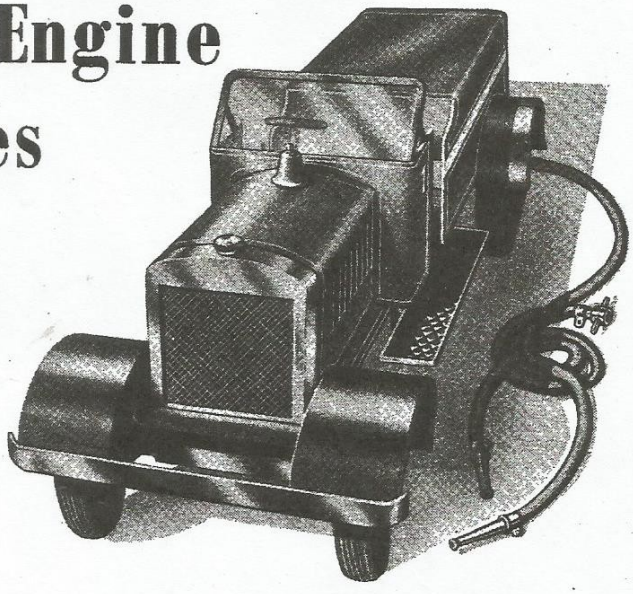
A Steam Fire Engine for the Kiddies

By "L.B.S.C."



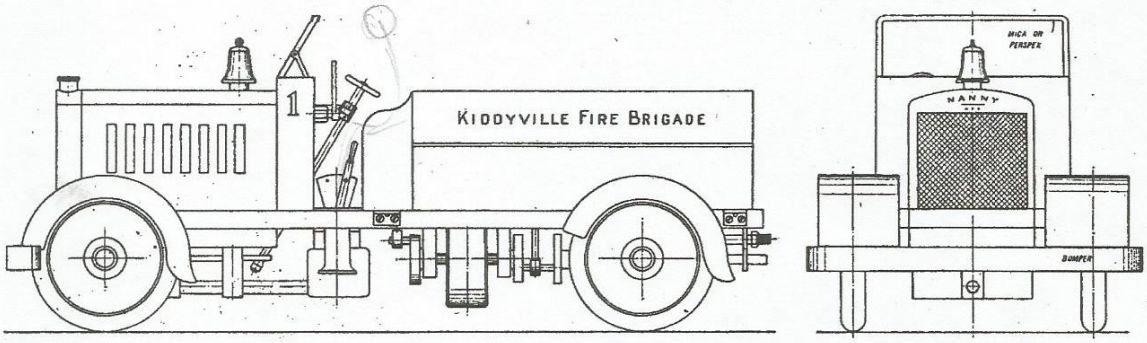
JUST after reading our worthy managing editor's . letter requesting something special for the Christmas number, I happened to see two small boys thoroughly enjoying themselves with a garden hose, and that put an idea into my noddle. I'm not writing any more tales, and reminiscences make me feel sad nowadays; so why not describe how to make a simple fire-engine, so that the kiddies could squirt away to their hearts' content ? I always act on impulse, so got busy and made the necessary drawings; and the greatest wish of my heart at the present minute, is that the mums of those nippers who get one of the engines, won't come around looking for me with a tommy-gun ! Well, I've only a few pages in which to describe it, so here we go.

Modern kids have never seen one of the old Shand-Mason or Merryweather engines of my childhood days, so one of that type wouldn't have found favour; and I have made Nanny look like what she ain't," as she resembles an ordinary petrol-driven outfit of the type that they all know. She can run to the fire at a high speed, ringing her warning gong to clear the road, and when she gets there, her powerful pump with two hoses, will soon do the needful. There is nothing complicated about the working parts, and dad can easily build her from oddments, very few special parts being needed. The rubber-tyred road wheels can be bought at most toyshops (a set off a discarded or worn-out carpet sweeper would be just the cat's whiskers) and Meccano or similar wheels can be used for the gears. I won't have the space to describe the job in full detail, so I have made the drawings as simple as possible, and anybody who has built one of my locomotives, shouldn't need any description at all. Here is just a brief run-through of the job.

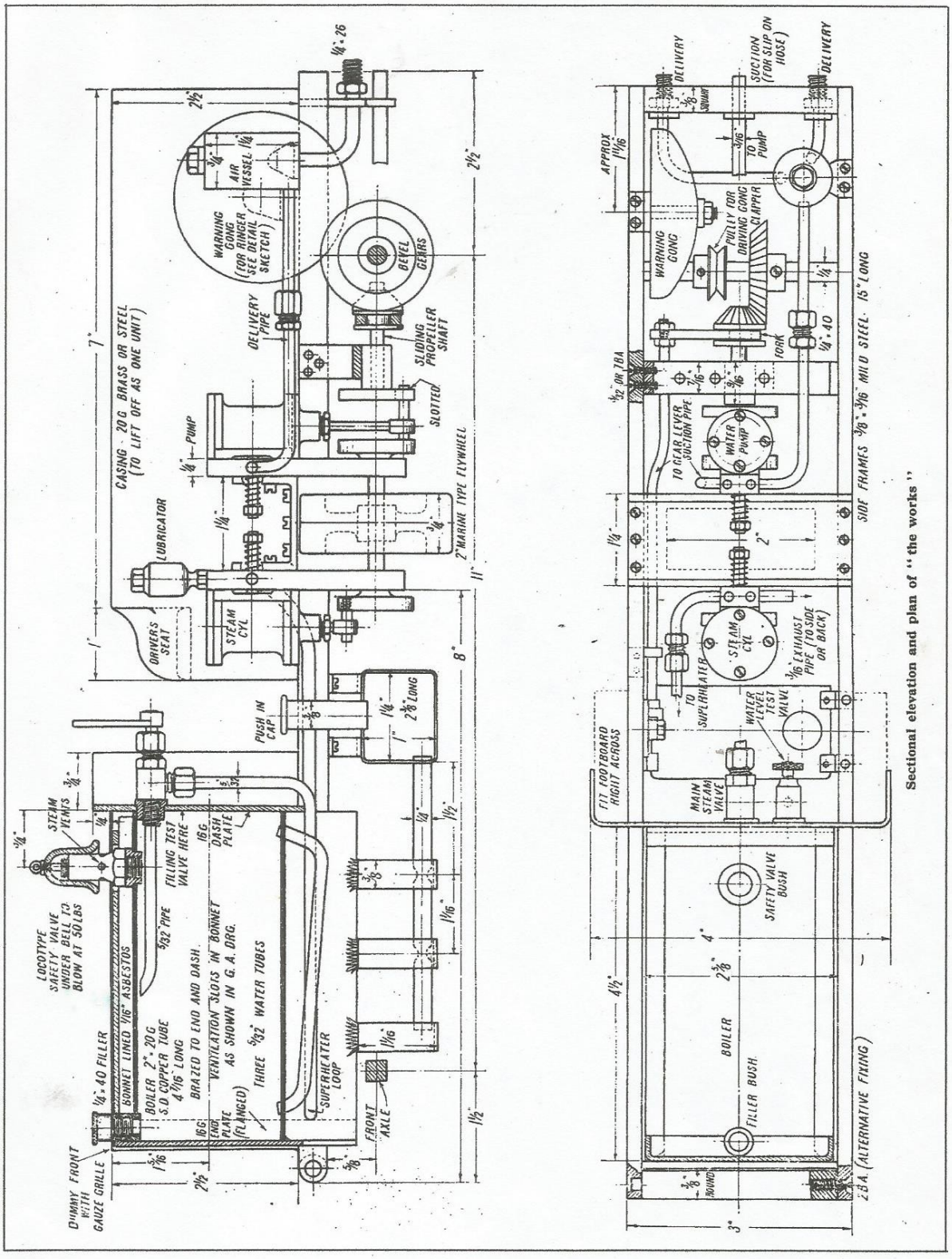
Frame and Boiler

The frame is simply two 15 in. lengths of 3/8in. x 3/16in. mild-steel rod, joined at the front end by a piece of 3/8in. round steel, and at the back by a piece of ⅜in. square steel. The springs are same as used on locomotive tenders, cast dummies, screwed to the underside of the bars; no objection, naturally, to anybody making working leaf springs if he so desires. The front axle is screwed direct to the front springs, and simple axleboxes are fixed to the back ones, to carry the live axle. Don't fit the axles until the "works" are erected.

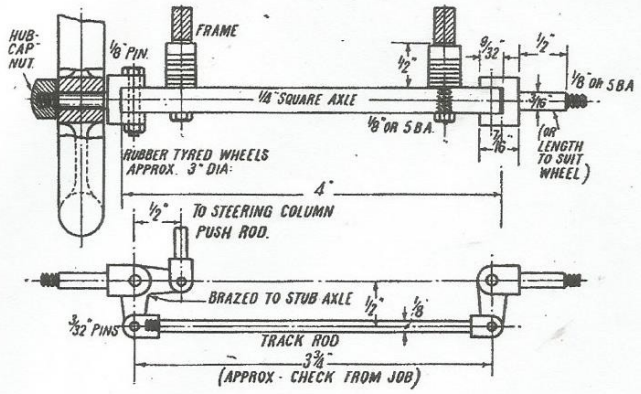
The boiler is a simple pot type fired by a spirit lamp. The front end forms the backing of the " radiator," and the dashboard forms the backhead. The barrel is a piece of 2 in. seamless copper tube, brazed to the ends as shown, and has three water-tubes silver-soldered into the underside, to help make her a fast steamer. There is no chimney, the products of combustion escaping through a series of slots in the bonnet, which is a piece of thin sheet steel, bent to the shape of the front end, and fixed by a few screws through the flange. To support the bonnet at the back end, rivet a piece of angle-brass to the front of the dash. A bush is silver-soldered into the top, at the front end, for the filler screw which forms the " radiator cap," and another bush is provided close to the dash, for the safety-valve, which is of the kind I describe for locomotives. This is covered by the dummy bell, so drill four holes around the base, just above the valve seating, to let the steam out.



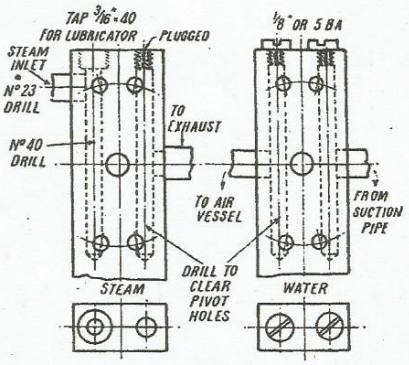
Side and front elevations of the kiddies steam fire engine



Sectional elevation and plan of "the works"



Front axle and steering details



How to drill ports and passages

The fittings comprise merely a screw-down valve of my " standard " type, with a long handle so that young Fireman Jack (or Firegirl Jill) will not burn their fingers; and a glandless screw-down valve fitted about two-thirds up, to test water level when filling. The 5/32-in. steampipe goes from the union, through the lamp flames, thence to the engine, as shown.

Engine and Pump Unit

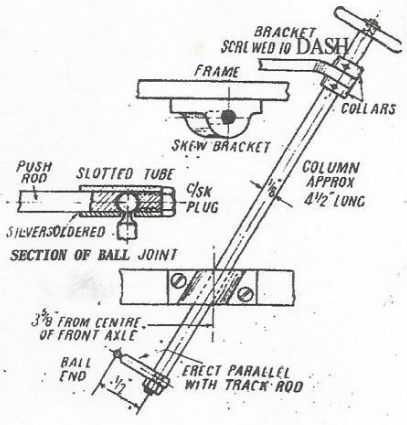
This unit is about the rock-bottom of simplicity, consisting of two oscillating cylinders placed back to back, with a single crankshaft and a heavy marine-type flywheel between them. The port-blocks are prolonged downwards, to carry the shaft, and they are supported by a channel-shaped frame, bent up from sheet steel (bench-vice job) to which they are screwed. Be careful to get both port-blocks dead in line; easy enough if you put a piece of rod through the shaft holes, and another through the trunnion holes. No reversing gear is needed, so the passages for steam and water are just plain drilling. The steam, exhaust, suction and delivery pipes can be silver-soldered direct into the port blocks, or attached by unions, just as you fancy. A " tea-urn " lubricator, or rather oil-cup,, is screwed into the steam port-block right above the passageway; steam must enter opposite this, otherwise only one end of the cylinder would get oil, and it will have a longer life if both ends get oily steam. The hole at the bottom of the "tea-urn " should be drilled as small as possible, say No. 75.

The disc-cranks should be a press-fit on the crankshaft, but the flywheel, which is fitted first, may be set-screwed. The crankpins are set dead opposite, the pump pin being longer than the steam one, as the disc driving the propeller shaft has to slide along it. The shaft should have just the weeniest bit of endplay.

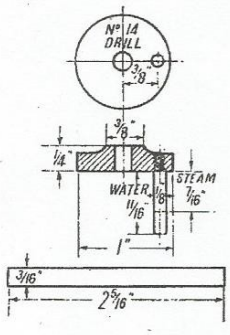
Both steam and pump cylinders are similar, the only difference being that the steam one is 1/2in. bore, and the pump 3/8in. bore, the stroke being 3/4in. I couldn't help smiling when I drew out the pump cylinder, to think of the fuss sometimes made about double-acting pumps; yet here is a double-acting pump which will pump away like nobody's business, and the blessed thing hasn't even a valve! As the machining and fitting are exactly the same as I have described several times already, there is no need to dilate on the job. Be careful to get true faces on both the cylinders and port blocks, by the process I recommend for valve facing. The complete unit is attached to the frame by screws at each side, in the position indicated in the assembly drawings. If the steampipe is coupled up to the boiler, the unit can be tried under steam right away. The pump, of course, operates when the fire-engine is travelling; but as the suction-pipe isn't in water, it just pumps lots of nothing, and the friction is negligible, as long as workmanship is up to average.

Driving Gear

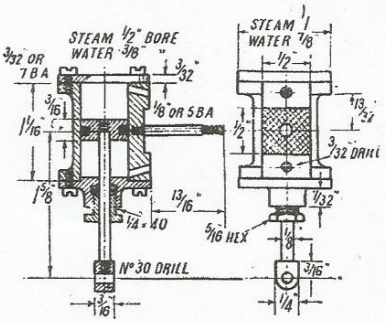
The drive is through a bevel gear-wheel on the live back axle, driven by a bevel pinion on a sliding propeller-shaft, driven from the crankpin of the pump. An ordinary pinion, with a crown-wheel having its teeth at right-angles, as used in many clockwork toys, would also do quite well. The propeller shaft is carried in a bearing attached to a cross-stay. like that on a locomotive; the bearing is made long enough to render another bearing unnecessary, and carries a side extension through which the actuating-rod passes. The disc at the front end is slotted to



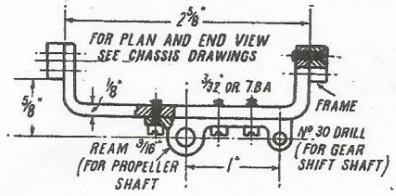
Steering column



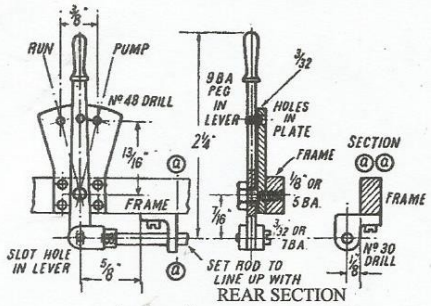
Crank and shaft



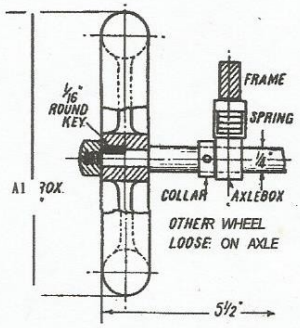
Steam and pump cylinders



Propeller shaft bracket



Lever " run-or-pump "



HOW to fit driving wheel

engage the pump crankpin, and may be pressed, or screwed to the shaft. A grooved collar is attached to the shaft, close to the pinion or the actual boss of the pinion may be grooved, if suitable. In this groove, are the prongs of a fork; the " handle end " of the fork is nutted to a sliding rod which extends to the front end. close to the driver's seat. This rod is bent to line up with a lever like the reverse lever of a locomotive, pivoted to the frame; a simple quadrant-plate is interposed between the lever and frame. The lever extends down below the fulcrum pin, and the gear-rod is attached to it by a fork, with a pin passing through a slotted hole in the lever. The gear rod is supported by an angle bracket just at the rear of the lever.

The bottom of the lever should have a bare 3/16 in. of movement;. and to hold it steady, a peg is fixed in it, as shown, engaging with little holes in the quadrant plate. The lever is sprung sideways, to disengage the peg from the holes; a very old wheeze, that, used on early motor cars. To ensure that the gears mesh properly, push the lever forward, so that the peg enters the front hole; then adjust the bevel wheel, or crown wheel, on the axle, until there is just the tiniest amount of slack between it and the pinion. When the lever is pulled back, and the peg enters the back hole, the gears should be right out of engagement, and the slotted driving disc just clear of the pump big-end.

Front Axle and Steering

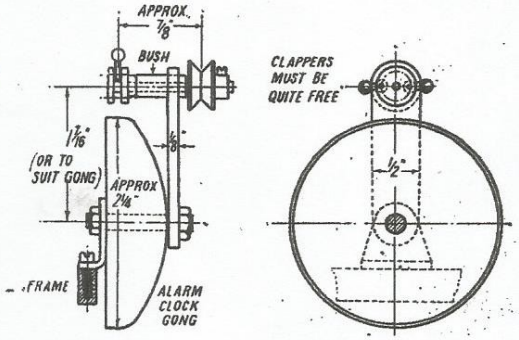
The front axle is a piece of 1/4 in. square rod attached to the leading springs as shown, and is finished with a simple swinging stub axle at each end, made just like a glorified valve-gear fork, and fitted in the same way. The exact shape and size of the wheel seat, depend on the kind of wheels used. If they have plain bushed centres, make them as shown, of a length to suit the wheel boss, and about 3/16 in. diameter. The wheels should run easily, but without excessive endplay. Make the nut like a hub cap, and Inspector Meticulous will raise loud cheers. If the wheels have ball-bearing hubs, like those on our carpet-sweeper, the spindle should be turned to suit the bore of the bearing, and the nut clamps it tight.

The steering arrangement is simple. A bell-crank is brazed to the bottom of one stub axle, and a single crank to the other; these are cut from 13-gauge sheet metal. The track rod is just a length of round steel with a fork at each end, like a valve-gear rod. The steering-column is a 1/8in. rod about 4-1/2 in. long, running through a bracket attached to the inside of the frame, the bracket being drilled at an angle, to give the necessary slope to the column. The top is furnished with a steering-wheel made like Britannia's reversing-wheel, minus the handle or grip, and attached in the same way. A small bracket cut from 16-gauge sheet, and bent as shown, supports the upper end of the column, and is attached to the dash by a screw. Put a little collar on the spindle, above and below the bracket, to prevent the column from up-and-down movement.

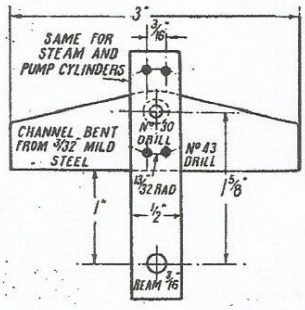
An arm, or single crank, is attached to the bottom of the column, and connected to the bell crank on the stub axle by a rod, similar to the track rod, and called a push rod. As the back end of this, moves in a different plane to the front end, an ordinary fork won't do for the joint, so we must use a ball-and-socket joint. Weeny ball-and-socket joints are used in automobile work, and it might be possible to buy one ready-made at a motor-accessory dealers' store; but one can easily be made specially for the job. Form the end of the arm into a ball; countersink the back end of the push rod, and bend a bit of 16-gauge metal around it, leaving the joint open, to form a slot for the " neck " of the ball. Silver-solder the slotted tube to the push rod, tap the end, and fit a plug with a countersink in it, filing the end until the ball is just free when the plug is tight home. The column should be slightly stiff to turn, so that it " stays put," when the engine is running to the fire (it is hardly big enough to carry Jack and Jill !) and this is easily wangled by setting the collars on the spindle, so that they bear on the upper bracket. Very little movement of the steering-wheel is required to turn the wheels to full lock.

Rear Axle

The rear axle is a length of 1/4 in. round steel as shown, passing through the bearings, or axleboxes, attached to the underside of the back springs. A collar is pinned to the axle, outside each bearing, to prevent endplay. Note-as we are not fitting any differential gear, and as there is considerable friction set up when rubber-tyred wheels rigidly fixed to the axle, traverse curves, one wheel only is fixed to the axle, the other running free, same as the front wheels. This " single-wheeler " drive is quite satisfactory, and is used on the great majority of kiddies' tricycles. The axle carries, in addition to the crown wheel already mentioned, a small pulley for actuating the gong clappers. If the engine didn't have any warning gong, it wouldn't be of great interest

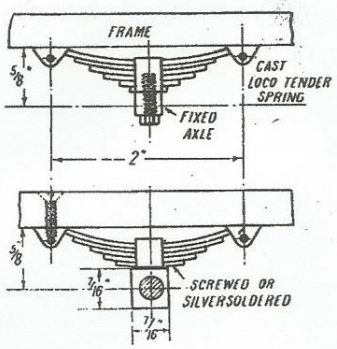


Warning gong



Combined port block and shaft bearing

to several young merchants of my acquaintance. The first question they ask about a small steam locomotive, isn't how fast it will go, or what load it will pull, but just " does it whistle ? " *Aren't* kids funny ? The speculation as to how my L.B. & S.C.R. signal was



How to erect springs and axles

worked from the signalbox on the bank opposite, was as good as any pantomime.

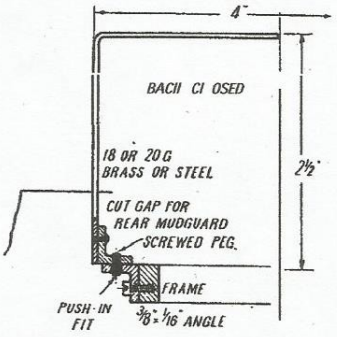
Warning Gong

The gong from a discarded alarm clock does fine for this job. It is attached to a bracket screwed to the frame at the rear end. On the outside of the dome, is a vertical support carrying a bush, in which runs a small spindle carrying a V-pulley at one end, and a pair of jointed clappers at the other. The latter are just the same as used on automatic fire-alarms. A pulley with a deep square-bottomed groove in it, is attached to the outer end of the spindle. The clappers can be turned from a bit' of rod, the opposite end to the ball being flattened, and pinned to the groove, so that it can swing freely. When lying-flat against the pulley, they should clear the gong easily, but should hit it when at'right-angles to the pulley. As the spindle revolves, driven by a belt of thin twine, from the pulley on the rear axle, the clappers fly out by centrifugal force and beat a lively tattoo on the gong-" Look-out-here -we-come-mum ! " says *Nanny*. If she kicks up too much of a shindy, just take the belt off.

Details

An air vessel, or balancing chamber, should be fitted, to ensure that both hoses get an equal share of the pump delivery, and squirt in a steady stream instead of in jerks. This is merely a 1-1/4in. length of 3/4 in. thin tube with silver-soldered end plates, a plug at one end, and a bracket for attachment to the frame near the back end. The branch pipes to the hose unions are silver-soldered into the bottom as shown, and another pipe with union, connects the air vessel to the delivery side of the pump. The two branch unions are just the same as the hand-pump union under the drag-beam of a locomotive, and are supported the same way, by passing through a plate bracket attached to the back of frame. The suction pipe is also attached like the suction pipe of a locomotive feed-pump, being supported by a hanging plate bracket, the pipe going from the " drag-beam " direct to the pump.

Ordinary rubber tube can be used for the suction hose and delivery hoses. The suction hose can merely be pushed over the end of the pipe leading to the pump; but if the delivery hoses are only push-fits, they will probably blow off when *Nanny* really starts squirting, so regulation-type branch unions should be provided. These are made like locomotive unions, but from round brass rod, and should have pegs attached to them, for hand operation, same as in full size; the youthful fire brigadiers won't have any trouble in coupling up. The nozzles are turned from brass rod. The whole of the " works " can be covered by a sheetmetal hood or casing, made in one piece with the driver's seat, and attached by pegs fitting into angles screwed to the frame, so that the whole issue can be lifted off as one unit, without having to unscrew or disconnect anything. I have shown flat mudguards, which can be attached direct to the frame by screws, but if anybody likes to go to the trouble to make and fit posh domed wings, well, go right ahead ! Same with the footboards. A small loco-type step is shown, but full-length footboards can easily be fitted. The' windshield consists of two thin metal frames with a piece of mica or perspex sandwiched between them, like locomotive cab windows ; warning--don't use celluloid ! It is attached to the dash by two small clips, and two stays as shown. Other accessories can be added just as the builder fancies-or as the kiddies dictate ! A coating of bright red paint,

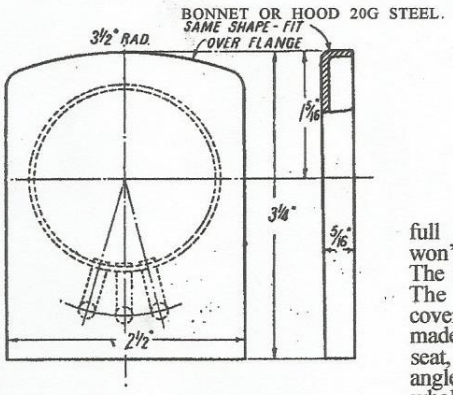


How to fit rear casing

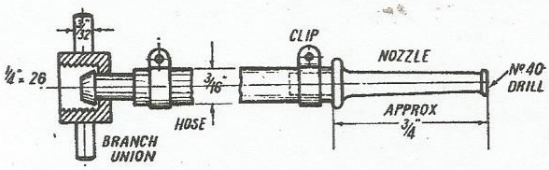
and a spot or two of lettering and lining, and *Nanny* will really be " the pride of the K.F.B."

Operation

Oil all moving parts with thin machine oil, and fill the ' tea-urn " with heavy black cylinder oil. The wick tubes should be loosely packed with asbestos string or flock, and the tank about 3/4-full of methylated spirit. For quick steam-raising (you want to get a move on when the station alarm goes !) fill the boiler with hot water until it runs from the water-level valve, then light up. The flames should be fairly large, as there is no blast to urge them. Steam will be up in a couple of minutes, and the engine should be warmed up by letting it run free for a quarter-minute or so, with the gear lever pulled back, and the suction hose off; then push the gear lever forward, set the steering wheel as required, open the steam valve, and Nanny will be off to the scene of action like greased lightning. When she arrives, couple up the hoses, drop the suction hose into a pan of water, pull the gear lever back, open the steam valve, and stand clear of the jets. If the engine stops on dead centre, flick the flywheel with your fingers. Wipe her down after every run, and she will give years of fun and pleasure, to kiddies and grown-ups alike.



Boiler front



Hose coupling and nozzle