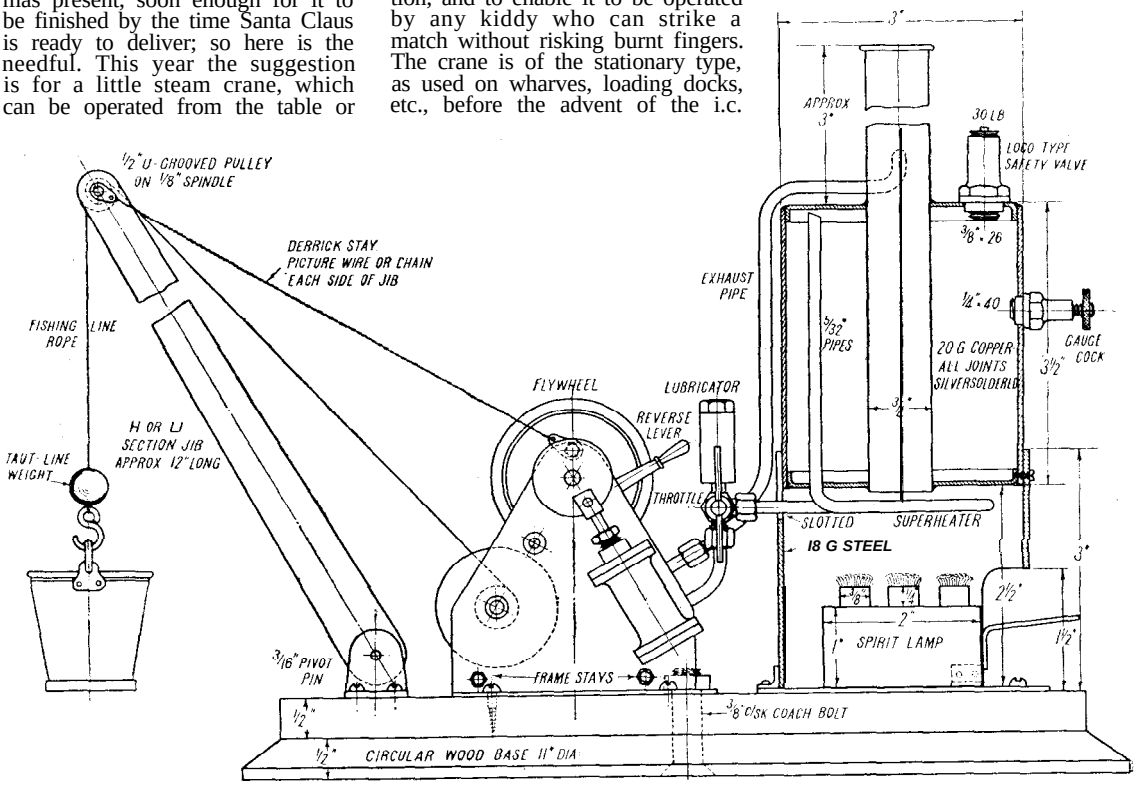
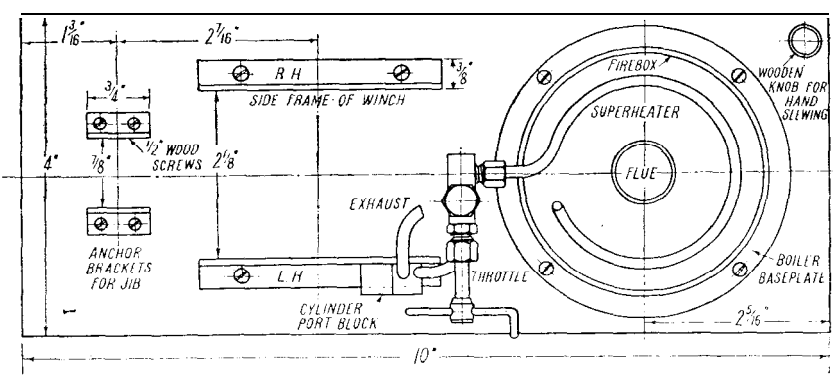
L.B.S.C.'s

CHRISTMAS PRESENT FOR THE KIDDIES

A SIMPLE STEAM CRANE

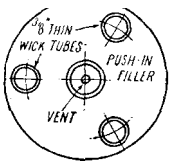
ONCE again, I have received sundry exhortations to put something in for the kiddies' Christmas present, soon enough for it to be finished by the time Santa Claus is ready to deliver; so here is the needful. This year the suggestion is for a little steam crane, which can be operated from the table or the window-sill. It is cut to the rock-bottom of simplicity, for reasons of cost, ease and speed of construction, and to enable it to be operated by any kiddy who can strike a match without risking burnt fingers. The crane is of the stationary type, as used on wharves, loading docks, etc., before the advent of the i.c. mobile crane; but it can be slewed by hand on its baseboard. To simplify the driving, neither clutch nor brake gear is fitted, crankshaft and winch drum being permanently connected. Only two handles are needed, throttle and reverse lever; so all that the young crane driver has to do, is to move the reverse lever either up or down, according to whether he wants to lift or lower, and give her steam. There is, of course, no objection to anybody adding refinements if they so desire.





General arrangement and part plan for a simple steam crane

The boiler is of the single-flue vertical type, with no water-space around the firebox. It is made from thin copper, with silver-soldered joints? and will come to no harm if the kiddies run it dry. The firebox is just a piece of sheet metal bent to a circle, and the firing is by a spirit-lamp. The boiler fittings are only what will be absolutely necessary. The motive power is a double-action oscillating cylinder, with a reversing-valve on the back; steam is regulated by a screwdown valve with a lubricator fitted integral. The cylinder is mounted on a



Plan of burners

-triangular frame carrying the gears and winding drum. The jib, made from channel or H-section metal, is pivoted at the bottom, and stayed by guy wires attached to the stay at the top of the winch frame. Hand derricking could easily be arranged, but it isn't necessary in the present case. The cylinder and winding drum can be made from castings, or built up; gear wheels from a broken clock or gramophone, will do just as well as the most expensive kind that could be bought or made. There is no need to keep exactly to the wheel sizes given, as the distance between centres of the shafts, can be varied to suit whatever wheels may be available. Very little detailed description is needed, the drawings being se!f-explanatory, so 1 won't inflict a long-drawn-out rigmarole on prospective builders !

Baseboard and Boiler

The whole doings is erected on a circular baseboard about 1/2 in. thick, and 11 in. diameter; a turned and bevelled hardwood one would look very pretty, but isn't essential. Drill a 3/8in. hole in the middle, and countersink it underneath. The crane baseboard, measuring 4 in. x 10 in. x 1/2 in. thick, also has a hole in the middle; and a 3/8in. countersunk coachbolt goes through the lot,, the nut and washer being adjusted so that the upper board can turn on the lower, without slackness. A thin circular metal plate 4 in. diameter, could be put between the two rubbing faces if desired. Screw a small wooden drawer-knob in one corner, for the kiddy to grab when slewing the load.

The boiler shell, 3-1/2 in. high and 3 in. diameter, can be made from 20-gauge copper tube, or rolled up from sheet copper of similar gauge, and riveted. The ends are hanged, and are a tight push fit. Each has a 3/4in. hole in the middle, to accommodate the flue, which is of 3/4 in. x 20-gauge copper tube, fitted as shown. Two bushes are needed, for safety-valve and test cock. The combined steam-pipe and superheater is bent up from 5/32-in. copper tube, and poked through a hole in the bottom plate. Fit a 1/4in. x 40 union nut and cone on the projecting end, as shown. The whole bag of tricks can be silver-soldered at one heating.

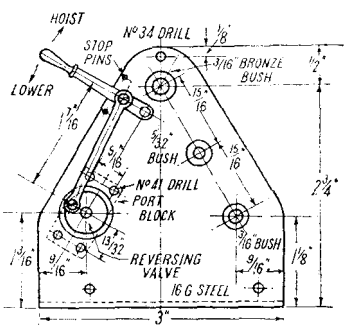
The firebox is rolled up from 18-gauge steel, and has a 2 in. gap cut in it to allow the lamp to be inserted. It is attached to the boiler by brass screws put through the flange as shown, which gives plenty of hold for the threads: a smear of olumbers' jointing on them, will prevent any leakage. The baseplate is a circle of 18-gauge steel, 3-3/4in. diameter. The firebox is attached to it by three pieces of 1/4in. x 1/4in. angle, riveted on. The baseplate is attached to the baseboard by four woodscrews, as shown in plan. The test cock-which isn't really a cock at all-is exactly the same as a water-gauge blowdown; and the safety-valve is of the regular locomotive-type pattern. with a 5/32-in. ball on a t-in. reamed seating. set to blow off at 30 lb. pressure. The boiler is fired by a spirit-lamp, consisting of a circular tank with three burners, as shown. It can be made from thin sheet iron or steel, and brazed, or from stout tin. and soldered: fit a push-in filler with a vent in the middle, also a " saucepan handle," for handling when hot.

The triangular winch frame-plates are cut out together from 1/16in. steel. iust like locomotive frames: drill 'the stay holes with No. 34 drill; and the bush holes 1/4 in. A 5/8in. hole is needed for the reversing-plate, and four holes for the screws securing the distribution or port block. The bottom edges are bent over for attachment to the base-board, as shown. The bushes are turned from bronze or gunmetal rod, and squeezed in, the flanges being on the inside. The stay rods are made from 5/32-in. steel rod, the ends being turned down for about 3/16 in. length, to 7/64 in. diameter, and screwed 6-B.A. They are fixed with ordinary commercial nuts. The winch drum can be turned from a casting, or built up from 1/2in. tube, with discs cut from 3/32-in. plate, silver-soldered on at each end. Even a cotton-reel would serve, if the hole in the middle is plugged, and a 3/16in. steel spindle put through it. Drill a hole through the barrel, and counterbore it as shown by dotted lines, to take the end of the hoisting rope. The large gear wheel can be pinned or setscrewed to the drum spindle.

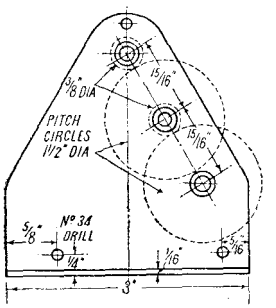
The intermediate shaft is 5/32 in. diameter, and carries a pinion, for meshing with the gear wheel on the drum spindle. Alongside it, is fixed another big wheel for taking the drive from the pinion on the crankshaft. A collar will be needed at the other end, to prevent the shaft from side-slippmg. The crankshaft is 3/16 in. diameter and 4/4 in. long, with a l-in. disc crank at one end. and a pinion and flywheel at the other. The flywheel is needed, owing to the crane only having one cylinder. As mentioned above, any gear wheels can be used, within reason, if the shaft centres are arranged to suit.

Engine

The double-action oscillating cylinder is 7/16 in. bore and 3/4 in. stroke. It is bored and and faced, the



Inside of L.H. winch .frame



Outside of R.H. winch frame

face machined, and the covers turned, in exactly the same way as described for locomotive cylinders. The gland is made from 5/16in. hexagon rod. The piston is turned from drawn bronze or gunmetal rod, and the piston-rod is 1/8in. rustless steel or bronze. The big-end is a plain block, drilled for the crank-pin, and screwed on to the end of the piston-rod. The tnmnion-pin is 1/8in. round steel; take good care to have this dead square with the rubbing faces.

The distribution block, or port block, is a piece of bronze or gun-metal rod 1 in., long, 1/2 in. wide and 3/8 in. thick. Face off both sides, and drill a No. 30 hole through the middle. Be mighty careful about marking out and drilling the ports and passages correctly. Drill the two longitudinal holes first, at 3/32 in. from one face, and 5/32 in. each side of centre. Next, drill the four ports so that they break into them. At the side, as shown, 3/32 in. from the edge, and 5/32 in. each side of centre, drill 3/32-in. holes 1/4 in. deep, open with No. 30 drill to 1/8 in. depth, and tap 5/32 in. x 40, as shown by the dotted lines. Now turn the piece over, and drill the four holes shown in a circle. The two at the sides, are drilled through into the longitudinal holes connecting the ports; the top and bottom ones break mto the holes just previously drilled. True up both faces of the block, on a piece of fine emery-cloth, laid on the lathe bed, or some other surface equally true.

The reversing-valve is a 3/16in. slice parted off a piece of 1/2in. round rod. Drill a No. 30 hole through the middle, and counter-sink it. Make four deep counter-sinks, corresponding to the four ports in the back of the block, on one side of the valve, and run them into two sausage-shaped grooves, by aid of a small chisel. On the back, drill and tap a 9-B.A. hole for the screw for connecting to the rod from the reversing lever. This should come in the thick part between the grooves. Face the grooved side truly, as above.

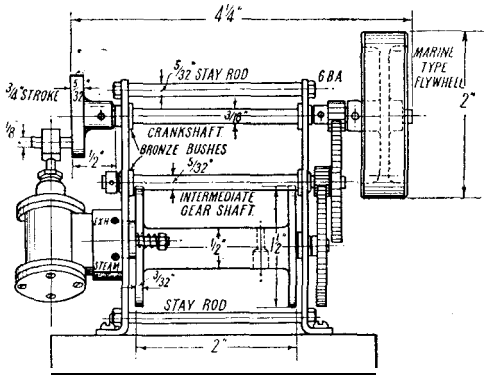
Temporarily clamp the port block to the outside of the l.h. winch frame, in the position shown by the dotted lines in the illustration; run the 41 drill through the holes in the frame, making countersinks on the port block. Remove block, drill the countersink: with No. 48 drill for 3/16 in. depth, tap 3/32 in. or I-B.A., and attach the block to the frame by cheese or roundhead screws Warning: the screws must not pierce the passages, so watch your step when drilling and tapping.

The cylinder can then be erected, with the trunnion-pin going through the hole in the block. Put on the reversing-valve, and secure with a 19-gauge steel spring and nut. Make a lever, in the same way as described for locomotive reverse levers, and pivot it on a small shouldered screw in the left-hand winch frame, as shown; connect the lever to the screw in the back of the reversing-valve, by a link made from 1/16in. x 3/16in. steel strip. The stop pins, which are made from 1/16in. wire screwed into the winch frame, are set so that when the lever is in the upper position, one of the curved grooves in the reversing-valve bridges the steam port (bottom) and one of the side ports, whilst the other groove bridges the exhaust port (top) and the other side port. Shifting the lever to the lower position, should move the reversing-valve a quarter-turn, the grooves then bridging the opposite ports, and reversing the engine. The completed winch is attached to the baseboard by woodscrews, as shown.

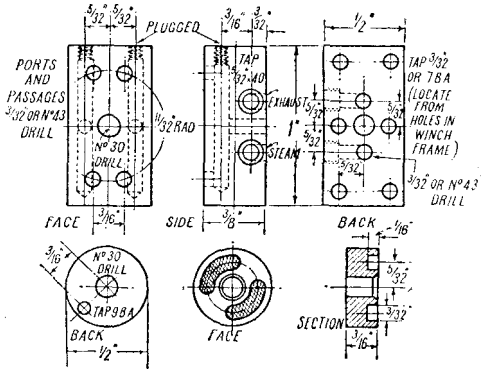
Throttle and Lubricator

Steam is controlled by a simple screw-down valve, the handle of which is far enough away from it, to avoid burning tender fingers, and big enough to allow of easy operation. The valve is very similar *to* the type described in a recent lobby-chat, having a separate section to carry the valve-pin. The body is a 7/8in. length of 5/16in. round or hexa-gon rod; chuck in three-jaw, face the end, centre, drill down for 13/16 in. depth with 3/32-in. or No. 41 drill, open out and bottom to 7/16 in. depth with 7/32-in. drill and D-bit, tap the end 1/4 in. x 40 and make a gland fitting to suit, as shown. Tap this for a 5/32-in. x 32 pin. At 5/16 in. from the tapped end, drill a 5/32-in. hole right across; and at 1/4 in. from the blank end, drill another at right-angles. This one should break into the small hole. Fit 1/4in. x 40 union nipples into two of them, as shown; the lubricator goes into the third.

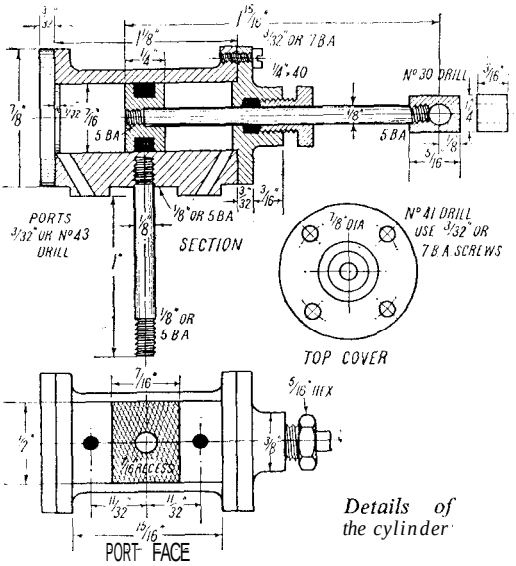
The lubricator is just a plain oil cup, made from 3/8in. round rod, turned to the shape and dimensions shown, and fitted with a screwed cap. The stem is turned a tight fit for the hole in the valve body, and is drilled No. 70. The two union nipples, and the lubricator, are silver-soldered in at one. heat. The valve pin can be made to any length that the builder fancies. On the end of it, fit a 7/32-in. boss, carrying a cross handle, made like a tender brake-handle; this is much better than a wheel, for operation by a kiddy. It gives more leverage, and doesn't slip when operated by small oily fingers. Kids don't reckon they are really on the job, unless their hands are dirty and oily



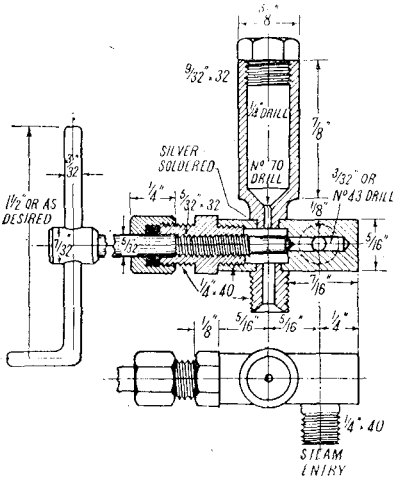
Back view of winch



Port block and reversing plate



Details of the cylinder



Combined throttle and lubricator

The union nut and cone on the superheater, are connected to the union nipple at the blank end of the throttle-valve. A short bit of 5/32-in. pipe with a union nut and cone, is screwed into the lower hole in the port block, and connected to the union nipple directly under the lubricator. The two pipes should hold the valve in place, without any other support being needed.

The exhaust pipe is 5/32 in. diameter, and arranged as shown in the side view of the crane. The pipe should be softened, and the upper end hammered into a cone; run a 3/32-in. drill into the end, in case it has been closed up too much. Bend the pipe as shown, and push the upper end into a 5/32-in. hole drilled at the bottom of the chimney. The lower end is connected, either by a union or a running-nut, to a short bit of pipe screwed into the upper hole in the port block.

Jib

The jib is a piece of H or channel-section brass or steel, about 12 in. long; for sake of appearance, it could be filed taper. It is held at the bottom by two pieces of angle, bent up from 16-gauge steel, as shown in the illustration; these are screwed to the baseboard, and a 3/16in. pin or bolt put through the lot. The upper end carries a round-grooved pulley, 1/2 in. diameter, on a 1/8in. spindle. Leave the spindle projecting at each side, and attach either pieces of flexible wire, as used for picture-hanging, or small chains, to the projections. Anchor the other ends of them to a couple of tags under the nuts at the ends of the top staybar on the winch frame. The jib can be sloped at any angle that the builder-or the kiddy — fancies. The wires or chains could be made adjustable, if needed.

How to Operate the Crane

Fill the boiler through the safety-valve bush, until water runs out of the test cock; then shut the cock, and replace the safety-valve. Fill the lamp about three-parts full of methylated spirit, using asbestos string or flock for wicks, and leaving them loose. While the kettle is boiling, oil all the bearings-don't forget the jib pulley-and fill the lubricator with cylinder oil, super-heater grade, the stuff that looks, but doesn't taste like molasses. For the hoisting rope, use about a couple of yards of stout fishing line; poke one end through the hole in the winch drum, tie a knot in it, and pull the knot back into the enlarged part of the hole, so that it is below the surface of the winch barrel, and won't interfere with the rope coiling up evenly.

When steam is up, put the reverse lever in the upper position, and open the throttle a little; if the crank stops on dead centre, give the flywheel a flick, to teach it good manners. Hold the rope in your fingers, letting it run over the jib pulley, whilst the engine winds the rope on to the drum. When it is all wound on, except a few inches below- the pulley, shut off steam, and thread a lead or brass weight on the rope as shown, tying a wire hook just below it. The weight is to keep the rope taut, when lowering with nothing on the hook. The crane is then O.K. for service.

The lucky kiddy will be able to hoist quite a decent load off the floor, slew the crane around, and lower the load on to the table or window-sill. A load can be picked up from the garden, and decanted inside the room. Young Curly's home-made steam crane was a source of delight to my few small cronies; on one occasion, we nearly sent the poor pld cat into hysterics, by dumping her quads into mother's shopping-basket, and hoisting the lot up to the first-floor window !

I hope that the little crane described above, will give the kiddies many hours of pleasure. All the maintenance it needs, is to keep the bearings oiled, the lubricator supplied, and a drop more water in the boiler whenever the lamp goes out. Extra blobs and gadgets may, of course, be fitted. A locomotive whistle would be useful for the driver to signal to his--or her-mate below, and a clackbox and pump could be fitted, to feed the boiler with water under steam. Other refinements could include a steam gauge, and a water-gauge. Anyway, there is the nucleus; do what you jolly well like with it, as long as it pleases the weans and makes them happy