted to obtain the necessary pressure. The firebox was placed on iron tray on table, borax and spelter put along one joint; when the gas was lighted and air turned on a good flame was produced, but the supply ofcompressed air was exhausted before the spelter commenced to run. The reservoir was charged up several times, but with no better result than burning a hole in the dinning-room table. The firebox was put on one side for a time and other work proceeded with. I eventually took it to a coppersmith's and had it brazed. Holes were drilled in the tube plate for the ½ in. tubes, patterns were made for the foundation and fire-door rings, and cast in brass; these being fitted to their respective places, rivetted and soldered stays were put through the sides and ends of outer and inside firebox by



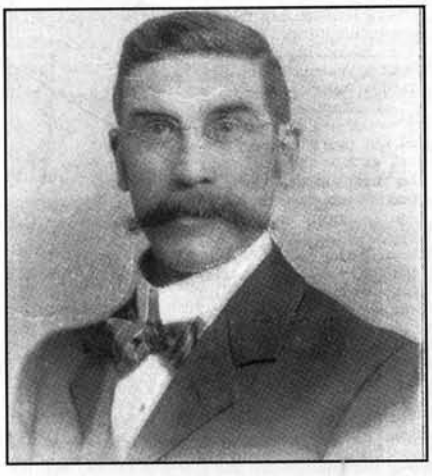
Mr. E. L. Pearce's Model Single Express Locomotive



Mr. W. Bashford's Model G.N.R. Locomotive

drilling right through the two places and screwing the ends of 3-32nds in. brass wire, and tightening up with square nuts and soldered.

The smokebox tube plate is 1-16th in. sheet brass, the upper half fitting inside barrel against a ring of brass ¼ in. by 1-16ths in. rivetted to barrel; the lower half extends outside of barrel and takes the curved line of smokebox to cylinders. The holes for the six tubes were made slightly at firebox end and enlarged at smokebox end, fitting the holes tight, and sweated in as shown in Fig. 4.



Mr. W. Bashford.

Methylated spirits is the fuel used to raise steam; in the upper part of tender is a tank to hold a supply, and a regulator to adjust the quantity required, which drops into a ⅞ in. tube fixed directly under it and connected to burner in firebox by brass and India-rubber tubing. the burner takes the place of the ordinary ashpan, and consists of a tin box, in the top of which are six ⅜ in. tubes packed with fine iron wire for wicks, and in the centre are two air tubes passing right through the box; air can also be admitted by a damper at forward end of burner.

When steam is to be raised the boiler is filled through the short piece of tube passing through the top of cab, to the level of the upper gauge tap. The spirit regulator is opened wide to allow a stream of spirits to run for a few seconds, and then adjusted to about one drop a second; then a few matches are struck and thrown into firebox, and in a second or two the wicks light up, and soon the firebox is filled with blue flame; the firedoor is left open, as there is very little draught through the tubes. In about ten minutes the pressure-gauge shows 1 lb. of steam, the blower is turned on a little, firedoor closed, spirits regulated to three or four drops a second, and the pressure runs up to 23 lbs. in two or three minutes.

On first turning on steam, jets of water are sent out of the chimney until cylinders get warmed up. With full steam on, the engine runs at a speed of 6 or 7 miles an hour, and it will haul a load of about 25 lbs. in a double bogie truck at a slow speed.

The engine will run for about ten minutes before boiler requires filling up, but if a can of hot water is kept at one end of track a few strokes with hand-pump in the tender every five minutes will keep the water level right.

Heating surface of tubes	56 sq. in.
Heating surface of firebox	30 sq. in.
Total	86 sq.in.
Weight of engine	11 lbs.
Weight of tender	5 lbs.
Total	16 lbs.

An edited version of the highlights of a detailed description of a successful loco which had been built and run by the designer. This was, in my opinion, the first design to appear in the ME with drawings and directions that most competent model engineers could follow. We shall hear more of Mr. Pearce. I wonder if he heard more about the table!

Mr. W. Bashford.

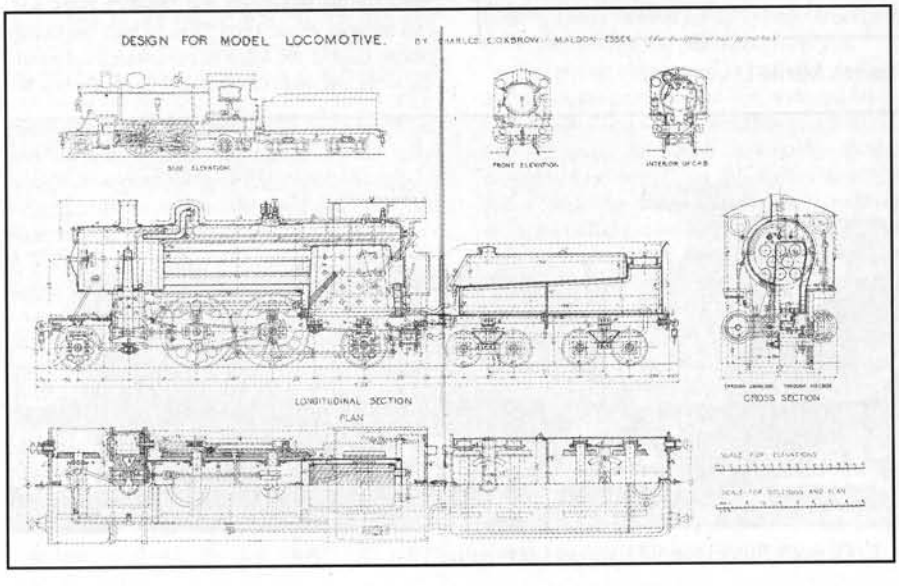
The silver medal for the best model locomotive was awarded to Mr. W. Brashford, who resides at Cricklewood, and is a keen enthusiast in all engineering matters both ashore and afloat. His steam-launch the Snowfish . His engine is a scale model of one of the Great Northern Railway express locomotives (No. 93). It is built to the scale of 1 in. to the foot; the cylinders are 1⅜ in. bore by 2 in. stroke; the driving wheels are 8⅛ ins. diameter, the bogie wheels are 4 ins. diameter, and the trailing wheels 4⅝ ins. diameter. Wheels are: Bogie, 6½ ins. centres; bogie to driving, 7¾ ins.; driving to trailing, 8¾ ins.; or a total wheel base of 23 ins. The engine is 2 ft. 7 ins. over all, width 7¼ ins., the rail gauge being 4⅞ ins.; the engine is fitted with the usual motion for reversing, the same being worked from the cab with the usual lever, etc.; spring buffers are also fitted to front and also between engine and tender; brake fitted and acting on both drivers and trailers and connected with the tender brakes, and to work in conjunction with them by the usual method by screw handle; the engine is finished with splashers over driving and bogie wheels; cab, screw coupling, and lamp brackets, etc.

The boiler is of steel, riveted, the firebox being of copper, flanged out at bottom to rivet up to the outside shell; it has five ¾ in. brass tubes screwed into the firebox and expanded, and also expanded in smokebox tube plate; the firebox is stayed with sixty-four copper stays, and boiler tested to stand 100 lbs. pressure; boiler is fitted with pressure gauge, water gauge, spring safety valves, dome from which engine takes the steam, and governed by the regulator in cab; it is also fitted with a back pressure valve, and arranged so that water can be put in to boiler by a hand pump; boiler can be steamed either by oil or coal.

The tender is of design as used with this engine; it has the usual tanks, coal, space, etc., it is fitted with brakes, and worked in connection with the engine brakes; tender is made from brass sheet, and riveted up with small rivets, it has coping and top guard for coal, it is also fitted with spring buffers and screw coupling.

Mr. Bashford's loco, an exceptional model, was willed to Percival Marshall and is still in the possession of the ME.

The design by Mr. Oxbrow was the winner of a competition in ME, it is in 3½ in. G and although designed for oil firing, looks as if it would be equally at home with coal. Quite an advanced design for 1900.



Design and Complete Specification for a 2 ½ in. Gauge model Locomotive.

By Henry Greenly.

In introducing this design for a locomotive, I must first say that I had an engine built from practically the same drawings for a friend of mine, but of slightly smaller dimension. The gauge of this engine, which is the one shown in the photograph, is only 1⅞ ins. - about the minimum a model engineer would care to attempt. The tender has yet to be made.

I did not advise such a small gauge; but, as it was for a railway already provided, I could not help myself.

It was by Messrs. Whitney, of City Road, under a specification similar to the one given below, for about the price of a bicycle.

The engine was at first intended to run with a lamp, but it did not answer, as the firebox is so small - actually 2⅝ ins. long by 1 in. wide inside - and, therefore, some other firing had to be experimented with, as the heating surface was ample. I made a temporary tender with a vapouriser, and fitted a burner to the engine, similar to that shown on general drawing, and a blower. With this apparatus the engine made more than enough steam to run constantly at about four miles per hour.

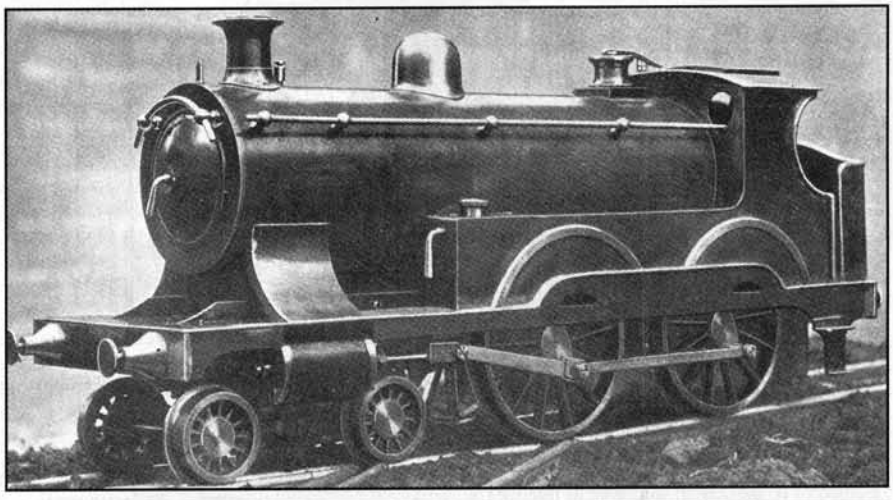
I have endeavoured in the design for the larger engine to make the model as nearly as possible to scale, and also to simplify, and therefore cheapen, everything. If this design is used by any reader who wants an engine to be used out of doors, I think he had better build it to the Society's standard gauge (3 ½ ins.), and use oil fuel on Mr. Crebbin's system; but for a locomotive to be used indoors the size shown is very convenient. The minimum radius of curves for 2½ in. gauge should be 6 ft. If the 3½ in. gauge is adopted the addition of lagging and outer cover for dome would be advantageous, and petroleum would be the only satisfactory fuel.

On my drawings I have shown brakes to the ten der; for myself I would not fit these to an engine smaller than 3½ in. gauge, as, when the steam is shut off, a small model soon comes to rest.

The leading dimensions of the engine for 2½ in. gauge are as follows:

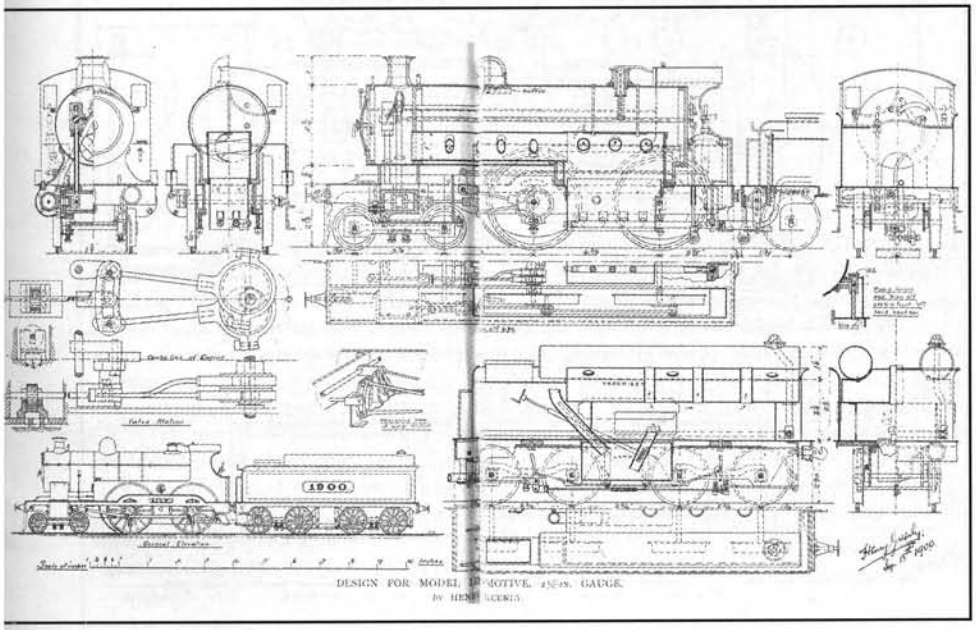
Cylinders	½ in. diameter by 1 in stroke
Driving wheels	3⅛ ins.diameter.
Bogie wheels	1⅝ ins. diameter.
Tender	1⅞ ins. diameter.
Boiler diameter	2¾ ins. diameter outside.
Heating surface, firebox	22 sq. ins.
Heating surface, flue tube	21 sq. ins.

I have allowed as much space as possible above the crown of the firebox, so that the model (as the cylinders consume about ¾ cubic in. of water per minute at 3 m.p.h..) should run for at least twenty minutes without water.



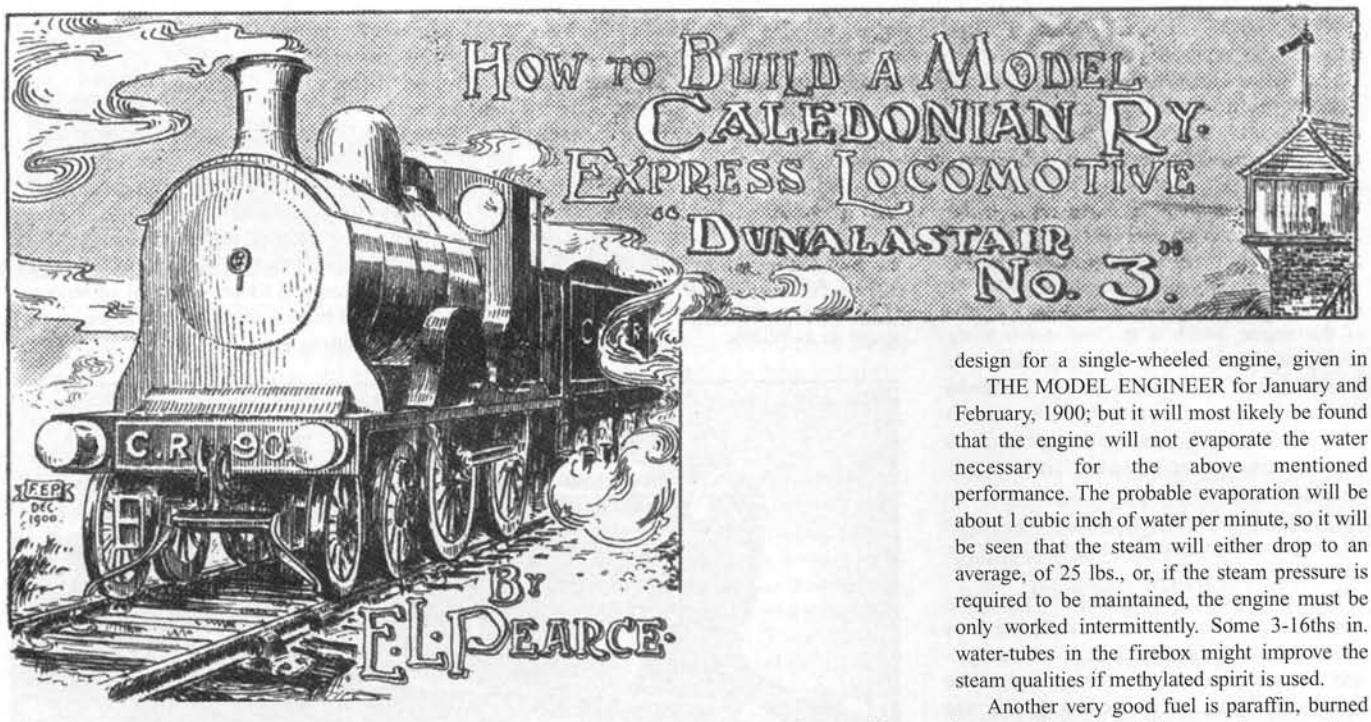
In the December 1st issue Henry Greenly had a design for a 4-4-0 tender loco. it included a detailed specification to be sent to suitable loco builder for quotes, presumably indicating that he expected readers to get someone else to do the building. He certainly didn't build one himself and does not give details of building. That having been said, it does look a sound job apart from the boiler and burner. It is interesting to note that in June 1901 he has had doubts about both and shows proposed modifications, virtually a loco type boiler albeit with cross tubes in the firebox.

(Although vapourising spirit burners were common practice, the thought of having a lamp in the tender under the vapouriser does not appeal, especially indoors. I was very intrigued by the assorted suggestions for steam raising.)



There is no danger in vapourising the spirit, the pressure is almost nil, and is only just sufficient to feed the burners. As a blower is absolutely necessary for steam raising, I should advise a tube having a blast-pipe connected to a small stationary boiler (preferably the boiler of one of those cheap German stationary engines with the paraffin lamp), which can be placed in the funnel until the engine has enough steam to work its own over blower. Alternatively, the steam could be raised by a gas bracket under the track or by spirit lamp. I believe with this firing, cross tubes in the firebox or something on which the gases can strike and rebound is necessary.

As an extra improvement, a very small pump might be fitted in the tender, or separately as in engine to supply the vapouriser. Although I have not yet tried it, I should think that if a tank of spirits be placed at a height of 5 or 6 ft. above rail level, it would have sufficient "head" to force the spirit into the vapouriser against the slight pressure. A cock could be fitted to vapouriser, and a flexible tube arranged to connect tank when the amount of spirit required augmenting.



SEVERAL enquiries having been made for dimensions and drawings for a scale model of the latest Caledonian Railway locomotive of the "Dunalastair" type, it was thought that working drawings, with hints on the method of construction, would be of interest.

The scale will be ¾ in. to the foot, the standard adopted by the Society of Model Engineers; but as some would no doubt prefer to make a larger model to 1 in. scale, the dimensions could be taken from the drawings by using the scale for an inch scale model, or by adding one-third to dimensions figured on the drawing.

It is proposed to keep as near the scale as possible in the external appearance of the engine, a few necessary modifications in the construction being introduced. This type of engine, having a large boiler and driving wheels of moderate size, should make a good working model, and allow the gauge between the rails to be retained to scale, which is 3½ ins. full, or, to be exact, 3 17-32nds ins. The most important deviation will be in the diameter of cylinders, which would be 1 3-16ths ins. diameter, and 1 sq. in. in area if made exactly to scale; but in the model they will be reduced to 13-16ths in. diameter, having an area of 0.5 sq. in., the correct stroke being retained, which is 1⅝ins.

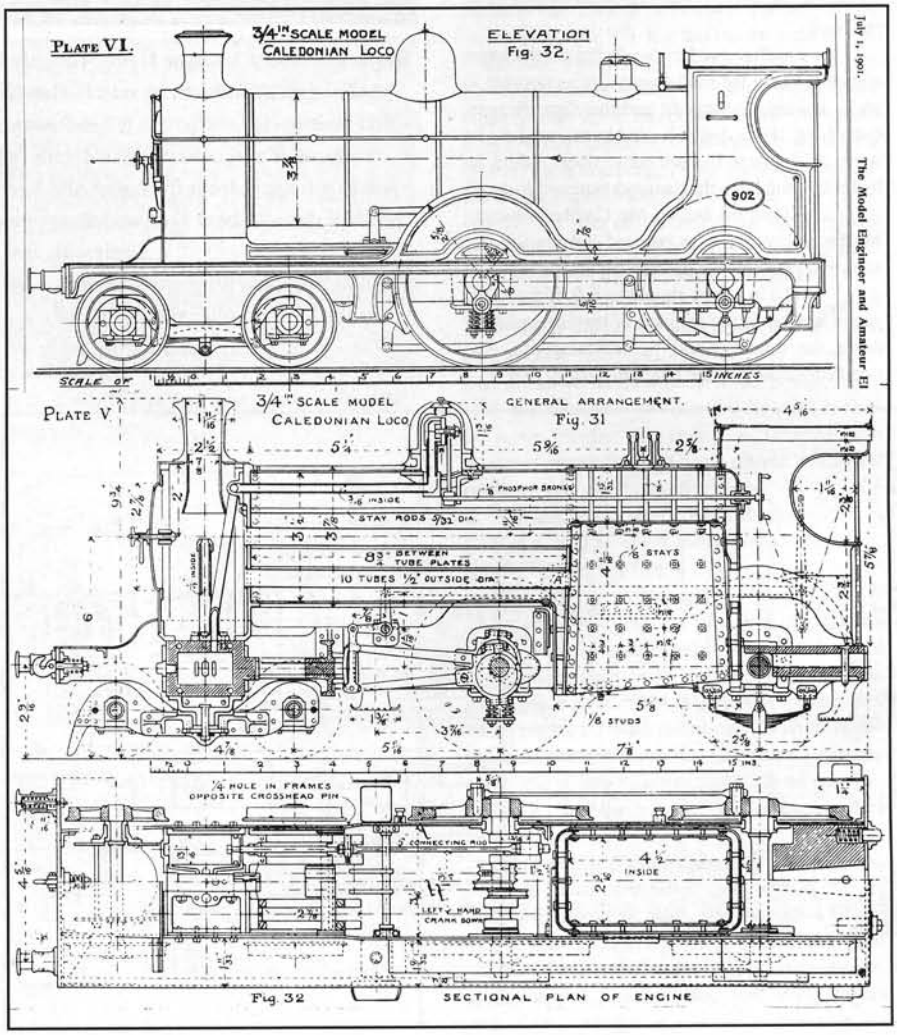
By reducing the diameter of cylinders to 13-16th in. it is possible to get them with the slide-valves comfortably between the frames, and the relatively small diameter will be compensated for by carrying a boiler pressure of 50 lbs. per square inch, with 80% of this pressure on the piston. The tractive force at the rails will work out as follows:-

$$40 \text{ lbs.} \times .5 = 20 \times \frac{1\frac{5}{8}}{4\frac{7}{8}} = 6\frac{2}{3} \text{ lbs}$$

which will be sufficient to start a very fair load.

We now come to the question of fuel. As the boiler is required to evaporate about 1 1/2 cubic inches of water per minute when the engines are running continuously at 5 miles per hour, with a working pressure of 50 lbs., a suitable and efficient fuel must be decided upon.Methylated spirit may be used, and the The Pitmaston Moor design for a single-wheeled engine, given in THE MODEL ENGINEER for January and February, 1900; but it will most likely be found that the engine will not evaporate the water necessary for the above mentioned performance. The probable evaporation will be about 1 cubic inch of water per minute, so it will be seen that the steam will either drop to an average, of 25 lbs., or, if the steam pressure is required to be maintained, the engine must be only worked intermittently. Some 3-16ths in. water-tubes in the firebox might improve the steam qualities if methylated spirit is used.

Another very good fuel is paraffin, burned in one of the Swedish patent burners. these burners, if understood and used properly, will never give any trouble, and ought to evaporate with this boiler about 2 cub. ins. per minute.



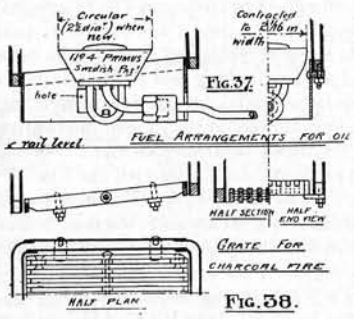
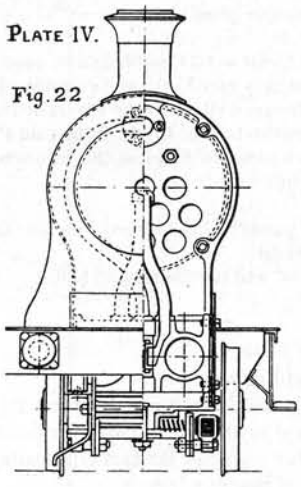


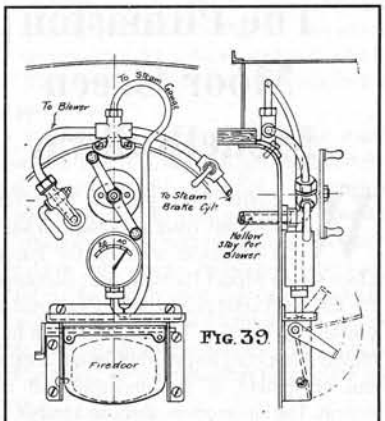
PLATE IV.

Fig. 22



The engine is very suitable and plenty large enough to work with solid fuel. Charcoal ought to give excellent results, as the firebox is fairly deep, a lasting fire should be obtained. the only drawback with charcoal is the stoking and the dirt which accompanies its use; a charcoal fire would have to be fed about every three to five minutes, whereas oil fuel would, under favourable conditions, require no attention for one hour. In fig. 38 a suitable grate is shown, the bars are strip steel No. 12 S.W.G., 3-32nds in. thick by ⅜ in. deep. The distance between the bars should be ⅛ in. Of course, a pattern can be made and the grate cast; in that case in the bars should be taper in section, the larger width at the top. The grate is supported at four points by lugs affixed to the studs, projecting down from the foundation-ring.

If, when readers have finished their engine, or if they may find some part not clearly explained, we shall be happy at the close of this serial article to endeavour to help with advice, or clear up any obscure point which may arise.



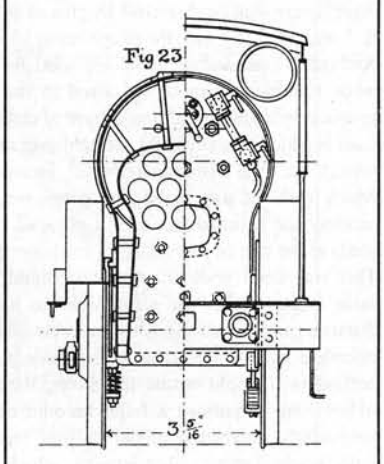
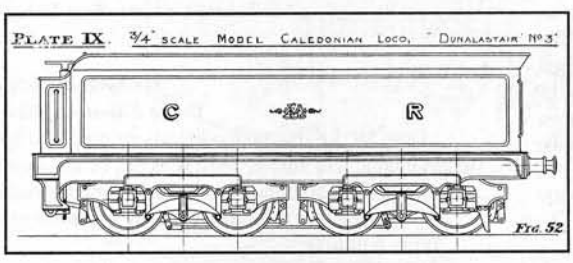
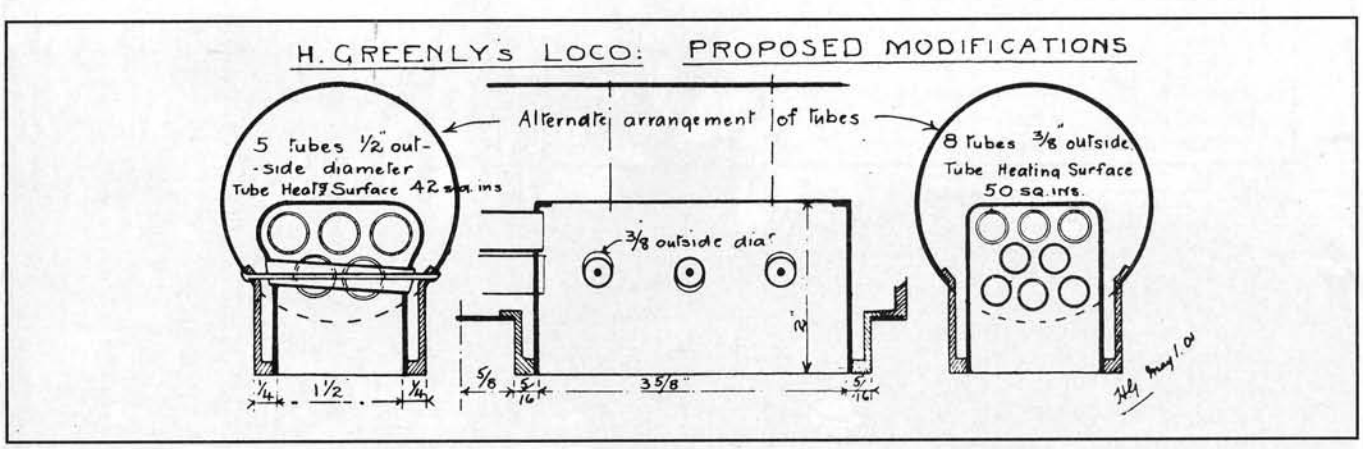


PLATE IX. ¾" SCALE MODEL CALEDONIAN LOCO. "DUNALASTAIR" No 3"





Since my design was published I have had experience with the method of firing; I have found that the methylated spirit vapour, although giving an intensely fierce flame, is very erratic in its conduct. At first I thought this was only due to the very small loco, Mr. Pearce very kindly fitted the arrangement to his engine. With this engine the Bunsen and ignition wire was possible, and therefore the burner kept alight much better. It was found, after exhaustive experiments, that although the heat developed is infinitely greater than that given out by ordinary spirit lamp, the whole arrangement is troublesome and uncertain, depending wholly on the blower, and therefore is not to be recommended.

Knowing that several gentlemen are building 2½ gauge locos to the published design, and to save them future trouble, I write this letter. The question then is, what will make the engine steam with the ordinary spirit lamp, and the only answer, have plenty of effectual heating surface.

I have, together with others in the light of experience, come to the conclusion that a number of flue tubes of comparatively small diameter, and made of very thin metal, are the most efficient arrangement, considering the limit of heat given out by a spirit lamp.

The drawing enclosed shows alternative modifications recommended, and I shall be glad of comment upon them.

I further recommend the adoption of a superheater, and the lagging of the cylinder and connecting steam-chest with felt under a tin casing. Kindly excuse great length.

Yours faithfully,

Henry Greenly

London. W.C.

The Pitmaston Moor Green ModelRailway

We have much pleasure in presenting with this issue a photograph showing a passenger train on the Pitmaston Moor Green Model Railway, near Birmingham. For this interesting picture we are indebted to the courtesy of Mr. H.C. Holder, who, with his two brothers, has been responsible for the installation and equipment of this business-like model system. The locomotives, three in number, are of the G.N.R., the G.W.R., and the American types respectively, and have overall lengths of 9 ft., 7 ft. 5 ins, and 7 ft. 6 ins., the gauge being 10¼ ins. Anthracite coal and charcoal are used for fuel when running, steam being raised in the first instance by a gas jet lighting a layer of charcoal. Coal is added as soon as the steamblower can be turned on. The American model locomotive which leads the way in the photograph we give, recently did a timed run over a distance of 30 yards at the rate of just under 15 miles per hour. This was done without any load behind. The same engine holds the record for the longest distance run over Mr. Holder's track, covering 15 complete laps of 303 yards each. She was then pulling two people beside the driver. We hope before long to publish a fuller account of this particularly interesting model railway, together with some further photographs which Mr. Holder has been kind enough to prepare for us.

1901 brought forth yet another design form Mr. Pearce, see preceding pages, described over ten articles, with excellent detail drawings. based on full size drawings published in The Engineer in May 1900, this design must have been the most comprehensive of its time, (and compares quite favourably with current designs). Reading his comments on solid fuel firing, even though he is clearly predisposed toward liquid fuels, one could be forgiven for thinking that solid fuel firing in small size loco's was just around the corner, but it was not to be. Unlike his previous design, there is nothing in the articles to suggest that he had built the loco himself, at the time of publication. Also on the preceding page we had a footnote from Henry Greenly regarding his Dec., 1900 loco. Although he had not built the loco, it is clear from his notes that he had carried out a lot of practical research into the original burner and boiler and found both wanting. To which end he proposed boiler mods., with two alternative firetube arrangements. (It seems to me that in those notes he is so close to the same conclusions that LBSC was to expound, he says, "that a number of flue tubes of comparatively small diameter, and of very thin metal, are the most efficient arrangement". If he had dumped the cross tubes, fitted a grate, and opted for charcoal. Who knows what might have been? Mr. Pearce certainly thought he had it right. It's all a bit academic now since we know the outcome and a certain Mr. Smithies was waiting in the wings with another method of increasing the heating area and a internal spirit burner that was to change the face of small boiler firing for years to come.)

1902 was another good year, in January we had a 1" scale LTSR 4-4-2T, published by courtesy of W. Martin of West Ham, whom the eagle eyed will have already noted as a well established firm in the 1898 adverts. There is no acknowledgement to the designer, either in the advert or the text, but the drawings are signed H. Greenly. Pity about the paraffin burner firing. (Who said I've got a thing about solid fuel. I'm sure there must have been someone building this loco who decided to put a grate in!)

A lovely shot of the Pitmaston Moor railway, anyone for tennis? King Edward's on the throne and all's well with the World.
Mr. F. Smithies introduced us to "Don" and the "Smithies" boiler.

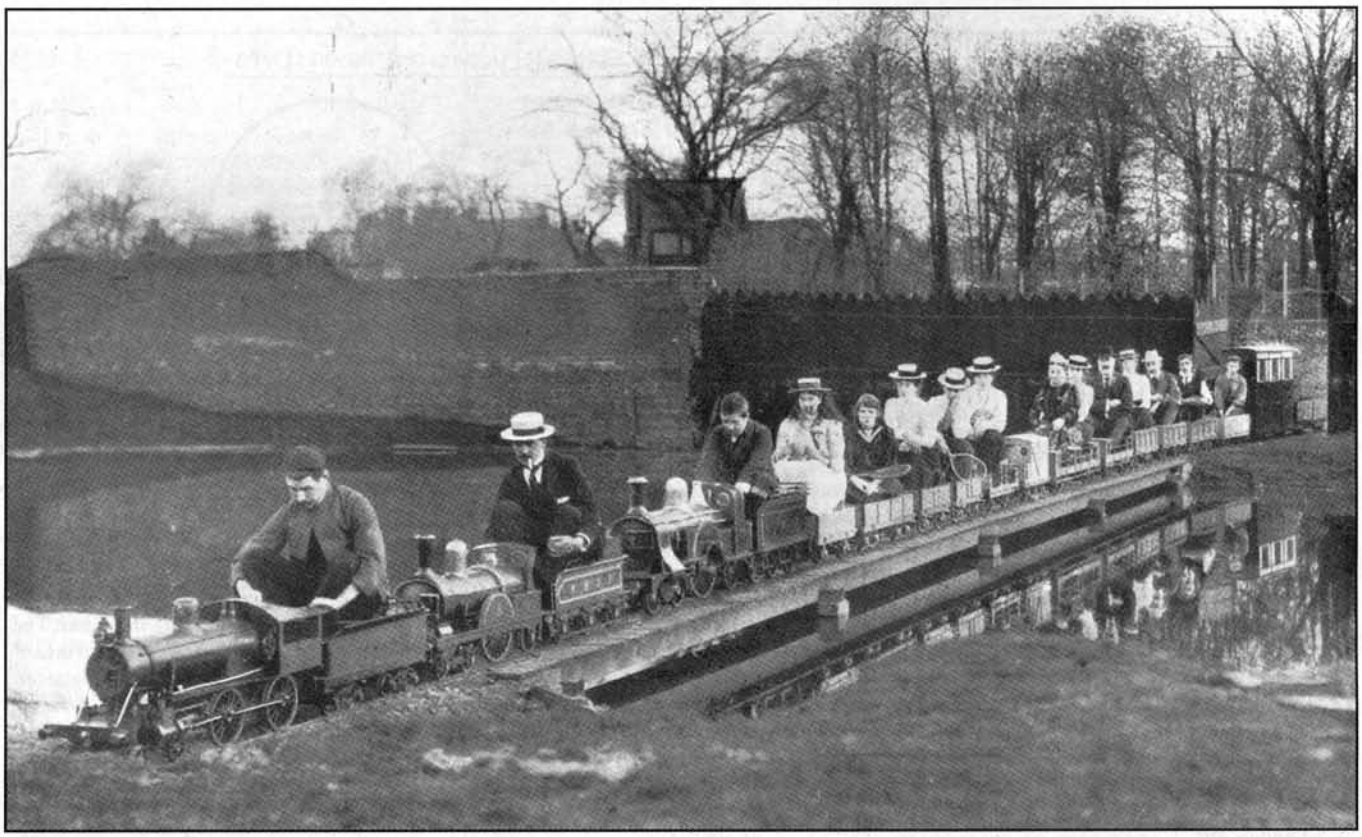
Mr. Greenly's Model Loco.

To the Editor of The Model Engineer

Dear Sir, I think the modifications proposed by Mr. Greenly for the boiler of his 2½ in. gauge engine will answer well. It would be difficult to find anything that could beat flue tubes or heating surface in the barrel of a locomotive boiler; they distribute the heat effectually, and the ends are easily got at for repairs in case of a leak.

Yours faithfully,
Dulwich.

E. L. Pearce.



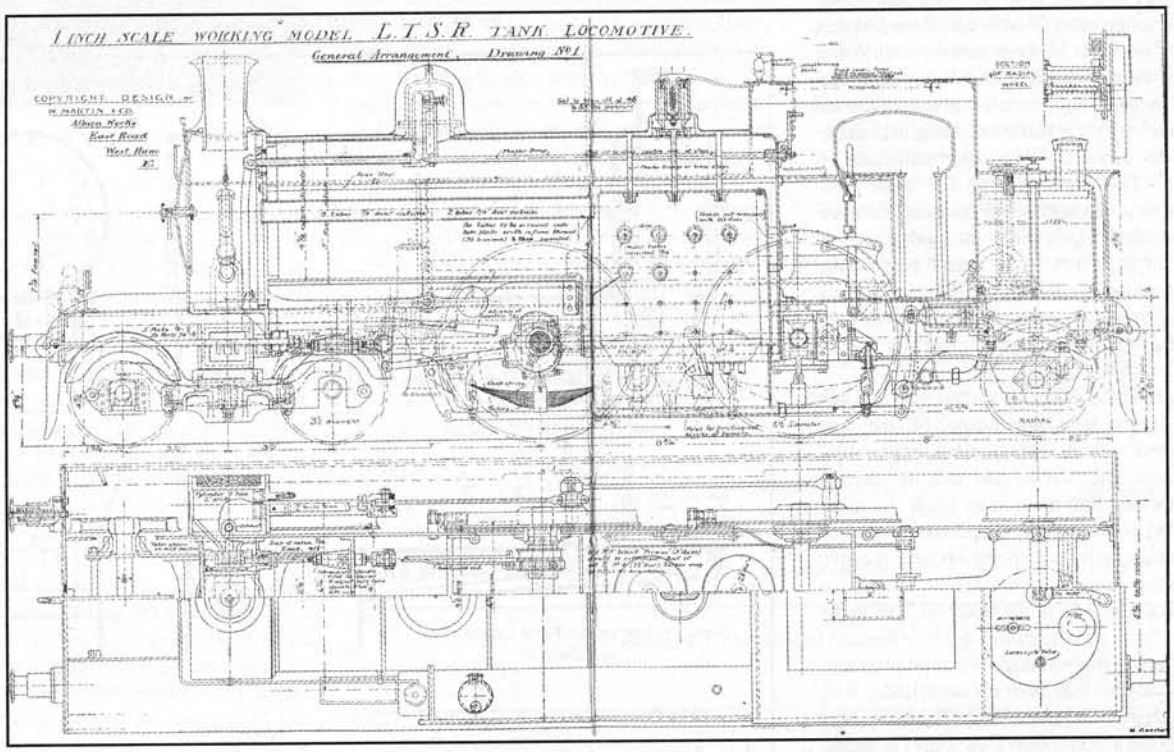
The Pitmaston Moor Green Model Railway

An Inch Scale Model L.T. and S.R. Locomotive.

By the courtesy of Messrs. W. Martin & Co., of West Ham, E., we are able to give full working drawings of their lastest production, in the shape of a scale working model of the most recent London, Tilbury, and Southend Railway ten-wheeled tank locomotive. This class of tank engine has long been popular with those who make the study of locomotives - real and model - their hobby, and these engines, being capable of "express" work, are a very good prototype for the model locomotive builder. The absence of the tender makes the engine very compact; connections for water and oil present no difficulties. The engine is much shorter, and its wheelbase is quite as flexible as the ordinary four-coupled bogie locomotive.

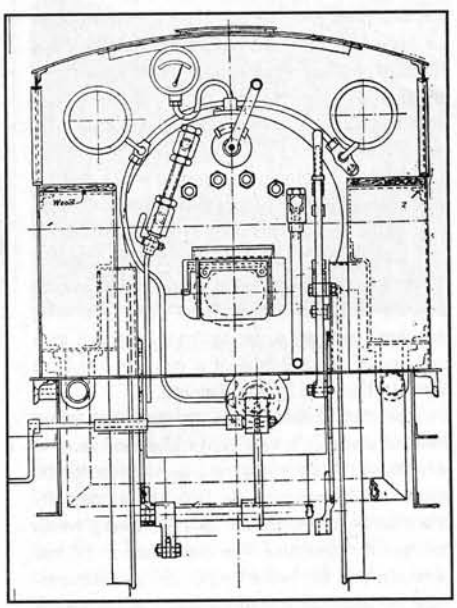
The first thing that occurs to one is "how is it possible for a tank engine with a closed cab to be fired and driven"; but a reference to the accompanying drawings shows that provision for this is made in two ways - the first difficulty is removed by the use of oil fuel on the Swedish system; the second by arranging that the centre part of the roof of the cab, sufficient to allow of the operation of the various levers, be removable. To strengthen this part, and to keep it in position, it is provided with angle "irons" projecting ion the under side, and to facilitate taking it off that which forms the cab ventilator in the actual locomotive is added. This makes a convenient hand-hole for the loose part of roof.

A firedoor may be arranged in the usual position; but this, it is stated, is not an absolutely necessity. Such would be essential if the engine were ever to be fired by charcoal, and it is worth while arranging for use with oil fuel also. The door should have side cheeks, as shown, otherwise, when the door is slightly open, the heated gases will have an easier exit and make a dirty mess, to say nothing else, of the boiler fittings. The firehole would be found very useful when lighting the oil burners.



LONDON, TILBURY AND SOUTHEND TANK LOCOMOTIVE.

Boiler Mountings Inside The Cab



Just the odd snippet from the description, no space for all of it. A very attractive loco, I suspect that a lot of these got built, there is an account of an enthusiastic German builder in 1905.

S.M.E. Medallists and Their Work.

F. Smithies.

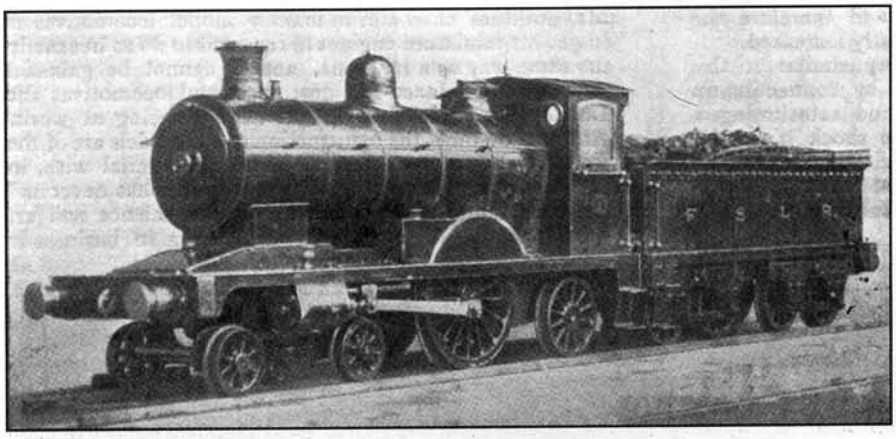
Mr. Smithies is nothing if not enthusiastic in his special hobby of model locomotive engineering. His two models gained a bronze medal at the recent competition of the Society of Model Engineers. Mr. Smithies' chief aim in making model locomotives is to get his miniature engines to run, and to do so in exactly the same way as a real one, and it cannot be gainsaid that he has produced the most successful locomotives the London Society has had the privilege of seeing at work. At the same time, the construction of the models are of the simplest character, made out of scrap material with, in the past, the rudest of tools. Mr. Smithies has never had the opportunity of any instruction in science and art of engineering, or any handwork, being in business in no way connected with the manufacture of anything. The total mileage of these two locomotives is now well over 2000 miles, and there is seldom a day upon which his models are not worked for an hour or so. In general proportions, appearance, and capabilities, Mr. Smithies' models of locomotives have improved from time to time during the last twelve years of spare time he has devoted to model-making.

Forgetting the maker for a short time, we will now consider the construction of the two locomotives which were exhibited at the competition. The tank engine and the express engine are built both to the same gauge and scale. The railway is laid to 3¼ in. gauge, and the engines stand well up, having high pitched boilers of ample dimensions, which gives them a massive appearance. The scale of the models is ⅝ in. to the foot.

The tank engine was made over three years ago, and, in its original state, had only one cylinder, ⅝ in, by 1¼ ins. The driving wheels are 2⅜ ins., and the boiler is 3 ins. in diameter by 8 ins. long. The engine was illustrated in the pages of The Model Enigineer for April 15th. 1901, and was the fifth locomotive Mr. Smithies had made, and also. at the time of construction, the best model for running and steaming, the reason of which will be dealt with later.

The next locomotive attempted was a marked improvement on any of the others turned out from Mr. Smithies' shop. This engine was built with what material and parts that could be collected, and is better described by the photograph and the outline drawing (Fig. 6) reproduced herewith. The cylinders (two) are ½ in. by 1 in., having a total capacity of about 2-5ths of a cubic in., and the driving wheels are 3½ ins. diameter.

The chief feature of the engine is the boiler, which is certainly a very clever idea, and seem to solve the difficulty providing a good boiler for the small model locomotive. the barrel seen externally is not the boiler proper, but simply a casing which contains the generator. The outer shell is 3¼ ins. diameter, and the boiler proper 2½ ins. diameter. Now we are dealing with the boiler in question it will be as well to record graphically the improvements made from time to time in Mr. Smithies' model locomotives. (see page 207)



The Model Express Locomotive "Don"

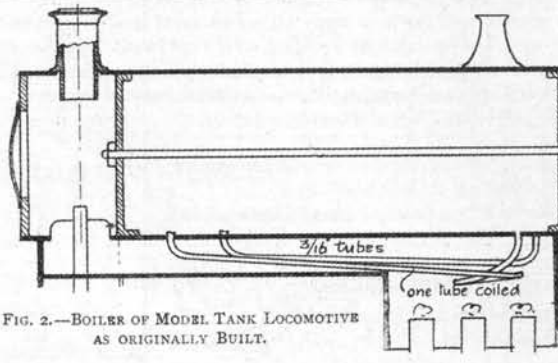


FIG. 2.—BOILER OF MODEL TANK LOCOMOTIVE AS ORIGINALLY BUILT.

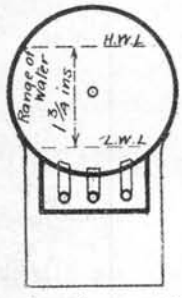


FIG. 2A.—CROSS SECTION AT FLUE.

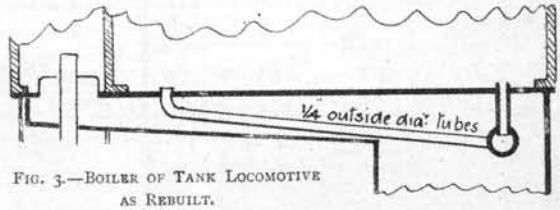


FIG. 3.—BOILER OF TANK LOCOMOTIVE AS REBUILT.

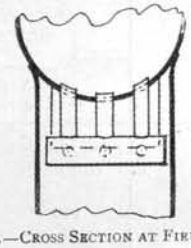


FIG. 3A.—CROSS SECTION AT FIREBOX.

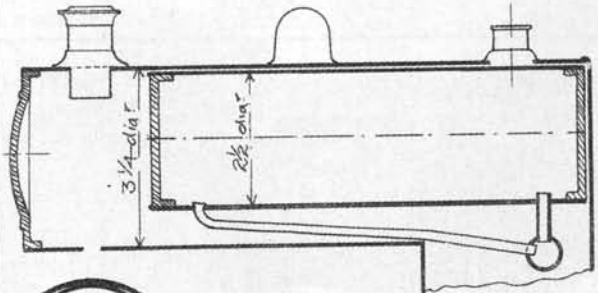


FIG. 4.—
BOILER OF MODEL EXPRESS "DON."

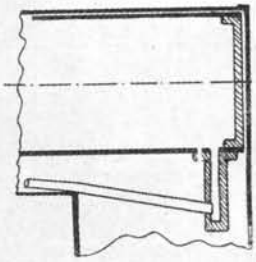


FIG. 5.—"DON" BOILER AS AT PRESENT, WITH CAST DOWNCOMER.

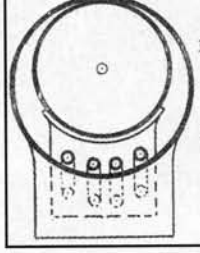


FIG. 5A.—CROSS SECTION OF "DON" BOILER AS AT PRESENT (showing Four Water Tubes).

MR. F. SMITHIES' LOCOMOTIVES.
DIAGRAMS SHOWING IMPROVEMENTS MADE WITH THE BOILERS.
Not to Scale.
(*For description, see page 208.*)

The earliest attempts at boiler work was the provision of a plain cylindrical boiler without water tubes, and coupled to large cylinders, as may be judged, it did not proved a success. Mr. Smithies' endeavour was, and is, to obtain a model which would in every way run as a real locomotive - go slow or fast and always have ample steam for all conditions of working, and the next improvement, to box the flame in entirely and augment the heating surface by the addition of water tubes as shown in Fig. 2, gave every satisfaction.On rebuilding the tank engine, the water tubes were provided with a downcomer made of pieces of tubes as shown on

Mr F. Smithies.

Fig. 3, and a conical casing underneath to conduct the heated gases to the smokebox. the boiler of the express loco "Don" was first provided with tubes as in Figs. 2 and 3, but the whole of the boiler proper has just been rebuilt with a cast brass downcomer similar to the one illustrated on the article starting on our issue of March 1st. This type of downcomer does away with a number of possibly leaking soldered joints. Three ¼ in. outside diameter water tubes are used in the latest arrangements, and the cylinders are amply supplied with steam for the hardest conditions of working. Great care is taken with all the boilers to make them steamtight and not have the slightest leak.

Another point with the engines under consideration is good fitting of valves and perfect packing of pistons. The valves are ground on to the faces as accurately as possible at frequent intervals. This is necessary when it is considered how many miles in a year these models cover, as the valve and cylinder faces get quite deeply scored, and loss of steam ensues.

The blast pipes are placed low down, and materially aid the ventilation of the flame when the engines are at work. When standing a blower is used, but this fitting is only a later addition, and is not absolutely essential; one of the chief advantages of the boilers used being a freedom of draught.

The good circulation of the water due to the water tubes is, in a measure, one of the best features of the boilers, and the fact that the whole of the steam generator proper is encased from the outer air in the model "Don", has a great deal to do with its success, and the very dry quality of the steam it produces. To dry the steam more thoroughly, Mr. Smithies allows the steam pipe to pass through the flame and hot gases, and thereby the water consumption of the engine for a given amount of work is comparatively very small indeed. On the whole, Mr. Smithies' locomotives are creditable pieces of work - although they may not be considered as highly finished examples of the model engineer's craft, they evidence much forethought and the result of a well-digested experience.

The Hyde Park Model Steamer Explosion

In our issue of February 1st appeared a brief note on the exploding of a large model steamboat on the Serpentine in Hyde Park. since going to press with that number, we have been able to see the remains of the boat and to make further enquiries, with a view to writing a correct account of the accident.

The model was 8 ft. long, and, it is stated, weighed nearly 2 cwt. It was a fine specimen of the boat-builder's skill, and represented very closely a large merchant vessel. We have been able to obtain the accompanying photograph, which, although no the best possible, shows its fine proportions. The deck fittings were very complete - such details as anchors, davits, boats, hatchways, binnacles, ship telegraphs, all being perfect models in themselves.

The owner, Mr. George Howard, made the engines, boilers, and all metal work in the boat; and Mr. Edwin Brooks, at whose house the model was

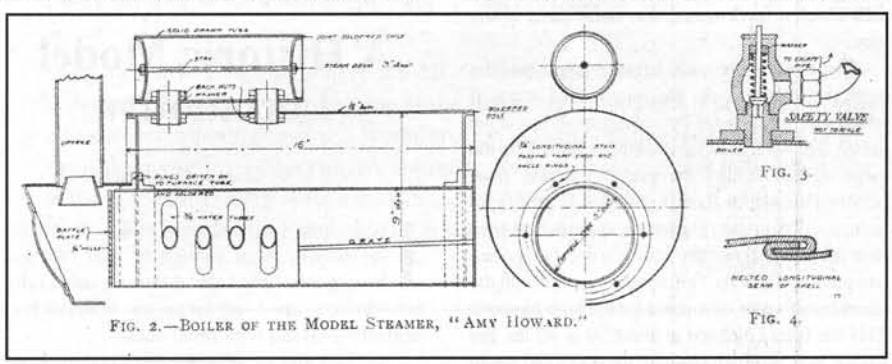


FIG. 2.—BOILER OF THE MODEL STEAMER, "AMY HOWARD."

FIG. 3.

FIG. 4.

Fig. 2 – Boiler Of The Model Steamer, "Amy Howard"

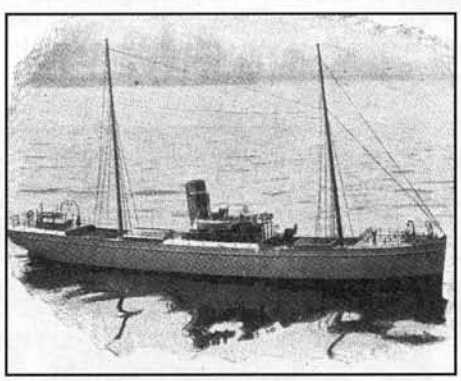


Fig. 1. – The Model Steamer, "Amy Howard

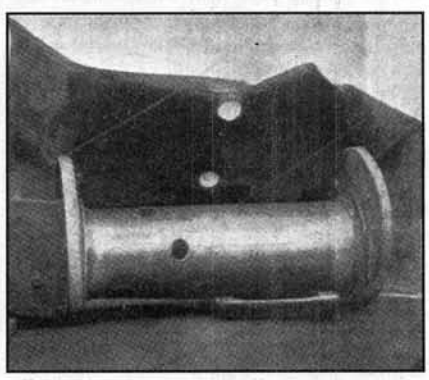


Fig. 6. – The Boiler After The Explosion

"docked", was responsible for the hull, the general work of the erection, and painting.

Sunday morning was the usual time of sailing, and the Serpentine in Hyde Park, some twenty minutes' walk, the place. The boat had prior to the explosion on January 5th, crossed this water over a hundred times, and no mishap of this sort was at all anticipated by her captain and crew.

The engines were high-pressure marine engines, beautifully made, having two cylinders 1 1/2 ins. by 2 ins., and link motion with screw-reversing gear. The engines, excepting that the steam piping was torn asunder, were not damaged at all by the accident.

Coming to the cause of the explosion, it will perhaps be better, before describing the construction of the boiler, to relate the circumstances which led up to the accident.

The usual course of procedure was on this morning adopted. The boiler - which, by the way, used charcoal as fuel - was filled at home, and the fire lighted, steam raised, and the boat removed from the room in which it was stored on to a special wheeled truck and taken to the lake. Contrary to the general custom, the boiler was not filled up with water with the pump - a rather large affair - which was entirely separate from the boat, the delivery pipe being a flexible tube with a screwed coupling, attached when required to the check valve on the boiler, at the end. One of the party - Mr. Brooks - mentioned during the journey to the lake that the water was getting rather low in the boiler, but, seemingly, no notice was taken of it.

On arriving at the Serpentine, the remark as to the shortness water was repeated, but it was decided to give her one run across before pumping up. The model worked splendidly - better than ever it had done, it is said. On arriving at the other side, Mr. Brooks stooped down and shut off the steam, bringing the boat broadside to the shore. He stood up from attending the boat, and a moment after the explosion occurred. the decks and the side of the boat nearest the shore burst open with a loud roaring noise, and all the bystanders were smothered in water, charcoal ashes, and splinters. Mr. Brooks was hit by the flying shell of the boiler,

which hurt his arm and lacerated his ear so badly that they had to be treated at the depot of the Royal Humane Society close at hand.

The ends of the boiler and furnace were torn out of the boat and laid in the water beside her. The keel was in two pieces, and practically all of the middle of the boat was demolished. The funnel, which weighs quite 3 lbs., was hurled a considerable distance. The bystanders who had not hurriedly left the scene helped to collect the more valuable fragments. The remains of the boat were hooked out of the water and taken home. the shell of the boiler was laid absolutely flat, the ends and furnace being intact.

The boiler in question was a Cornish type boiler, the shell being 16 ins. long by 9 ins. diameter, with four ¼ in. water tubes crossing the furnace tube at the rearmost end. The furnace consisted of a 5 in. solid drawn brass tube, connected to the ends in a very efficient manner with angle rings inside and outside, with stays passing right through them and ends of the shell. These ends were of 5-64ths in. copper plated flanged over, the shell being laid over and soldered. This joint was not rivetted, and except for the little resistance to breaking offered by the soft solder with which it was sweated, was not secured in any way.

This oversight or neglect further aggravated the weakness of the shell, the longitudinal seam of which was only secured by welting, as shown in the sketch (Fig. 4). It is certain that these joints were the cause of the failure, the pressure having risen beyond the safe limit, owing to the rapid accumulation of steam after the engines had been shut down. No doubt the blast during the last run had produced a fierce fire, which, together with the shortness of water, accounted for the high pressure. This has been estimated at about 70 or 80 lbs. per square inch, at which pressure the water and steam would be at about 300 ° F., and at this temperature soft solder of the ordinary quality would be getting near its melting point. This circumstance would practically nullify the strength given to the joints by the solder. The welted seam simply opened out, and then the shell and the ends parted.

"Where was the safety valve, and why did it not act?" the reader will ask. A safety valve was provided, but it was such only in title. The illustration (fig. 3) shows the general construction of this. Without the washer shown we tried the strength of the spring, and, considering the smallness of the outlet, we should judge that it would blow under a pressure of 90 or 100 lbs. per square inch, and even then would not lift sufficiently to relieve the boiler altogether. If the boiler had had riveted joints this valve would not have been correct, as the working pressure with the best of joints should have been 35 to 25 lbs., according to the factor of safety adopted.

This accident, therefore, only shows the amateur that - especially if a large model boiler is to be attempted - he should not forget to provide a good reliable safety valve, or even two; and also that the theoretical part of the design of a boiler, or, indeed, any working model, should not be neglected. If he is not well acquainted with the boiler-making arithmetic he should avail himself of some text-book or our own Query Department.

The last of the Amy Howard now hangs on the wall of Mr. Brooks' workshop, with the inscription written underneath, "Lost, January 5th, 1902."

I know this isn't a loco, but I thought it relevant to the boiler test to destruction trials, [v134/335, P.F. James], which showed how tough a well constructed boiler was, to show what could happen. (Besides, I liked it, the thought of the captain and crew walking through the streets, with the fire drawing nicely, and the water low, conjures a wonderful picture. "The model worked splendidly - better than ever it had done,", I'll just bet it did!)

A Historic Model Locomotive

By Stanley E. Gritton

I had long wished to build a model locomotive large enough to pull me; but having then only a wood-turning lathe, I did not venture upon so large an undertaking, contenting myself with small ones.

But four and a-half years ago I obtained one of the Britannia Company's 3½ in. centre screw-cutting lathes, and at once commenced upon the engine, which I have now just completed, and of which I send you three the photographs. The engine is a model of one of the late Mr. Cudworth's four-coupled passenger engines, built for the S.E.R. Company some thirty or forty years ago; since then rebuilt by Mr. Stirling.

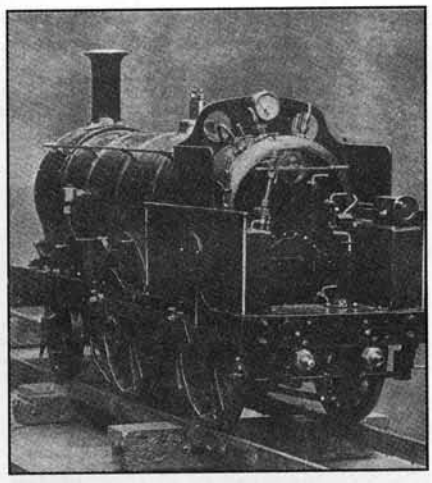


Fig. 1.- Mr. Stanley Gritton's Model S.E. & C.R. Locomotive - View from the Rear.

I commenced at Christmas four and a-half years ago, making some full-size working drawings of my own design, but copying a photo of this type of engine for the external details and general appearance.

It has double frames; but the driving wheels have only one pair of axle-boxes, these being screwed fast to the frame and having imitation springs. The other two pairs of wheels have sliding-boxes and working springs, but no horn blocks.

The boiler was the first I have ever made, and was certainly rather a bigger job than I anticipated. With a little solder run in the joints, it stood a hydraulic test of 110 lbs. and a steam test of 50 lbs.

Before painting it, I steamed the engine with a coal fire, and as soon as the tender is finished I shall try oil fuel, as the firebox is shallow.

The boiler is lagged with asbestos and sheet iron. There is also a steam brake of my own design, of which I append a sketch, all parts being steam-jacketed and the brake worked by a three-way cock in the cab. By this device prompt

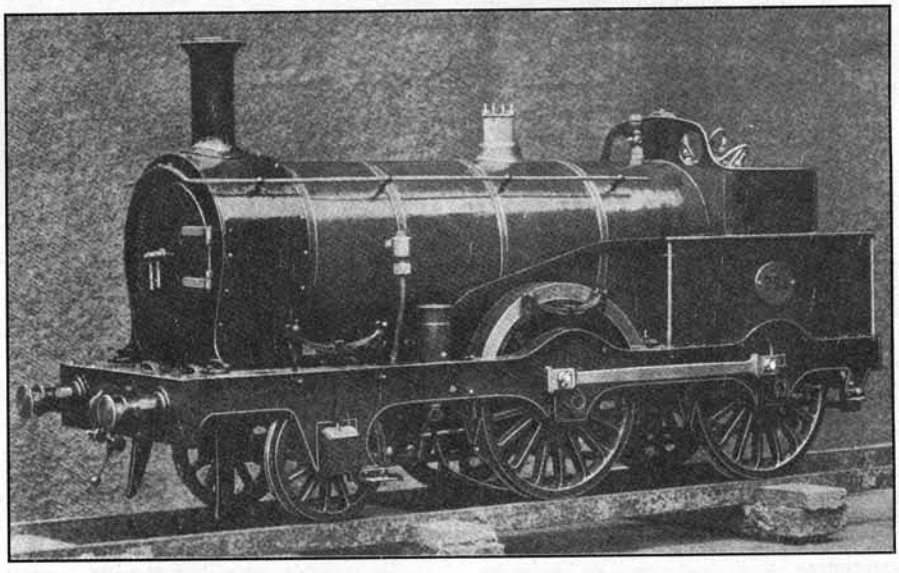


Fig. 2.- Side view of the Model.

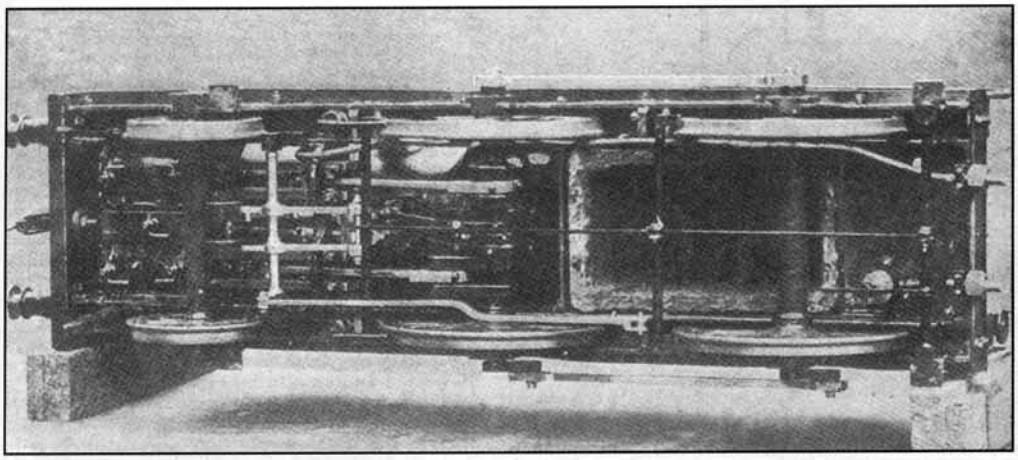


Fig. 3.- View of Underside.

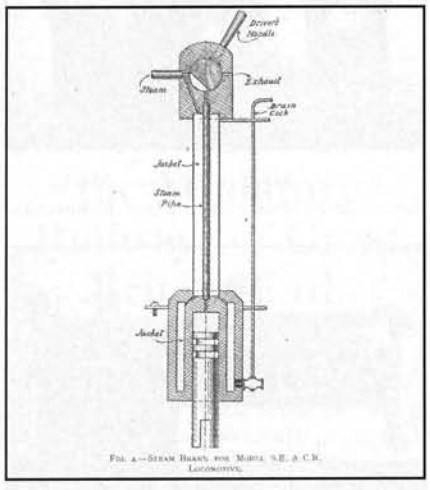


FIG. 4.—STEAM BRASS FOR MODEL S.E. & C.R. LOCOMOTIVE.

action is assured.

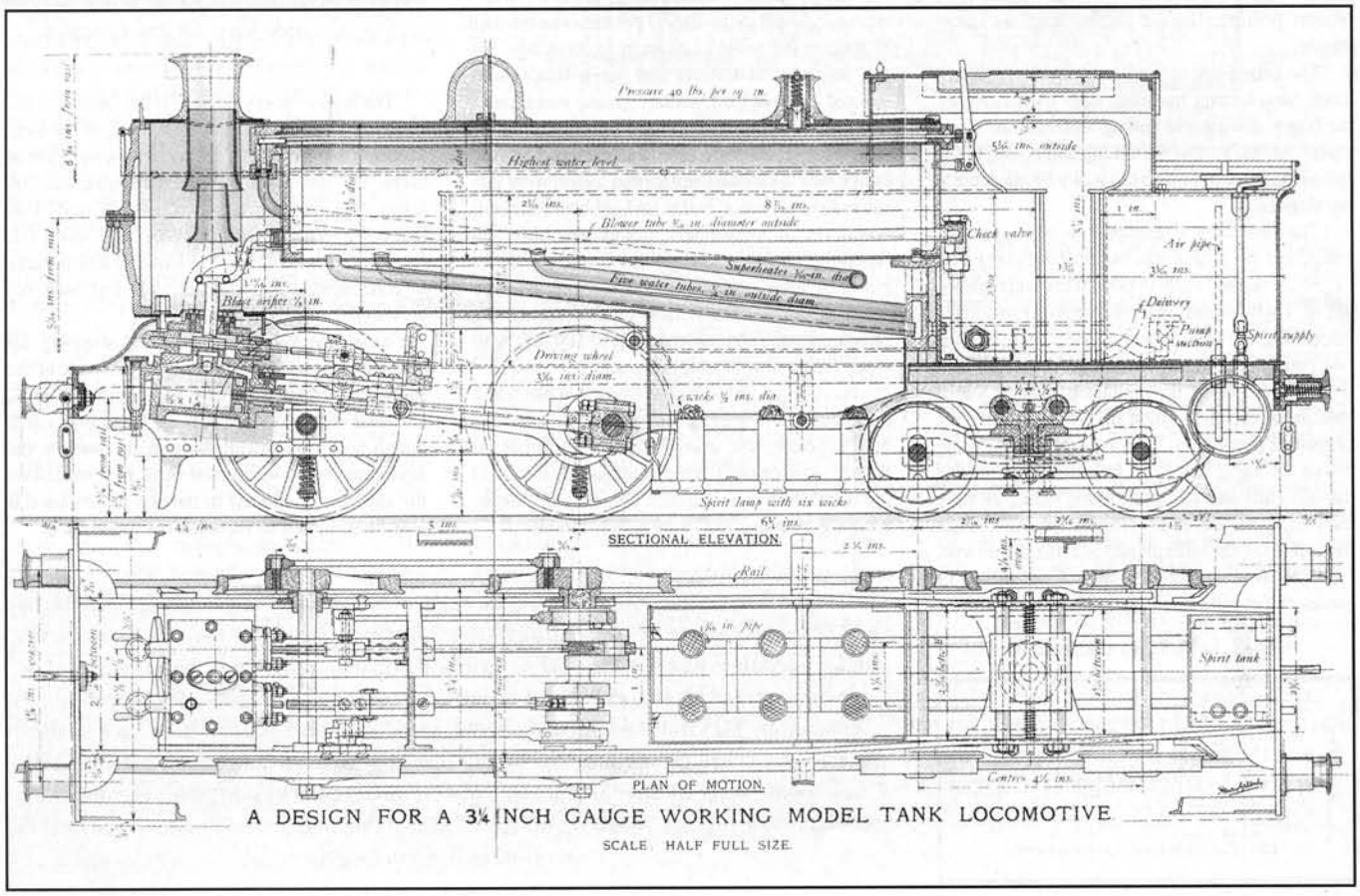
The slide-valves are actuated by the Stephenson link motion. The eccentrics were all four turned together out of a solid piece of gunmetal, previously cut in half, sweated together, bored and fixed on a mandrel with four centres each end.

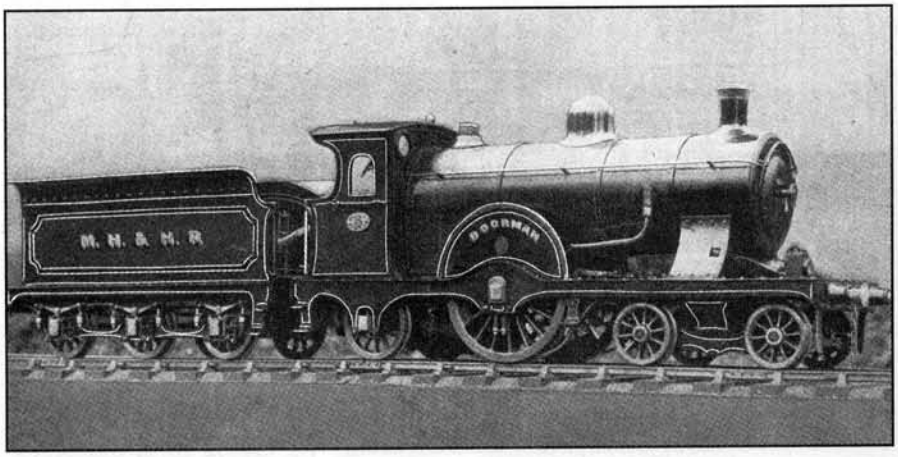
I think this is much better than making them separately, and if I ever made another I should turn them all in one with the crank-shaft.

The regulator is in the smokebox, and is of the slide-valve type actuated by a rod running through the steam pipe in the boiler, connected to the pull-out lever in the cab.

The photos show the engine with grate and ash-pan removed

I love the enthusiastic style in which Mr. Gritton writes, I am reminded of Jerome K. Jerome. He says "I obtained one of the Britannia Company's lathes, and at once commenced upon the engine." It conjures up a picture of him unpacking it in the drawing room, straw everywhere, mounting it on the packing case in which it was delivered, and starting to turn an axle, while his wife has an attack of the vapours on the setee, and has sal volatile administered by the parlour maid!





Mr. J. C. Crebbins' Model Compound Single Express Locomotive

My Model Caledonian Locomotive, and How I Made It.

By Harold F. Morton.

Having built the ¾ scale Caledonian locomotive "Dunalastair" from the drawings given in THE MODEL ENGINEER (Vols. IV and V), a short account of difficulties met with and a few photographs taken at different stages during the construction may be of interest to readers of the model engineer, many of whom, perhaps, thought of building the same engine.

The lathe I had to work the parts up with is a small hand-turning machine, with 1⅞ in. centres. the bogey, driving and trailing wheels I had to get machined out, as also the turning and boring of the cylinders, this work being too heavy for the lathe at my disposal.

The first thing I attempted to make was the crank, and this I think was the most difficult job of the whole engine. I had to build it up, and a glance at Fig. 1 will explain matters. A pattern was made comprising the webs, pin and wheel shaft; off this two gunmetal castings were made; they were then turned up and bored, the central shaft, which was of steel, being driven in a tight fit up to a shoulder, the eccentrics slipped on, then the other web casting driven on tight; an ⅛ in. hole was then drilled through each web and shaft round steel pins were then driven in, and a very firm and true crank was thus obtained, the difficult part is to build it up true.

The two coupling-rods were filed up out of pieces of flat mild steel; the holes in these for the crank pins have to be drilled to exactly the same centres as the distance between the driving and trailing wheel centres, or else the rods will lock as the wheels revolve. If the holes are too large, a knocking noise will result as the engine travels. For the boiler barrel I obtained a piece of seamless copper tube 9 ins. long 3½ ins. diameter.

Fig. 1. – Built up crank-shaft

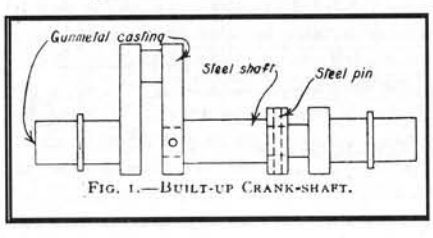


FIG. 1.—BUILT-UP CRANK-SHAFT.

The back plate and firebox ends were cut out of 1-16th. in. sheet copper, the flanging being done on iron blocks cast to shape. After riveting, the firebox was brazed. the throat-plate was a brass casting, the pattern being made out of cardboard.

The boiler contains ten smoke tubes in the barrel ½ in. diameter and four water cross tubes at the top of the firebox; these water-tubes improve the steaming power considerably.

The boiler fittings I made, excepting the whistle and steam gauge - and fiddling jobs they were, especially to get steam-tight. I put the same number of stays in the boiler as given in the drawings. All the stay nuts and rivets and screw-heads were sweated over with soft solder to make steam tight; and what a terrible job it was stopping the leaks! After going round each head with the blowpipe, the boiler was connected up to and filled with live steam from a vertical boiler; and oh! how the steam oozed out at innumerable places! But carefully "spotting" each one, and going over them with the blowpipe again, each one was stopped, and the boiler at last got fairly tight. I then attached the pressure gauge, and tested her up to 100 lbs., with water forced in with a bicycle pump.

For firing I use a Primus burner. When using these burners it is essential to have the blast and blower nozzle low enough in the smokebox to create a good draught. mine were placed too high in the first instance, and the fumes and smoke resulting from this fault were simply killing.

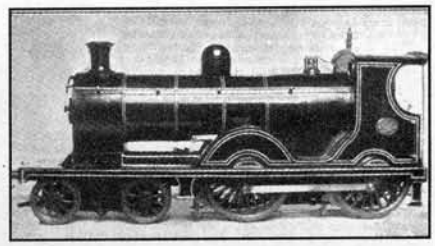


Fig. 5.– The Finished Model Caledonian Locomotive

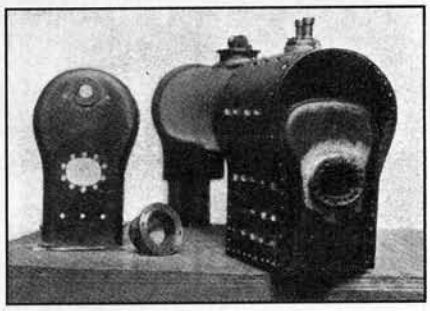


Fig. 2. – Mr H. F. Morton's Model Locomotive Boiler Back Plate Removede.

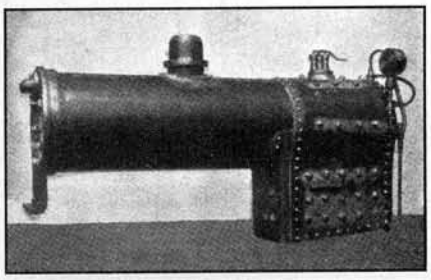


Fig. 3. – Side View Of The Complete Boiler.

The engine works well at 50 lbs. pressure, and has shown good form on a 40 ft. track at our local Society's exhibition. All the patterns were made at home. The time taken to build the engine was 760 hours - the spare time of two years. It weighs 40 lbs., contains 600 screws, and cost £6 to build - this for general material only. The tender is now in hand. In conclusion, I must say the drawings work out very well.

An amalgam very convenient for stopping up holes that cannot be soldered easily is made of the filings of an alloy of zinc 66% and tin 34%, kneaded with quicksilver in the hand into a stiff dough, squeezing out all the mercury possible. the amalgam should be pressed when first made into the cavity, and allowed to harden. When hard it may be scrapped or filed like the metal itself.

I thought this an interesting page, a) an early mention of JC (Uncle Jim) Crebbin, b) a built version of Mr. Pearce's "Dunalastair", I was intrigued by the way in which the boiler backplate had been left off to facilitate brazing, something I had thought of as a more recent idea. c) Perhaps, I should have left the "amalgam" out, it was not included by Mr. Morton but is one of those "useful hints" popped in to fill a space. (If there had been more space they would probably have recommended a doctor with some experience of mercuric poisoning. Just an example of a bygone age when we often did hairy things which would not be acceptable today. Can't understand how so many of us lived so long!)

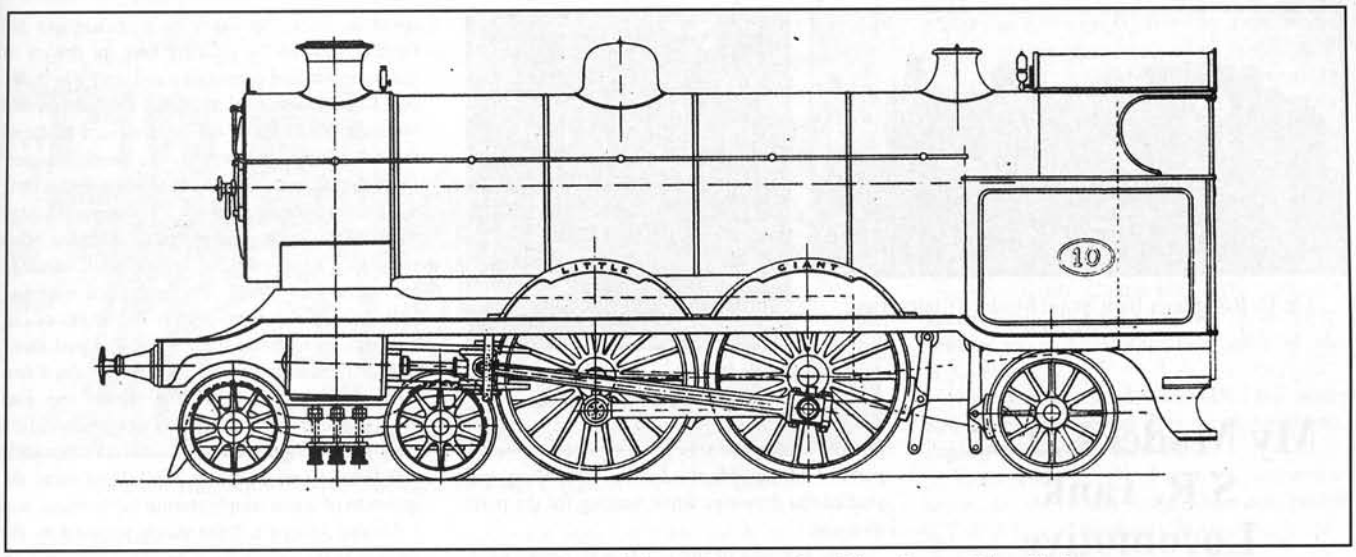
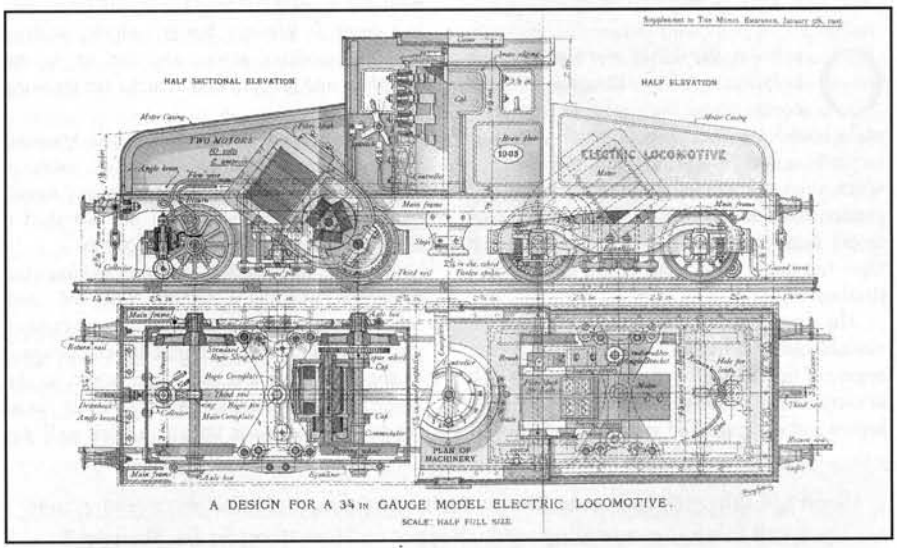


Fig. 1. – The "Little Giant " Class Miniature Locomotive: 15ins, Gauge, 3 ins. Scale.

New locomotives for the Miniature Railways of Great Britain, Ltd.



A Design For A 3¼ in Gauge Model Electric Locomotive.

In describing the construction of the new engines for the above Miniature Railway Company, we have to record the completion of what is, perhaps, the largest working model railway locomotive that has been built. The engine we illustrate is for the Blackpool Railway, and the work of erection was commenced early in January last. The "Little Giant" was built at the workshops of the company at Northampton, to designs and under the superintendence of the engineer, Mr. Henry Greenly, and is of a type well-known to our readers. The engine does not follow any particular prototype, but has distinctive features of its own, many of which were chosen, not simply out of a capricious fancy, but to serve, in the best and cheapest manner, the purposes for which the engine was built.

For instance, the "Atlantic" type was adopted so that a long deep firebox could be obtained, and although most "Atlantic" type engines of real practice have a much longer wheelbase than ordinary four-coupled bogie engines (4-4-0 type), the wheelbase of the design under consideration is reduced to a comparatively very small figure. For example, the engines of the London & North-Western Railway "Precursor" type have a wheelbase of 25 ft. 1½ ins. whereas the dimensions of the "Little Giant" class, if increased to full size proportions, would measure only 24 ft. 6 ins. It is, therefore, really a much better engine for sharp curves than a model of the 4-4-0 type locomotive above mentioned, or than a scale replica of, say, a N.E.R. or G.C.R. "Atlantic" engine*. Moreover, the trailing wheels having side play, and the frames being clear of the front bogie wheels, the wheelbase is much more flexible than any model of an inside cylinder express engine of the "Precursor" or "Dunalastair" type could be. This is a very important point, as the engine for Blackpool is required to traverse very sharp curves. The means by which the short wheelbase was obtained has rather enhanced the design than otherwise. The diameter of the bogie wheels was reduced to a scale equivalent of 3 ft. 1 in. The driving wheels are comparatively small, viz., 18 ins. (equivalent of 6 ft.), and the distance between the trailing wheels and the drivers is as little as is possible. The small driving wheels, of course, means increased tractive effort, and the general reduction in the wheelbase from the centre of the bogie to the centre of the driving wheels renders an objectionable length of flue tubes avoidable. The "Atlantic" arrangement of wheels also allows for very ample proportion in the valve gear, and in no one particular has the adoption of the type created any serious difficulty in design and construction.

* The G.C.R. engines have a wheelbase of 27 ft. 9 ins., and those of the N.E.R. 28 ft.

The January 1905 ME design was a 3¼ G North Eastern electric, again by Greenly. (Although designed for rail pick-up supply, it could easily be scaled up for 5"G battery working, although the battery would, I suspect, have to be on the driving car. It also strongly resembles the "Metropolitan" 'Camel' and wouldn't take much conversion. Sure enough, in 1910 [24/247/] we have a mod for the outline and motor suspensions of a Metropolitan No.1)