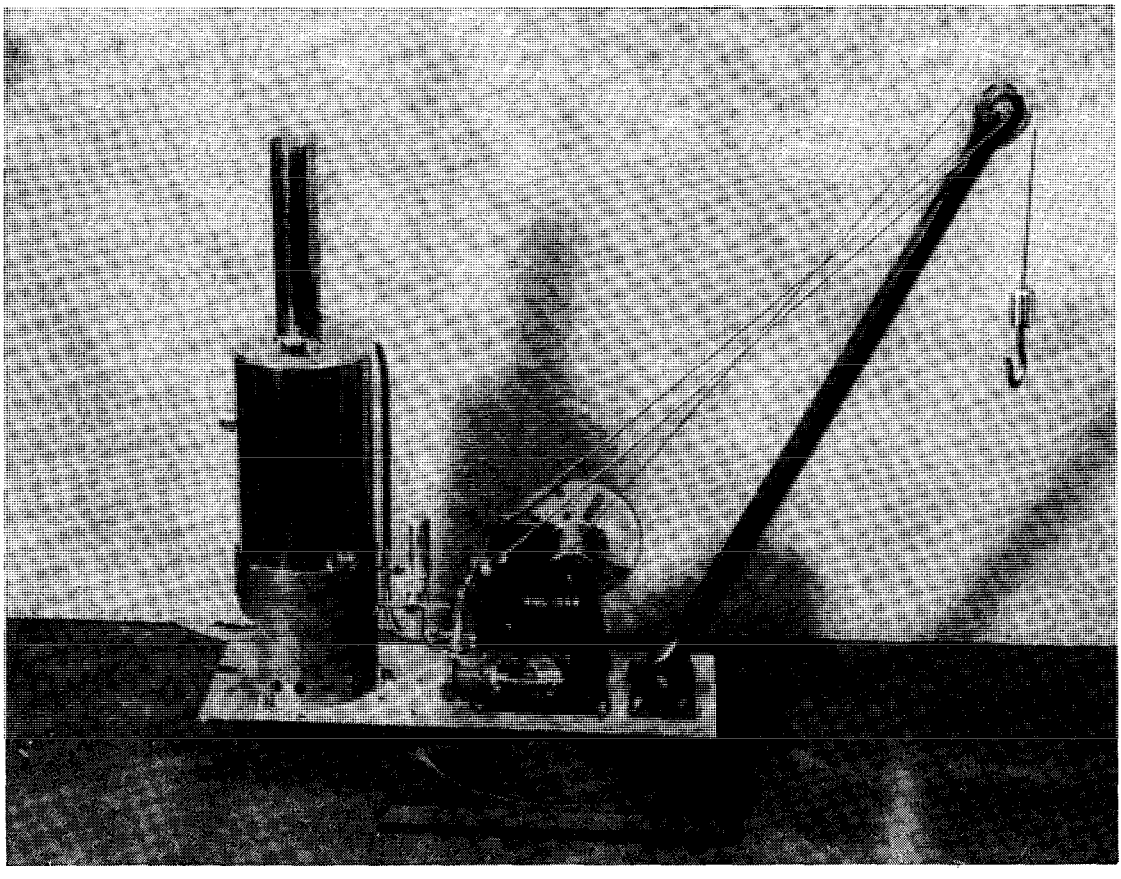
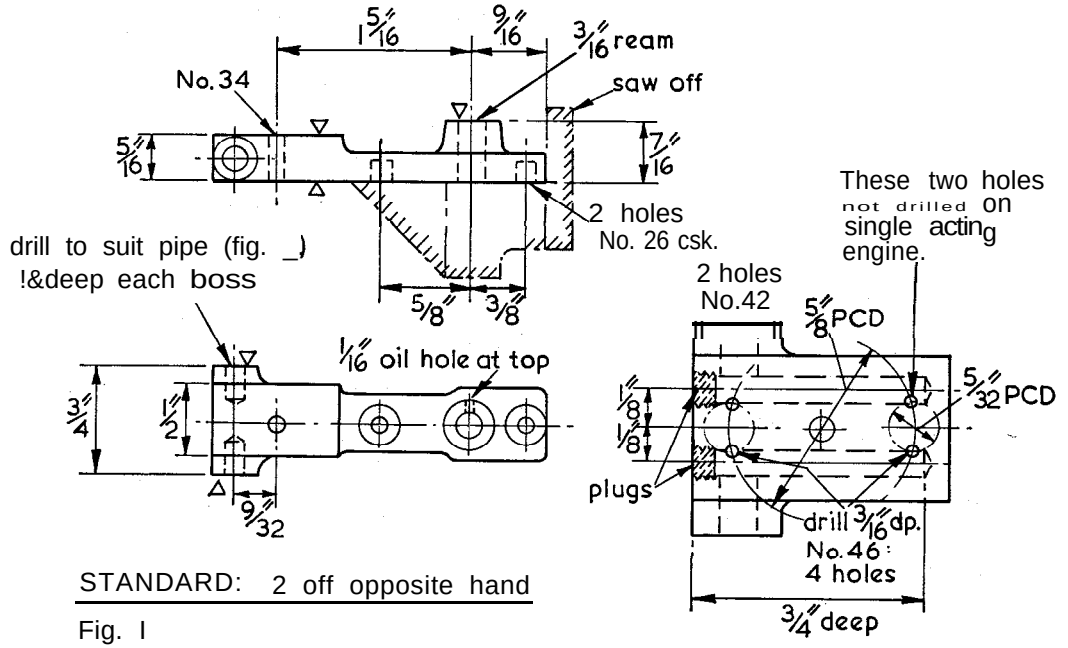


TUBAL CAIN DESCRIBES A STEAM CRANE

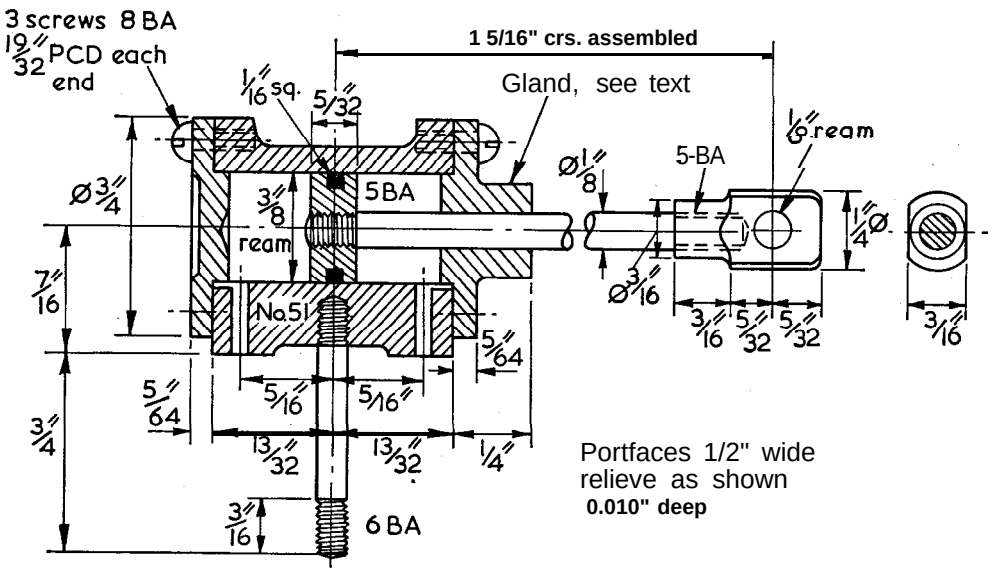
IT IS VERY NICE to win an "H.C." Diploma at the M.E. Exhibition, better still to win a medal, but neither can compare with the pleasure gained from seeing a small child's eyes light up when he unpacks Uncle's present and finds a real steam engine inside-the more so when he realises that "Uncle" made it himself! Quite a number of readers have built the little engine I described a year or so ago, so I thought that perhaps it was time for something different. What better than a Steam Crane? The late LBSC did one about 30 years ago, and I know of at least one which is still being used-albeit by the offspring of the original recipient.

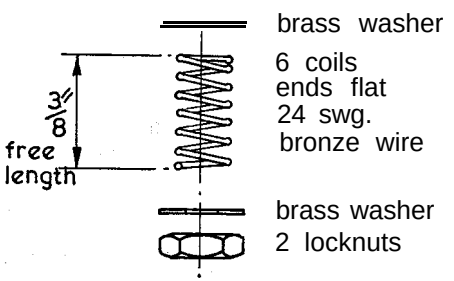
That crane had a few snags, the greatest being the use of clock-gears, satisfactory ones hard to come by, and even the best a bit weak for the job. So I have specified the readily obtainable Meccano gears. To make things easier still I have used currently available castings for the cylinder(s) though the whole thing can be built up if desired. These are the "Popular" set, marketed by Reeves for 30-odd years, but any similar will do. For those in a hurry, Stuart Turner market a similar engine (the "S.T.") in machined parts. The rest of the bits and pieces will probably come from your stock or from "Jack the Scrap". The jib, for example, can be made from brass curtain rail, suitably stiffened



STANDARD: 2 off opposite hand

Fig. I





CYLINDER SET.: 2off

Fig. 2

with spacers, or from brass angle stiffened with lattice work or, as shown in the photos, from a piece of steel tube with two brake-rod fork-ends brazed on. So long as it's about a foot long and looks "proper" you can make it to suit yourself.

The "engine" can be a twin-cylinder, double-acting, cranks at 90º; twin single-acting, cranks at 180º; or even a single cylinder, double-acting on one side only. Mine has the twin DA set-up, and doesn't really need a flywheel, but the others will; so I put one on mine to make sure it would go in. The type of engine used won't affect the lifting capacity all that much, as the limit here is what it will carry without toppling over, not engine power. In fact, if you use the twin DA arrangement you may care to reduce the cylinder bore by 1/16 in. to keep things in proportion. Mine will lift over 10 lb. with 10 p.s.i. of steam-if I clamp it down.

The boiler is a very simple pot, with a steam drying coil. The main problem is not ***making*** steam, as much as reducing blow-off; steam demand is intermittent, and there can be quite lengthy idle periods whilst loads are hooked on and balanced (a crane teaches a youngster quite a lot about centres of gravity and such) so I have called for a "top-hat" damper to go over one of the wicks to reduce fire in such periods. But you might care to consider using Meta fuel, and give the youngster a bit of experience in managing a fire. I ***don't*** advise this if there are any toddlers in the family as the tablets look too much like sweeties and won't do the tummy any good. You will notice I have called for a screw-plug as a water-level indicator when filling the boiler. Most people put a drain tap here, but I prefer a plug as there is less risk of the tap being opened when under steam+; even at 5 p.s.i. this can give a nasty scald.

None of the unmarked dimensions is critical and you can adjust many others to suit yourself or the contents of your scrap-box. The base wants to be either large or fairly heavy (the one I made 25 years ago was mounted on an old cast-iron pulley) and the pivot for rotating the crane should be more or less underneath the winding drum-forward of centre of the baseplate, that is-to give a bit of counterbalance. The rotating base can be of wood if you like, but I used a bit of steel plate well painted against rust from leaks. The "works" are thus located with "proper" bolts which won't work loose over the years as woodscrews might. In which connection, try to use nuts and bolts which will be easy to come by; e.g. 2-4-6 BA rather than 3-5-7; or even Meccano ones where suitable. Readers know my views about screwdriver slot bolts by now-this is a case where they are entirely approoriate, as it makes running repairs and periodic overhauls easier for the lad, and it's better that he gets this sort of experience than that he has true-scale hexagons all over. So, to work.

Engine

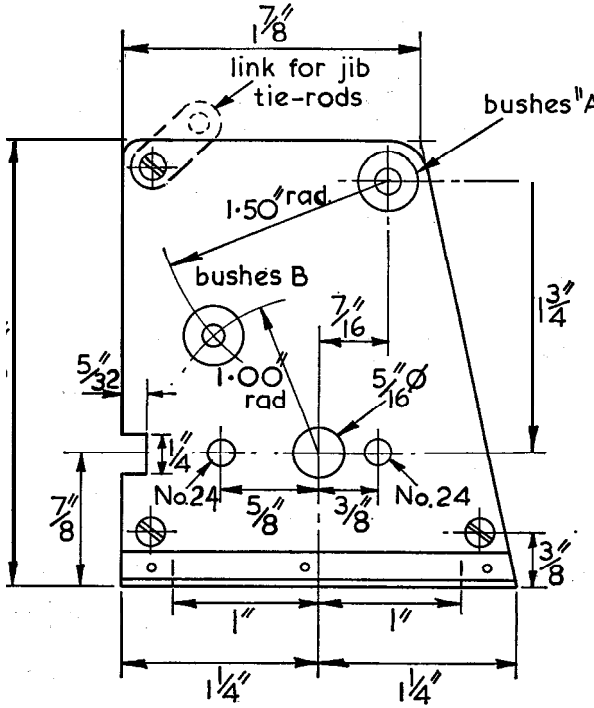
Messrs. Reeves have been good enough to agree to supply part-sets of the engines. For the two-cylinder job you should ask for two cylinder sets, parts 3, 4, 5, 6 and 9; and two stands, part 10. If you decide to fit a flywheel (you must for the single-acting designs) this is part 1. I also suggest you obtain the screws, part 14. The drawing is part RV23, and it will help to have this, if only to save mucking up the ***M.E.*** in the workshop. Start by making the following alterations to the drawing. ***Stand.*** Steam inlet and exhaust bosses to be 5/32 in. drill (or to suit your steam pipe), not 3/16 in. x 40; steam and exhaust ports drill No. 46, not No. 50; main bearing hole, 3/16 in. ream, not 5/32 in. ***Cylinder.*** Drill the ports No. 51, not No. 52. These changes will improve the performance of the engine on load.

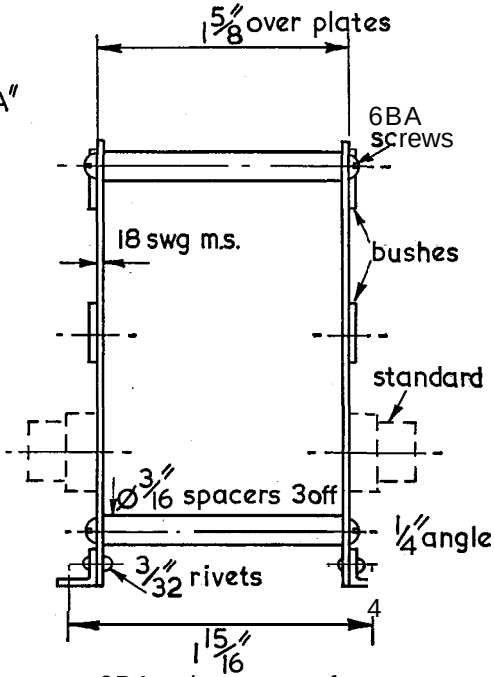
Saw off the foot of the standard, leaving as much of the column available as possible, and also the bearing boss and rib at the back. File or mill the back dead flat and trim up the sawn-off end. Now mill or file the port face parallel to the back face-keep reasonably near to the 5/16 in. dimension. File the boss of the main bearing to 1/8 in. above this port face. Mark out the longitudinal centreline and fix the position of the crank bearing. From this, mark out for the pivot-pin hole (No. 34) and from this again scribe at 5/16 in. radius to find the centre of the ports. Mark these out very carefully; start with a ***very*** fine dot-punch, enlarge the dot with a tiny drill, and then very carefully drill them No. 46. The idea of drilling the ports first is that if you make a boss-shot and have to plug and re-drill you still have the pivot pin centre to mark out from again. Drill the pivot hole, the two No. 23 fixing bolt-holes, and drill and ream the bearing. Put in a 1/16 in. oil hole. (Get it right way up!)

Mark out for the No. 42 passages (not needed on the single-acting engines) and drill these, finally drilling the bosses to fit whatever steam pipe you decide to -use (5/32 in. is O.K.) through to meet the passages. Tap the No. 42 holes 6 BA just a few threads, screw in a short length of 6 BA brass, and seal with soft solder. Blow out all holes well with compressed air.

Cylinder

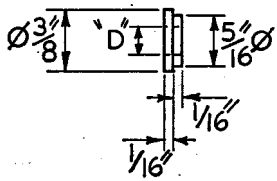
This is machined in the usual way-1 don't think I need go through the process on a little chap like this. However, don't forget that it is ***vital*** that the cylinder bore be parallel to the port face. I recommend either milling supported on a mandrel through the bore ***or*** filing and scraping and





6BA clearance for fixing screws.

bush A ream 3/16" 2off
bush B drill. No.20 2off



No.26 pinion 19 teeth 1/2" PCD
reduce as shown

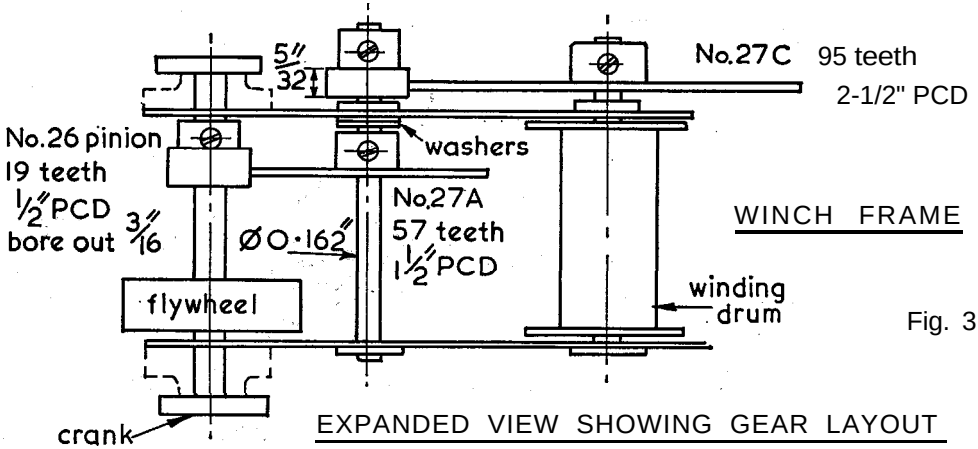


Fig. 3

EXPANDED VIEW SHOWING GEAR LAYOUT

measuring to a mandrel (a parallel one) to get this right. Again, mark out for the pivot pin and the ports, drilling the latter first for the same reason as on the standard, and make a little groove in the bore from the port to the end of the cylinder. When drilling and tapping for the pivot pin, this too ***must*** be square and true to the port face-take great care. Don't drill too deep, and don't force the pin in so hard that it bulges the bore; use Loctite instead!

The back cover presents no problem except that of holding the brute, but the front cover does show a rather fiddly little gland. ***I didn't use one,*** my piston rod running in a reamed hole in the boss. This is almost dead steamtight, but if you do it this way you must run a file over the tops of the threads on the piston rod when fitting. The act of running the die down will raise the tops of the threads above the nominal diameter, as well as leaving a nasty burr at the end of the thread. You can fit a gland if you like, but mine runs O.K. without. Before fitting the pivot pin you should relieve the port face about 15 thou and also "make smooth" both the cylinder and pedestal port faces -match these together after fitting the pin. Drill the fixing holes in the cover and in spotting through to the cylinder make sure that the screw-hole (tapped 8 BA) doesn't align with a port!

Piston

Make the piston of brass, the big end of bronze. Again, no need to go into detail, I think. It will pay to finish the piston after screwing to the rod provided your chuck runs reasonably true, otherwise you will have to chance it. You can either make a single groove 1/16 in. wide and deep, and pack with cotton thread and tallow, or just cut three tiny grooves about 5 thou wide and deep. I used the packing. It's important that the 1/8 in. hole for the crankpin be at right-angles to the piston rod, and you can't put it right by bending it, as the big end has to be "unscrewable". If it does appear to be a trifle cockeyed in final assembly try a ***gentle*** application of a taper reamer! The crank-shaft should be the next job, but best to make the winch-frame first. Oh-flywheel. Hardly needs instruction, but machine it all over for balance and polish the rim for appearance.

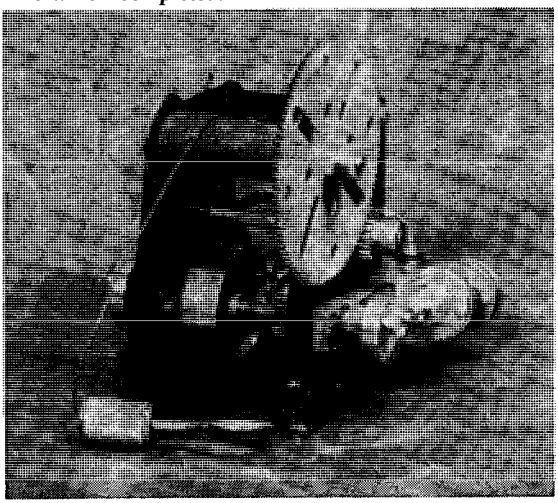
Winch Frame

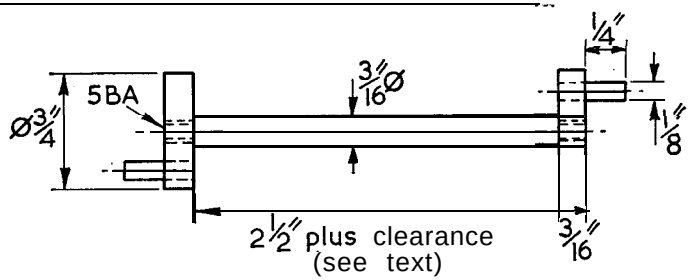
Either brass or steel will do-1 used 18 s.w.g. steel for economy! You may feel that if you use brass the bushes won't be necessary; you could be right, but don't forget the crane may well pass on to your great-grandchildren! Cut out the frames to the shape shown-or to suit your own ideas-and I recommend the use of a saw rather than shears. Square up the bottom and back edges to act as reference faces when marking out for the holes. Locate the centre for the crank first, then for the winding drum, and from these two for the second-motion shaft. The sizes of the gears are shown on the drawing-you need two pinions nominal 1/2 in. dia., one gear nominal 1-1/2 in. dia. and one nominal 2-1/2 in. dia., which give an overall gear ratio of 15/ 1.

Mark out for the other holes, and drill those marked 6 BA clear. Bolt the two plates together and drill the other holes, enlarging the bush-holes step by step till the right size is reached. File out the little notch at the back-this is to clear the spring of the cylinder pivot pins. Make the bushes to fit the holes, the width (thickness) being such that the bush projects a few thou through the side-plates. Remove all sharp edges from the plates, more than mere de-burring, to avoid risk of the child cutting itself. Fit the bushes with a touch of Loctite and leave to cure.

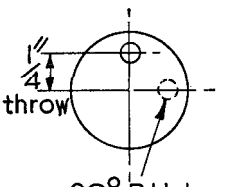
The spacers are made from round or hexagon stock-polish them up a bit-parted off to uniform length and the ends drilled and tapped 6 BA. Lightly countersink after tapping. Assemble the whole and check that (a) the frame sits on a flat surface without rock and (b) that a spindle passed through the bushes rotates fairly freely. If you have trouble, correct the fault. Now attach the two standards using 4 BA screws and make sure that a 3/16 in. spindle will rotate in these. YOU ***may*** have to draw the fixing holes a trifle to achieve this, but if it binds no matter what you do, then it's probable the plates are not parallel to each other and you'll have to put that right by adjusting the spacer lengths. Once you are satisfied, measure the distance over the crank-bearing bosses and note this figure for making the crank. Remove the standards, make and fit the ngle pieces by which the frame is fixed to the base.

The winch completed.

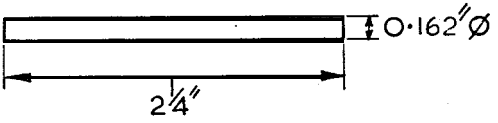




CRANKSHAFT: I off m.s.

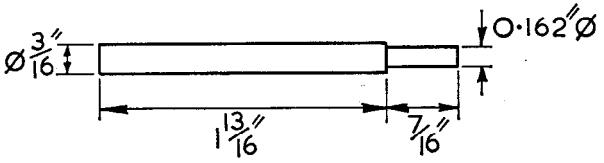


90° R.H. leading for DA engine
180° for single acting engine



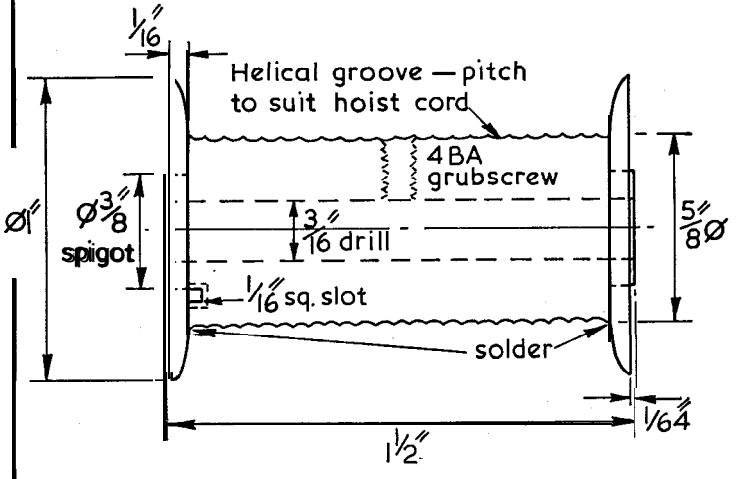
SECOND MOTION SHAFT: I off

see text re: flats to grubscrews



DRUM SHAFT: I off

Fig. 4



HOIST DRUM: 1 off

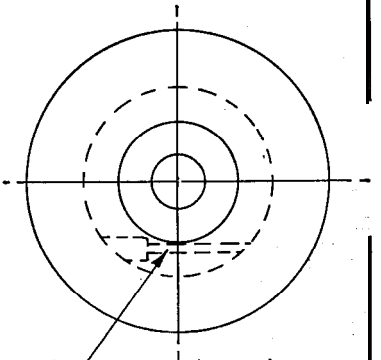


Fig. 5

Crank and Spindles

The drum spindle is simply a piece of 3/16 in. silver steel with the end turned down a good fit to the largest gearwheel. (The tolerance on Meccano gear bores is ± 0.001 in. on 0.162 in. dia.) The intermediate or second-motion shaft can be a plain Meccano axle (these are made from nominal 20 s.w.g. coated wire) but I find that the coating doesn't like running in a well-fitting GM bush and soon wears slack. So I turned this shaft to 0.162 in. dia. from 3/16 in. steel and then polished it so that it was both a good fit to the gearwheel and a nice running fit to the bushes.

For the crankshaft, this is turned so that the distance between the shoulders is that shown provided that this is at least l/64 in. more than the distance over the' bushes mentioned earlier. Make it the greater of these two figures. The ends must be screwed with the tailstock dieholder, as close to the shoulder as you can. The disc is faced in the lathe, drilled and tapped from the tailstock, and then marked off using your height gauge for the crankpin before parting-off. Turn round in the chuck, and run a No. 30 drill in a couple of threads. Drill for the crankpin, taking great care that the hole is truly vertical to the face. (Chaps often sneer at oscillating cylinder engines, forgetting that alignment is ten times as important for them as it is for slide-valve engines, where you can get away with almost anything! You need ***good*** workmanship to make a good oscillator.) Make and press in the crankpin, using Loctite if need be. Now offer up the crankdiscs to the shaft. If the discs don't come at the right angle, carefully file the back face of the disc till they do-90º or 180º as the case may be. If it's only a few degrees away that doesn't matter much; if a trifle more you may be able to force it; but if you need to go more than 15º or so, file it. Note, by the way, it doesn't matter which crankpin leads; though in real practice the right-hand engine was usually the leader.

Now, of course, you are certain you have (or I have) made a mistake, because the 1/2 in. gear won't go on the shaft. I know; you have to bore it out to fit! Grip lightly in the 4-jaw by the boss and adjust till the bore runs true, using a bit of axle to help you set it. Then carefully enlarge the bore with successive drills and finish with a 3/16 in. reamer. Take the grub-screw out first, though ***! You*** can now offer all up and try the gears for mesh. If there is slight binding here or there, ease the top of the teeth of the offending gears ***very slightly.*** If they are miles out, then you have the second-motion shaft bushes misplaced, and the best thing to do is to knock them out, and make new ones with the hole slightly eccentric. Reassemble and rotate them till you get reasonable gear-fit; then Loctite them in that position.

Trial Run

Bed the faces of thecylinders and standard with a very little Brasso and oil, and assemble. Don't put too much tension on the springs. If the crank now will not rotate, check that you have clearance each end of both cylinders; if not, adjust the position of the big-end bearing. (Or, at worst, make a new piston rod!) She may be a bit stiff to rotate, but this will ease off after running a little. Stick a piece of pipe into each of the top holes in the standard, inject a few drops of oil, and apply compressed air. She will need perhaps 10 or 15 p.s.i. to start with but should soon buzz away merrily on 5 to 10. Look for faults, like rude noises, grinding gears, or grunts from the pistons, and correct each as it arises. Then fit the pipes to the opposite holes (a push fit should be quite good enough) and try her in reverse. When you have run an hour (which soon passes) take all apart, file little flats where the grub-screws were, thoroughly degrease, and apply paint. This is up to you, but small children like bright colours, red cylinders, yellow gears, black winch plates (so that the oil doesn't show dirty), green jib, and all pipes etc., polished brass.

Winding Drum

This is shown as 5/8 in. dia., but can be larger or smaller as you please. A smaller one lifts more, but carries less wire (string to you) and vice versa. It can be made of whatever comes to hand-even wood; boxwood will take a thread for the grub-screw provided it's not a fine pitch. I made mine of brass. You will see in the drawing that it has a thread on it. This is the wire-guide. Measure the cord (fishing line is ideal) and make the pitch of the thread just a trifle larger. Mine is 24 t.p.i. for cord 0.040 in. dia. Face the ends of the stock about 10 thou less in length than the distance between bushes on the winch, and then turn a little shoulder to fit the hole in the side-cheeks. Drill and ream 3/16 in., and remove sharp edges. The cheeks are parted off (or mine were) from 1 in. brass bar after drilling to fit the spigots (3/8 in. in my case), but before parting-off the faced end is filed slightly convex and ***during*** parting-off the cut is stopped and the edge well rounded. Make a saw-cut across the end of the drum, avoiding the hole, and enlarge one end to take a knot in the string. Then after soldering the cheek on you will have a hole through which the string can be passed. Check that you get the saw-cut at the right end, depending on whether you want to hoist with the rope on top of the drum or underneath. The first is "pukka", but it makes no odds. Solder on the cheeks, drill and tap for the grub-screw, polish all up, and there you are ! File a flat on the shaft to match up with the grub.

To be continued

STEAM CRANE

Tubal Cain continues with his Christmas project by starting work on the Reversing Valve

***Part* 11**

From page 1342

MAKE THE BLOCK first. Face both sides and then mark out -for the ports, noting that two on one diagonal go only half-way through, two on the other right through. These are all drilled No. 41. Drill the centre-hole a close 6 BA clearance fit. Turn over and very carefully enlarge the two ports showing that side to half the thickness to be a close fit to the pipes you are using--# in. or 5/32 in. to choice (1⁄8 in. makes the pipework easier, but make sure it's fairly thin-walled stuff). Now drill the access holes in the two opposite sides to meet the other pair of ports as shown on the drawing.

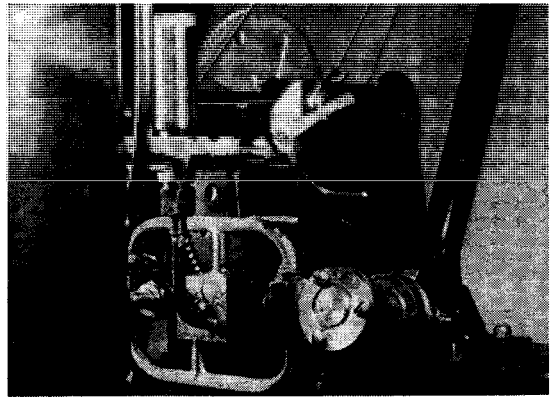
The valve is faced in the lathe and the middle hole drilled from the tailstock. Mark out for four No. 41 holes one at each end of the banana-shaped slots. These holes will, or should, match up with those in the block. Now make a little chisel out of 3/32 in. square silver steel and carve out the bananas. They don't need to be more than l/32 in. deep, nor need they be the exact shape, provided there is a reasonable flat surface between 'them and the centre hole or the edge. If by any mischance you mark the flat face, which might cause a steam leak, return to the lathe and reface. Once finished, part-off to thickness. (It's ***far*** easier to hold when making the grooves if you do this on the large chunk of stock.) Now slip a 6 BA bolt through and grind the two faces together, starting with the very finest emery, or even pumice powder, and finishing with rouge or Brasso. You should get a dull, not a polished surface.

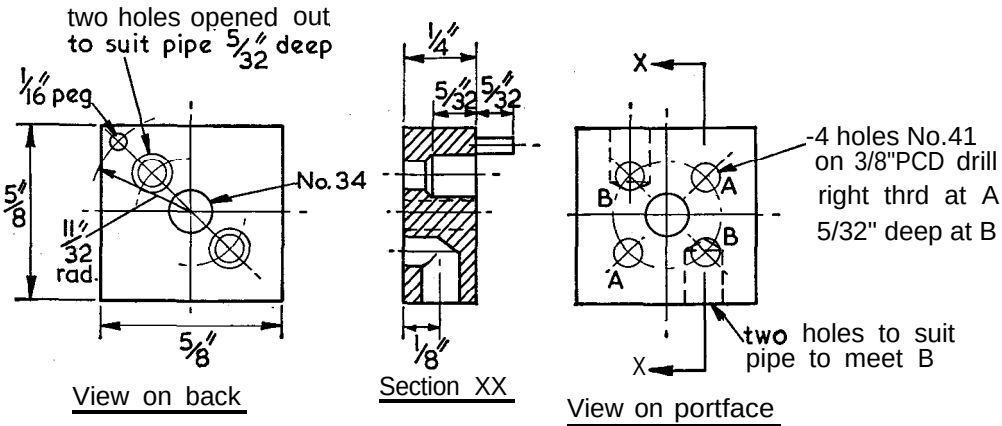
Wash very thoroughly (for those who do a lot of this sort of job, it's worth thinking of making an ultrasonic cleaner. I made one, and it only takes two minutes to de-grit a job like this-and does it whilst I am busy elsewhere, at that!) and then reassemble. Drill a 1/16 in. hole in one corner of the block, and then fit a peg with well-rounded ends. Fit the valve, and mark on its periphery the position for a pair of radial pegs to limit the rota--tion-you find these limits by looking down the holes in the back of the block. Drill for and fit these pegs with the minimum of projection. Finally, hold the assembly in roughly its position at the back of the winch, between the engine standards; mark the top with letter "T" and also mark for the little 8 BA screw on the back of the valve to'which the operating rod will fit. Drill and tap for this, taking care not to go right through the valve.

Pipefitting

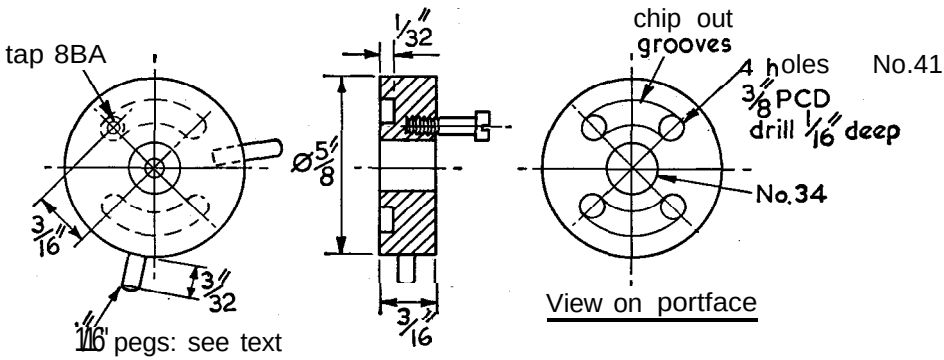
Make up the pipes as shown. Bend up the link-pipes first and offer them to the engine standards, adjusting till they look well and fit well. Make two short studs and fit these into the reversing block; hold this in place and make a mark on the link-pipes. Take all apart, file one end of each stub to a 90" point, and similarly file a 90" vee at the marks on the link-pipes. Make sure they fit closely, remove burrs and blow out with air. Clamp each stub to its link and braze up. Pickle, wash, and blow out.

Now offer these pipe assemblies to the job, and file the stubs so that the block sits square to the engine. Solder the upper link-pipe to the engine-standards. Easy, just like that! The secret? Use a

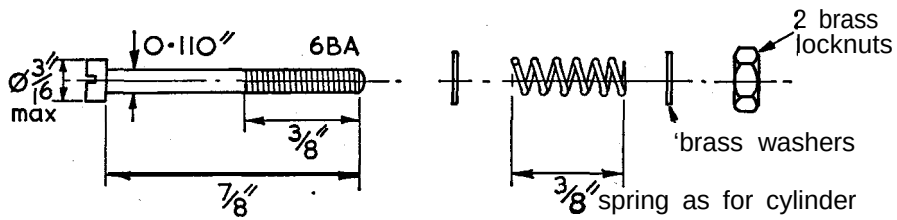




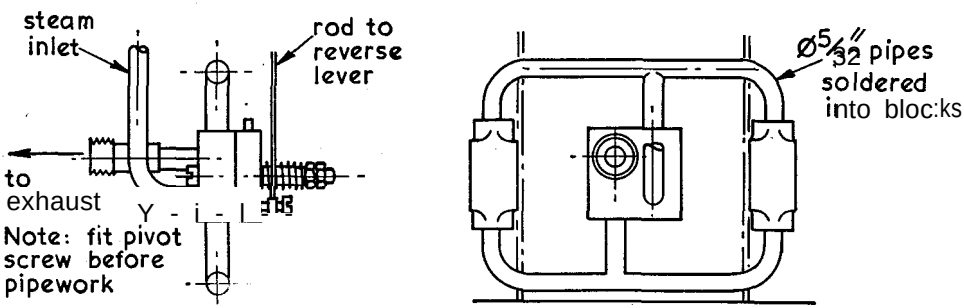
REVERSING BLOCK: brass



VALVE : g.m. or bronze



PIVOT SCREW: brass



REVERSE 'VALVE & PIPEWORK

Fig. 6

large soldering bit with a small end 1 have a really hefty one with a 5/16 in. hole in the end into which I can stick any shaped bit at will. Alternatively, use your normal soldering bit and help it out with a mouth blowpipe, or the fine flame of a Soudogaz lamp applied to the ***pipe,*** not the engine block. Get a good clean joint-it shows. Now solder the stub to the reversing block. Same procedure helps. You must then turn the job over and fit the lower pipe-doing the joints in the same order. Take care (a) not to get solder running ***into*** the pipes and (b) that the lower link-pipe doesn't stick out below the bottom edge of the winch plates. Clean everything well.

Fit a 6 BA round or cheesehead screw, put on the valve-disc with a spot of oil or grease, a washer, a spring like those used on the cylinders, another washer and a locking nut. Unlike the cylinder pivot spring, this one needs to be fairly well screwed up, as the steam pressure has a larger area to work on. You can now make and solder in the steam and exhaust connections to the back of the block, as shown on the drawing. Then, apply compressed air, or steam from a test boiler, and try her forward and reverse. If you have a little pot boiler-or one like that shown for the Williamson engine-this is better than air at this stage as it will show up any leaks better. Besides which, all engines run far better on steam than on air.

Reversing Lever

I have given no dimensions for this as it offers an opportunity for artistic design on your part! You will see the way I did it in the photo. The little bracket is filed up from a bit of scrap brass angle, drilled to pass the 6 BA spacer screw on one face, and drilled and tapped 8 BA for the lever pivot on the other. The lever is made from 3/ 16 in. x l/16 in. steel strip, drilled about a third way along for the pivot screw and tapped 8 BA at the end. The operating link is bent up from a bit of 18 s.w.g. spring wire softened at the ends. Locknuts are used on the two little screws. You can make it much simpler, of course-just a bit of wire to pull up and down, through a hole in the winch frame spacer-or more elaborate if your tastes run that way.

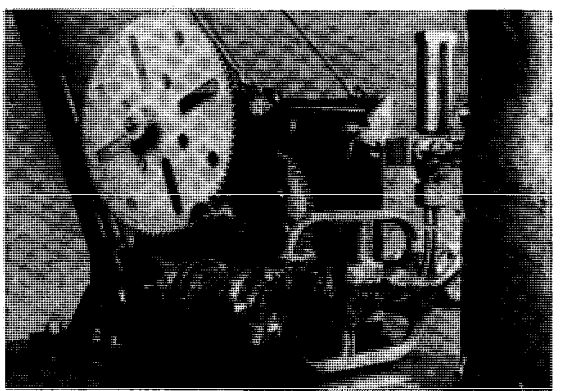
That completes the winch, but I will mention a few odd points before going on to the next item. The 1/2 in. pinion on the second motion shaft can be thinned down as there is no need for the 1/4 in. face width on this job. I chucked mine by the boss and reduced it to 5/32 in. wide on the toothed face. Use two grub-screws on the large gear on the winding drum; it has quite a torque to handle and one isn't really enough. (Meccano threads are 5/32 in. Whit., by the way.) On the cylinder pivots and that for the reversing valve I used self-locking 6 BA nuts rather than locknuts. These came from Whistons at New Mills, and come in very handy on jobs like this. The grub-screw in the winding drum is an Allen socket head type-an exception to my remarks about screwdrivers, but this one must be really tight. I think the photos should clear up any other queries.

Stop Valve and Lubricator

The reversing valve will work as a stop and start valve as well, but you need something a bit finer for speed control; and a lubricator is advisable. The design shown is more or less as that provided by LBSC and you will find that my description is almost the same as the old maestro's "words and music". I make no excuse-the one I made has worked perfectly for a quarter of a century; I only hope some of my designs last as well !

The body is made from 5/16 in. square stock-3/8 in. A/F hex would do-the ends faced to 7/8 in. overall length. I have a self-centring 4-jaw for this sort of work but you can set up in the usual way if you haven't one. Drill 7/32 in. to 3/8 in. deep, flat bottom the hole to 7/16 in. and then re-centre with a little Slocumbe after which drill down No. 41 to 13/16 in. total depth-just not quite breaking through. Tap 1/4 in. x 40 using the tailstock drill-chuck to guide the tap true. Remove from the chuck and drill 5/32 in. holes for the spigots of the unions and the lubricator. Get them the right way round ! The gland is made from a bit of brass hex. Chuck in the 3-jaw, face the end, turn down to 1/4 in. dia. for 3 / 16 in. and thread 1/4 in. **x** 40 with the tailstock die-holder. Drill No. 30 and tap right through 5/32 in. x 40. Reverse in the chuck and repeat. I use a spare union nut from my "bits" box for the gland nut. (If you do that, check first that it ***is 40*** t.p.i., as some are 32; cut the thread to suit in that case.)

The spindle is stainless steel and should present no problems. Make the cone on the end 60° for fine control. I silver soldered a brass boss on the



end, cross drilled afterwards for the handle. Don't you do that! Cross drill the boss first, then drill and tap a 5/32 in. x 40 thread, thread the end of the spindle, assemble all, and then braze (or even soft solder) the lot. The two union stubs should be threaded to suit the union nuts you are going to use; one of mine was 40 threads, the other 32. The lubricator is a simple turning job from 7/16 in. brass rod. The only snag is the small hole in the lower end. If you haven't a No. 70 drill (0.7 mm.) use the smallest you have-say No. 60-and burr the end a bit till a 24 or 26 s.w.g. wire just fits.

The union bosses and the lubricator body are all three brazed in at one go, but take care again that they face the right way. Lubricator on top, unions pointing downwards and one to your ***left*** when looking ***at*** the handle end. Here a word about "handing" may be apposite. Quite a high proportion of the population is left-handed. If this applies to the youngster concerned, hand the whole winch put the gears on the opposite sides to those shown, the reversing lever on the opposite side, and make the throttle valve opposite way round too. This brings the controls to the left-hand side of the crane (looking at the boiler end) and will be more natural for the driver when he (or she) stands behind the crane to work it.

There is no need for any support bracket, though you can make one if you like. The lower union stub is attached to the vertical pipe from the reversing valve; the other goes to the steam-dryer pipe from the boiler, and these hold the job firm enough.

Boiler

This is 2-1/2in. dia. x 4 in. long in the shell-you need a piece 4-1/4 in. long to allow for the flange. These sizes are not critical, and for jobs like this I tend to use the tube which is to hand or (more important) one for which I have flanging plates already! 20 s.w.g. is quite thick enough at this pressure (20 p.s.i.). The flue is 3/4 in. copper water pipe, or the metric equivalent, and the end plates 18 or 20 s.w.g. sheet flanged to fit ***inside*** the shell. You will see from the photo that I have domed the top plate upwards as in real practice, but this isn't essential. You need bushes for the safety valve, water level plug and filler plug. I always make this separate from the safety valve, to reduce the risk of youngsters interfering with the setting. You can, of course, add fittings to your heart's content-level gauge, pressure gauge, and even a feed clack, pump, and water tank; but I think that the addition most likely to be appreciated is a whistle. This will not only use up surplus steam, but also serve to give warning to the cat that she and her basket are about to take a trip upwards!

I needn't go into detail on the brazing job, as you can refer back to the "Williamson" pot boiler or the test boiler described earlier in the year, but when putting all together arrange for the safety valve to be on the opposite side of the crane to the throttle valve and reverse lever. The steam pipe, as you can see, runs up inside the boiler-bevel the top of the pipe at 45° and is curled round once in the "flame box" to act as a mini-superheater. When brazing up, see that this comes out at the winch side. It can be a nuisance handling this on the hearth, so curl it up in a coil whilst brazing, but make sure you don't braze the pipe to the boiler bottom by accident! You should be able to braze (silver solder) all up in one heat, after which test for leaks and give a pressure test in the usual way. Give a good rub with fine wire wool and then polish. Lacquer it if you have any which will stand the heat.

The plugs on boiler and lubricator should all have the same hexagon size and the safety valve any type that suits you. Mine is one that has been sculling around for 20-odd years, but if I had had to make one I would have used either a loco type from the LBSC book or one like that on the pot boiler described earlier. A note about the spring. Use bronze, of course, but the trick for low pressures is to use a long spring-one with plenty of coils-so giving more adjustment for a given pressure change. Wind it close coiled round the "mandrel" and after squaring the ends on the grindstone stretch it out to the length you need.

The firebox is rolled up out of steel-I used lead-coated "Template" — or tinplate. Don't use aluminium; this is about as far as it could be from copper in the electro-chemical series, hence the corrosion experienced when aluminium washers are used on boiler fittings; an aluminium firebox would rot away in no time in any case. You need a piece about 8-1/4 in. long to give the overlap. Note that the little cut-out to clear the steam-pipe is not exactly on the centreline-offer the rolled-up firebox to the winch and you will see where to cut it out to match up. Attach to the boiler shell with four 8 BA brass screws, and fit three little angle brackets to screw the boiler down to the baseplate. Offer up to the winch, cut off the end of the steam-pipe to length, countersink the end, and braze on the union nipple-not forgetting to put the nut on first!

Lamp

This is almost the same as that shown for the pot boiler (p. 20) except that in this case I squeezed the tube sideways to make it oval-about 1-3/4 in. wide x 2-1/4 in. long-so that it went into the firehole easily. The little hat-on-a-handle is for damping down when idling on the engine. Don't forget the little hole in the top-without this, spirit will tend

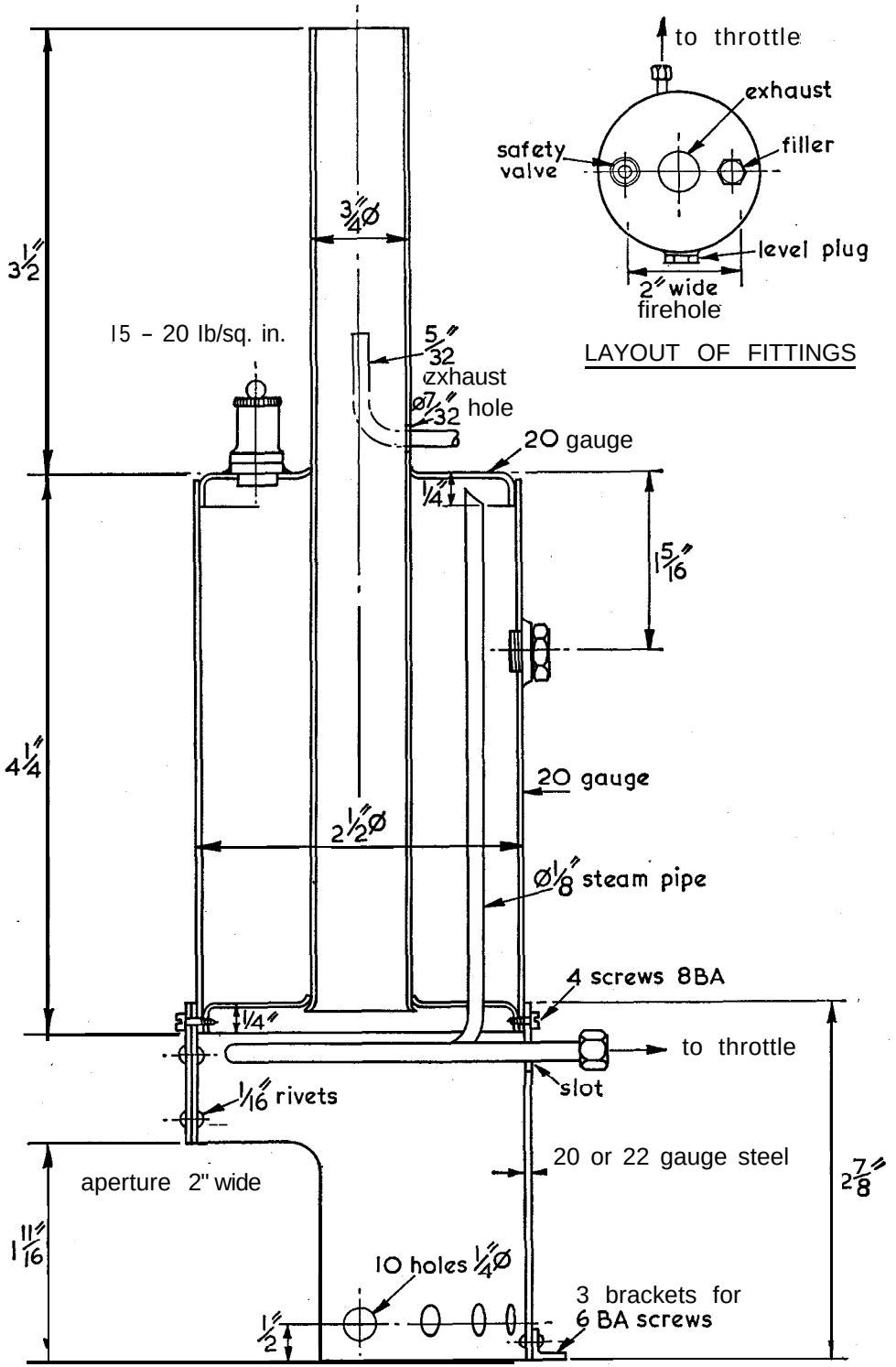
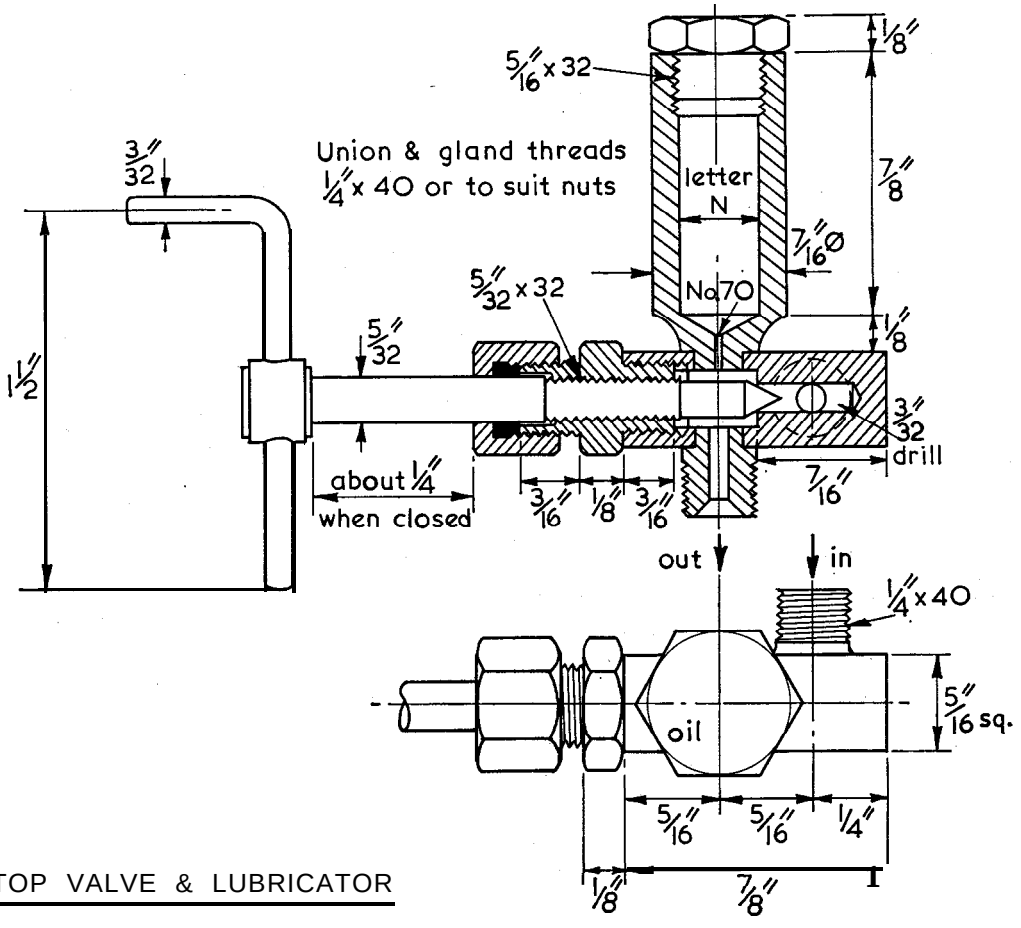
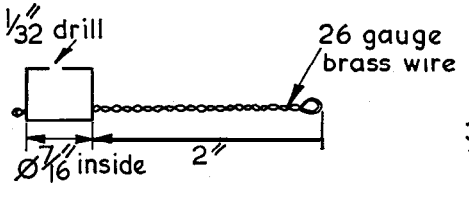

to throttle
exhaust
safety valve
filler
level plug
2" wide firehole
LAYOUT OF FITTINGS
3½"
15 – 20 lb/sq. in.
¾Ø
5/32" exhaust ø7/32" hole
20 gauge
¼"
1 5/16"
4¼"
20 gauge
2½Ø
Ø⅛" steam pipe
4 screws 8BA
¼"
to throttle
slot
1/16" rivets
20 or 22 gauge steel
2⅞"
aperture 2" wide
1 11/16"
10 holes ¼Ø
3 brackets for 6 BA screws
½"
BOILER

Fig. 10



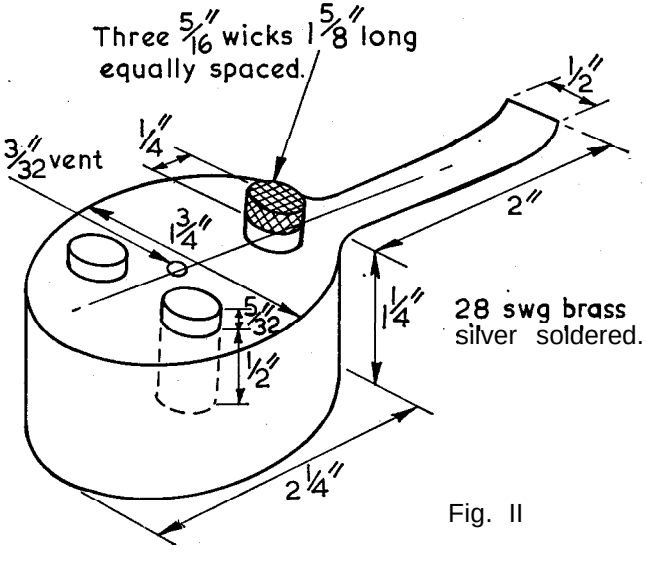
STOP VALVE & LUBRICATOR

Fig.7



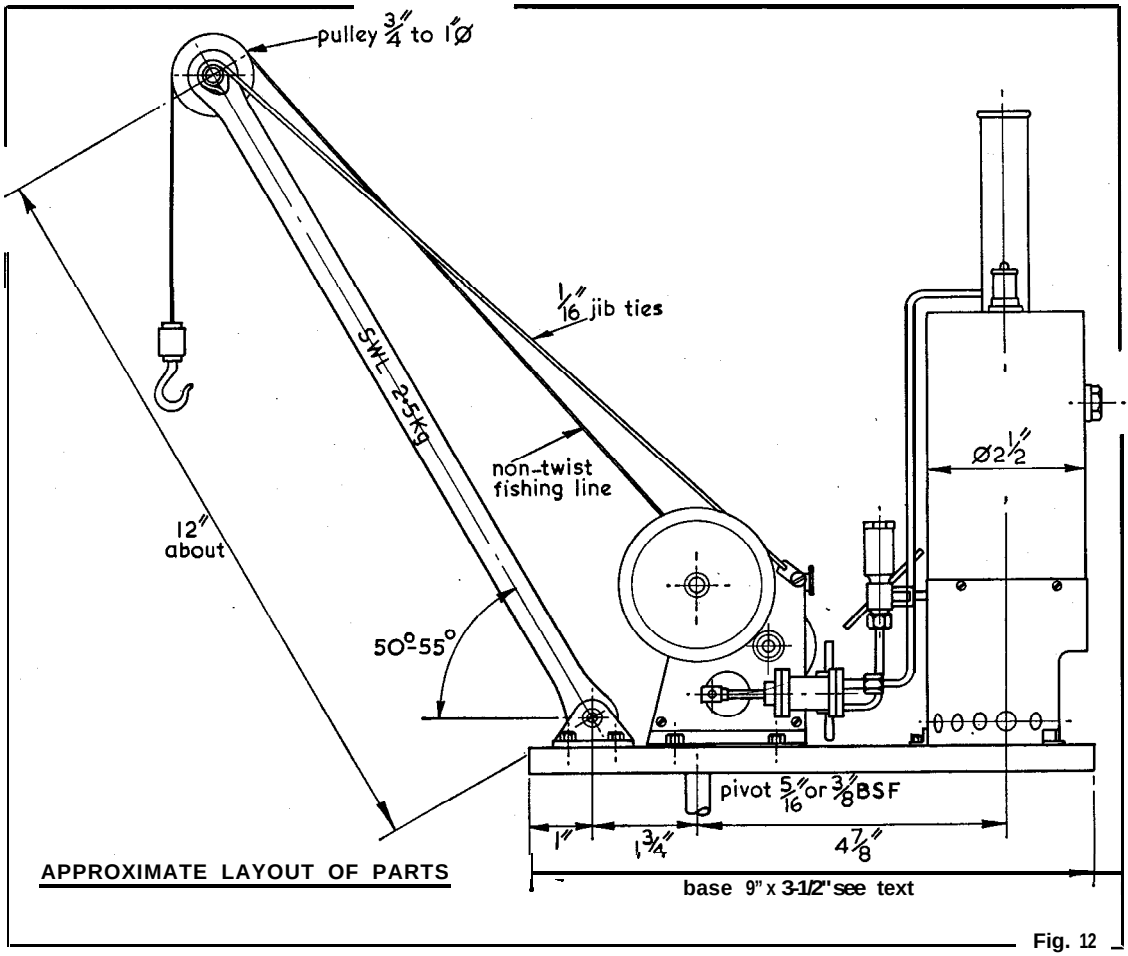
WICK EXTINGUISHER

(1/2" brass tube)



SPIRIT LAMP

Fig. II



APPROXIMATE LAYOUT OF PARTS

Fig. 12

to weep out from the wick. You will see that I have shown no filler plug; I find it just as easy to lift a wick out and fill that way.

If you are going to use Meta fuels, make a sort of fence round it. Use fairly coarse mesh wire, make the legs about 3/8 in. tall and the fence round it about the same. It will need a little handle, and you'll have to buy or make a pair of tweezers so that the fireman can stoke to the back of the fire when need be.

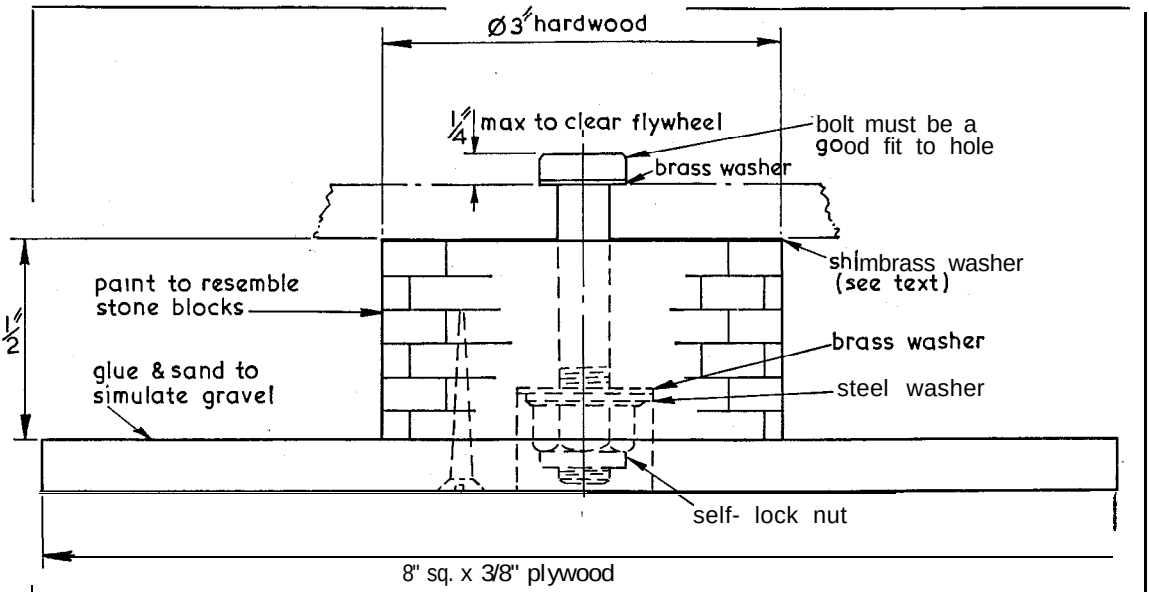
Jib

As I said at the beginning, this can be made to suit yourself and the contents of your scrap-box. A hexagonal or octagonal timber jib is quite attractive-there was just such a steam crane as this at a little country goods yard when I was a boy which had a timber jib; it was tapered at the ends and had a slight belly in the middle. The pulley axle and the jib pivot should be not less than 3/16 in. dia. The pulleys on most "toy" cranes I have seen are far too small (that on mine may be a bit on the large side !)-there is a minimum size over which a wire may be bent. The groove should be U-shaped at the bottom, and the width of the groove about twice the cord diameter. The pulley axle is extended at either side of the jib-head to take the support wires.

These supports should be fairly stiff; l/16 in. welding rod will do very well. As you will see, mine are anchored back to the winch, but you could take them back to the rear of the baseplate if you liked. If you do this you may need a crossbrace at half-length to stop them flapping sideways. The bottom of the jib is supported in a couple of reasonably substantial brackets-whatever size of angle is handy. The "safe working load" is determined by finding what weight will tip the crane over and halving it.

Base and Stand

The rotating base in my case is of 1/8 in. steel. It



SUGGESTED WOODEN BASE — Fig. 13 –

looks a bit thin, and I think I shall rivet some 1/4 in. angle to it to give a more substantial appearance. Mark out the centreline first, and offer up the parts to this. Lay the jib flat along the centre and pop through for its holding-down screws; then the winch, and mark through for that; finally the boiler. Adjust the overall length of the plate to leave a bit sticking out behind the boiler. Now mark out for the centre pivot bolt-5/16 in. or 3/8 in. and make sure that its head won't foul the flywheel. (If it does, either reduce the head or move the wheel.) Drill through all fixing holes, and countersink below, or, if you are using wood, drill the appropriate pilot hole. Fit the pivot bolt before attaching the parts. Fit the exhaust pipe at the very last. You can close the exit to a nozzle if you like, but it isn't really necessary. The main reason for exhausting up the stack is to ensure that drops of dirty water come out at a point where no-one's eye is likely to get in the way. You ***could*** take the thing up through the firebox and the inside of the flue, thus boiling off any water drops, but it would be a bit of a pig to wangle it in. Though not shown on the drawings or photos I recommend that you fit a small "pot",say 5/8 in. dia. x 1-1/2 in. long, at the foot of the exhaust pipe, and feed the exhaust from the cylinders into it about half-way up. This will trap oil and condense water drops, and make the lady of the house far more tolerant when the crane is used in the kitchen. Fit a little plug or cock to drain it at intervals.

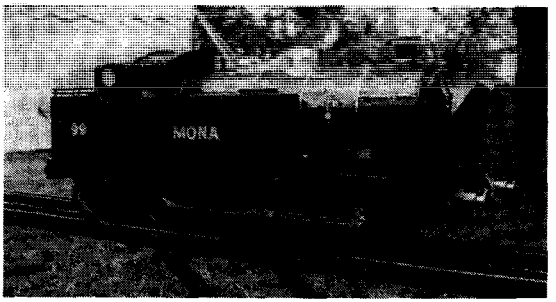
The fixed base can be made to suit you-1 give one suggestion. My own was to have been mounted on the loudspeaker from a defunct radiogram, which, being heavy and about 9 in. dia. on the frame, would have been ideal. However, looking for this in my junk-hole I fell over the base of a sun-lamp which came to us along with a box, several flower-pots and a few other odds for 10p at a local sale (we wanted the wooden box) and this is what I used. It looks quite well and is heavy enough not to tip over. The hole in the top was dead right, too! The one point to watch in this part is that (a) the crane can swivel sweetly and (b) there is no slobber in the joint so that the crane rocks. If you have used wood I suggest a large diameter washer made of say ten-thou shim-brass and a spot of grease will help.

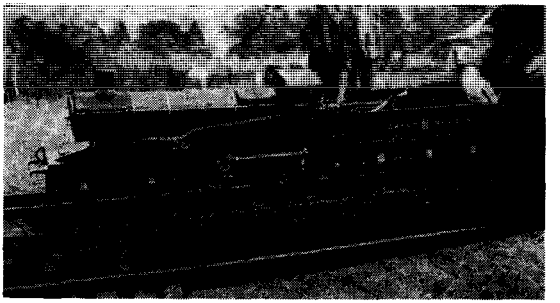
I see I have forgotten to mention the hook. YOU can use the Meccano type if you like as it's quite strong, but you do need a fair weight on it so that the cord stays taut when reeling in with no load. I suggest a piece of 3/8 in. brass, drilled through, and about 1/2 in. long.

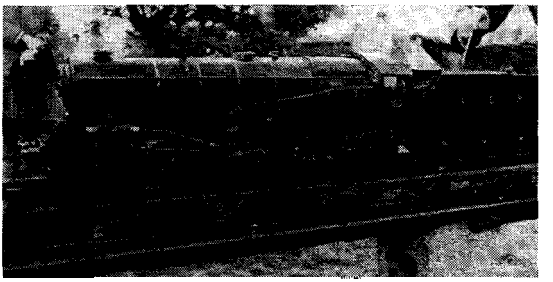
General

The outfit needs completing with a little funnel for filling the boiler, a spanner to fit the plugs and the lubricator, a small bottle of oil and,. 1 suggest, a tin which pours ***properly*** to keep the spirit in. This stuff is now sold in very dangerous plastic bottles, which not only disintegrate if they get hot, but also tend to squirt out the contents if squeezed ***and,*** moreover, don't pour. (The reason for forbidding the use of glass containers is ***safety,*** believe

Continued on page 1421







Hugh Simpson. This was converted by him to coal firing and generally pepped up to perform usefully. ***Annabel,*** the big Erie R R***Mallet***, was another which received his attention and later passed into his ownership. In one of his reminiscences he related ho w ***Cock o' the North*** ,an L.N.E.R. 2-12 in. gauge 2-8-2, had been purchased from a commercial firm and the dissatisfied owner asked him to improve it . ***Curly*** condemned the poor engine as hopeless and he swopped it for one of his own 2-1/2 in. gauge engines. In the course of time, he worked on ***Cock o'' the North*** and brought it more nearly into line with his own ideas.

He delighted in taking a full-size design and making a model variant of it; thus, although he described the 3-1/2 in. gauge B.R. Class 7 Pacific, his own version appeared as ***Polly O'Flynn*** with outside Stephenson's gear. The air-smoothed Southern Bulleid Pacifics came in for some caustic comment from him and his own design called ***Pamela*** was of a more conventional 3-1/2 in. gauge Pacific. He also found a kind of perverse satisfaction in producing an effective model performer out of a not so good full-size prototype and his ***Jeanie Deans*** became the subject of one of his famous Lobby Chats in which he related how he did it.

Top left :Mona *after* ***the Peter Roake*** *treatment.*
Top: 3-1/2 in. gauge G.W. style 4-4-0 Dilys.
Bottom : Curly's Britannia ***with gear variation.***

It was rather a pity that the weather was not so kind on the day of the Rally at Colney Heath, but a dry spell in the morning and again in the afternoon allowed visitors to see ***Curly*** engines in action both on the small Cuckoo line and main line; they were also able to enjoy riding behind other LBSC designed locomotives put in steam there. So successful were the North London Society's efforts in staging this Memorial Rally that the idea of a Centenary Rally in six years time is already being considered.

STEAM CRANE- ***Continued from page I395***

it or not!) You should also write out a proper specification and instruction sheet, as would the makers of a full-size crane.

You may be tempted to arrange the crane with a sheave on the hook, so giving twice the lift. This is up to you, but if you do you may find first that the thing twists (you will need a swivel hook to avoid this)***and*** it halves the available hoist. There is no reason why you shouldn't reel on two or even three layers of cord. The thread on the drum will reel the first layer quite smoothly, and the second and third will follow automatically. When the first layer is knobbly the others follow suit.

On the little "pot" boiler I showed an asbestos liner to the firebox; I don't advise this for children's use; not a great risk, but I think parents would prefer that it wasn't there. That boiler also had a spiral retarder in the flue. You can fit one if you like but as I mentioned earlier the problem with this little chap is the excess of steam made between lifts, so I haven't found it necessary.

There it is, then. I think you'll find you need about a week of nights to make it, but it will give many years of pleasure. Indeed, if you make a decent job of it you (or your descendants) may find it turn up at Christie's 100 years hence as a "Contemporary 20th Century Toy Crane" and fetch a few dozen Mega-credits, or whatever they use for money by then ! Finally I must thank Messrs. Meccano Ltd., who very kindly provided me with works drawings of their whole range of gears. If your tolerances are as close as theirs the job will work all right. ***("Tubal Cain's" crane should be on display at the M.E. Exhibition.)***