WORKING POST MILL

DESIGNED AND MADE BY
JANICE WESTON

ILLUSTRATED BY ROY PALMER

AFTER visiting a post mill in the summer, I was fascinated by the actual workings and thought how a child would love to make a lot of wheels work in a toy windmill. This thought was also promoted by making a wheeled toy with a secondary movement during our coursework.

I then gathered together as much information as I could about windmills. I wrote to the Royal Netherlands Embassy, then to Holland, The National Trust and the Society for the Protection of ancient Buildings. I visited many windmills, collected numerous postcards and even bought some cards from the Royal Acadamy. I also had access to several reference books.

On studying all this information I came to the conclusion that no two windmills are alike and there were many variations. I discarded the tower mill because of the practical problems of the round shape. The post mill seemed the obvious choice in shape and to make as a toy.

I first made a mock-up in corrugated cardboard to get an idea of size and proportion. In doing this I realised the importance of the structure at the base (the pyramid) in making it stable. I also experimented with cardboard wheels on cocktail sticks to see how the movement would work. I then tried using manufactured wooden wheels on cocktail sticks.

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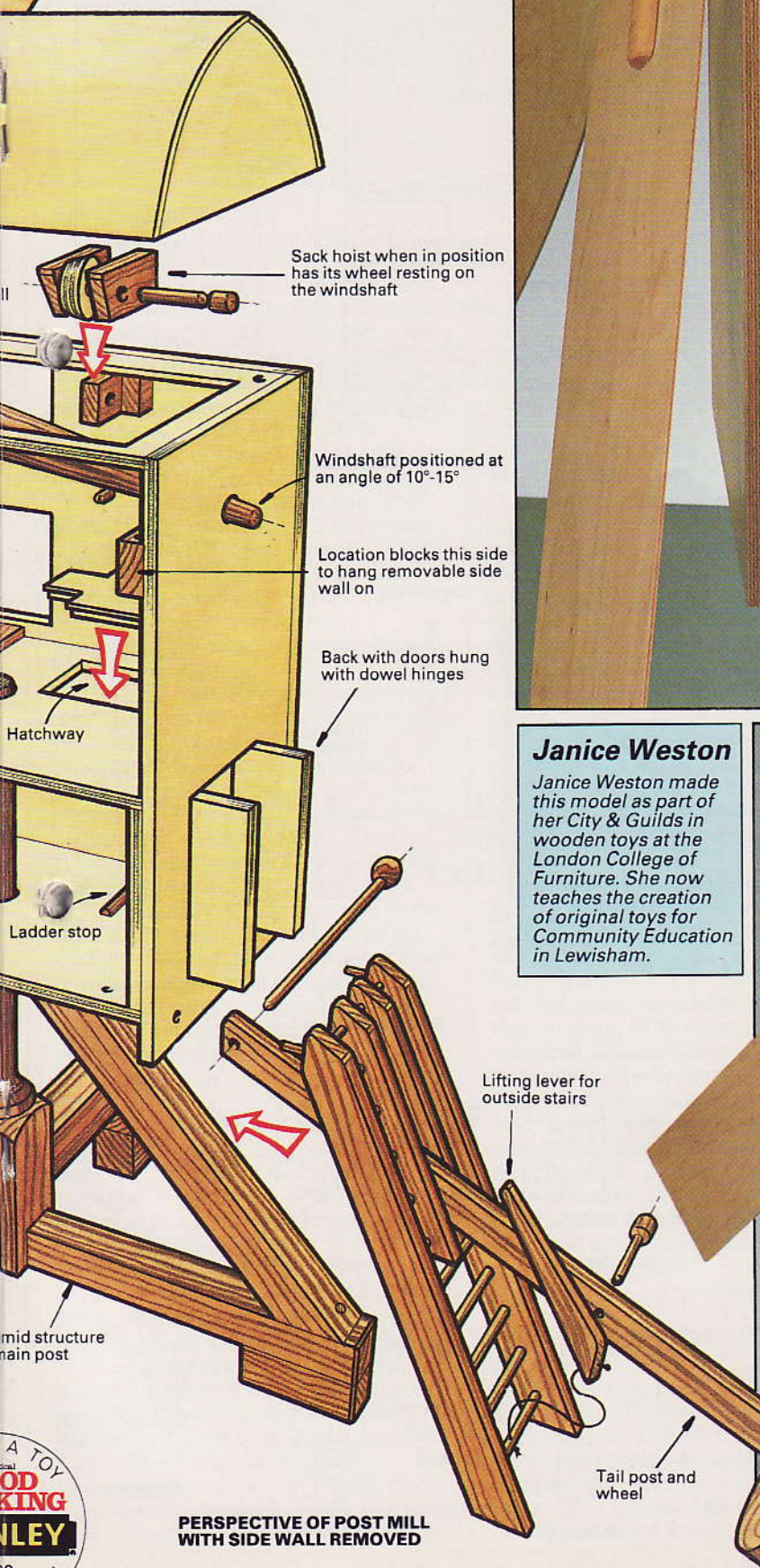
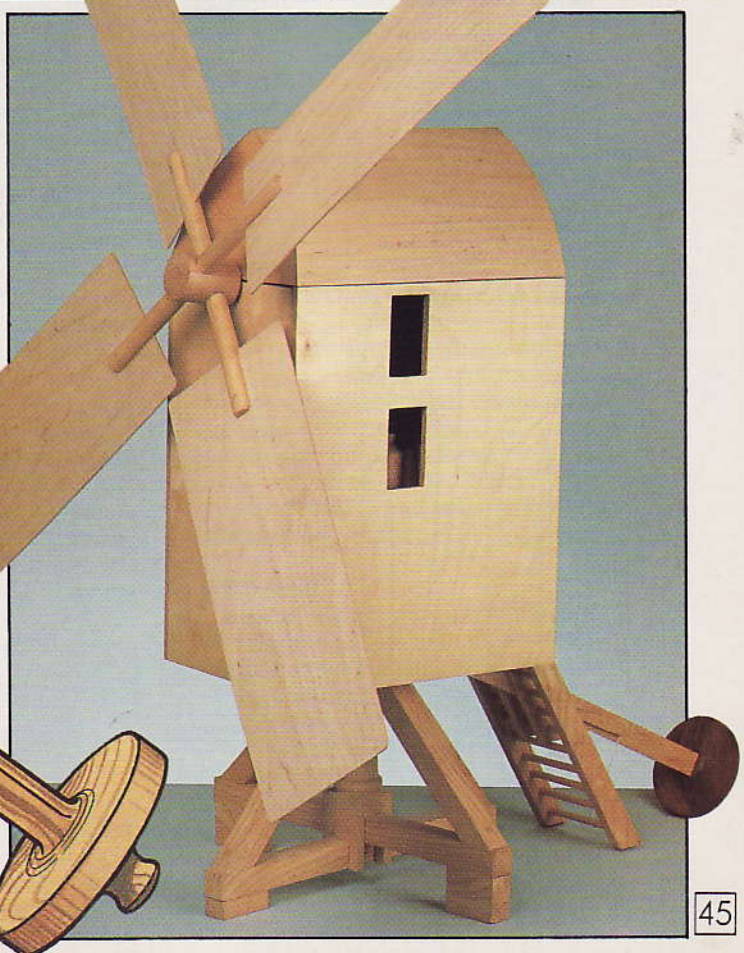
This magnificent model won second prize in our Stanley Design-a-Toy competition. It was researched, created and impeccably made by Janice Weston.



PERSPECTIVE OF POST MILL WITH SIDE WALL REMOVED

Janice Weston

Janice Weston made this model as part of her City & Guilds in wooden toys at the London College of Furniture. She now teaches the creation of original toys for Community Education in Lewisham.



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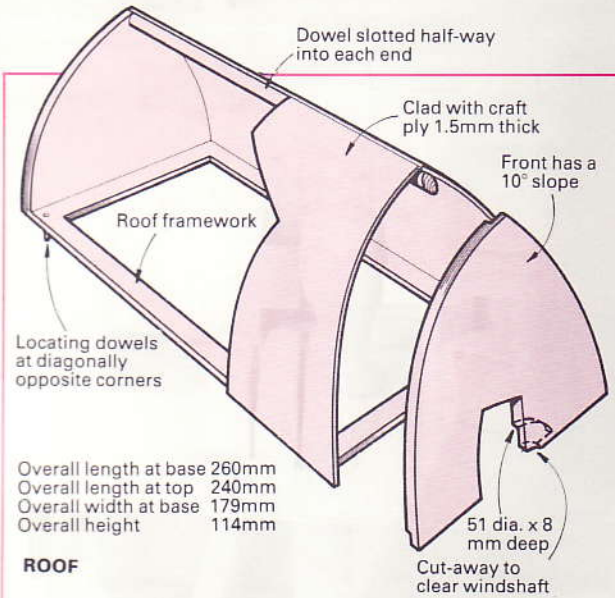
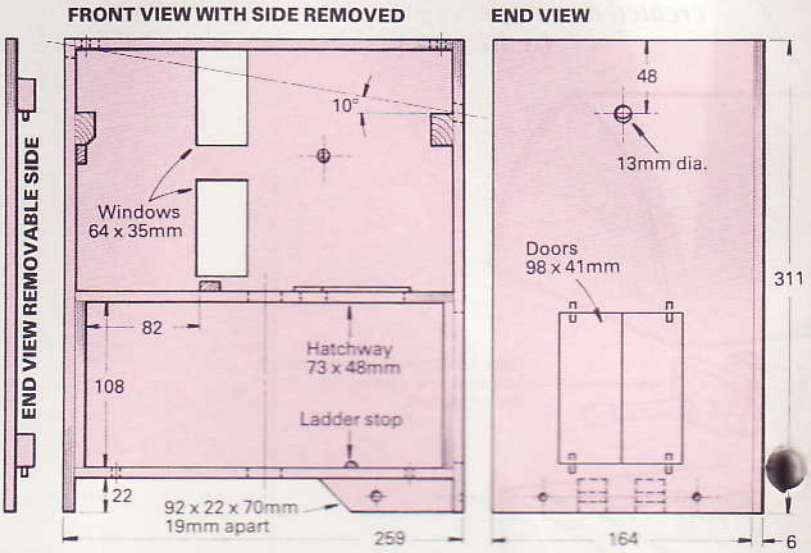
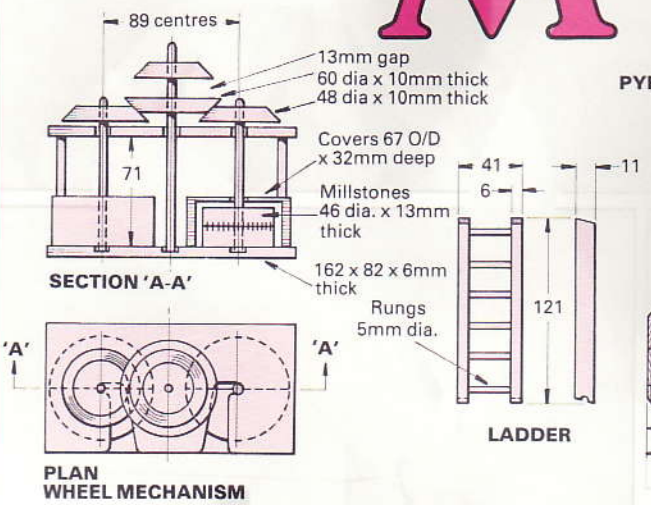
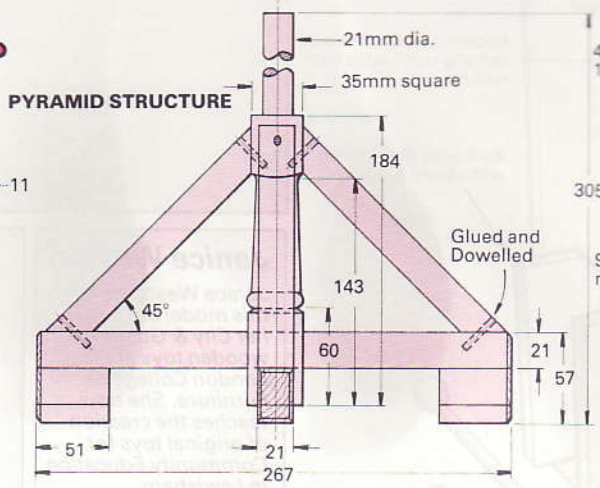


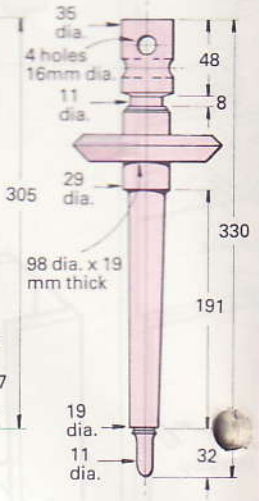
ROOF



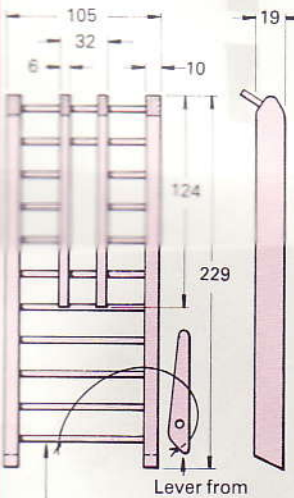
POST MILL CARCASE



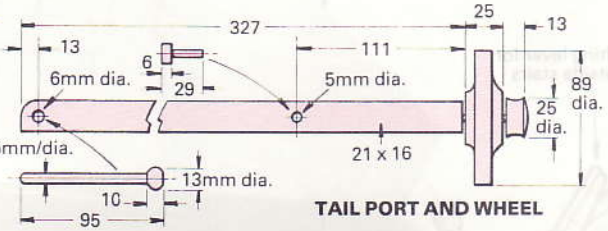




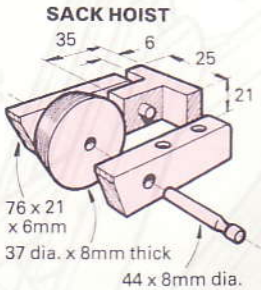
WINDSHAFT



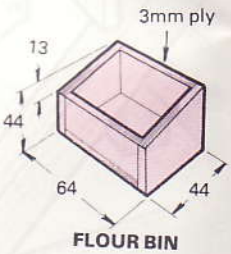
OUTSIDE LADDER



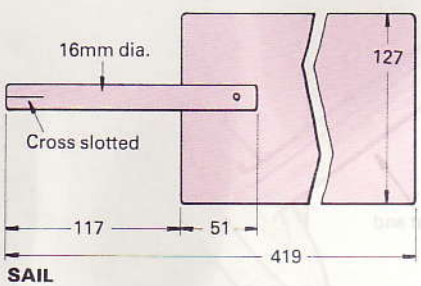
TAIL PORT AND WHEEL



SACK HOIST



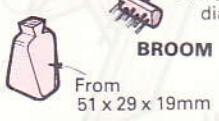
FLOUR BIN



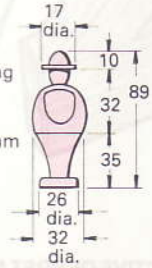
SAIL

SHOVEL

BROOM



FLOUR SACK



MILLER

TROLLEY

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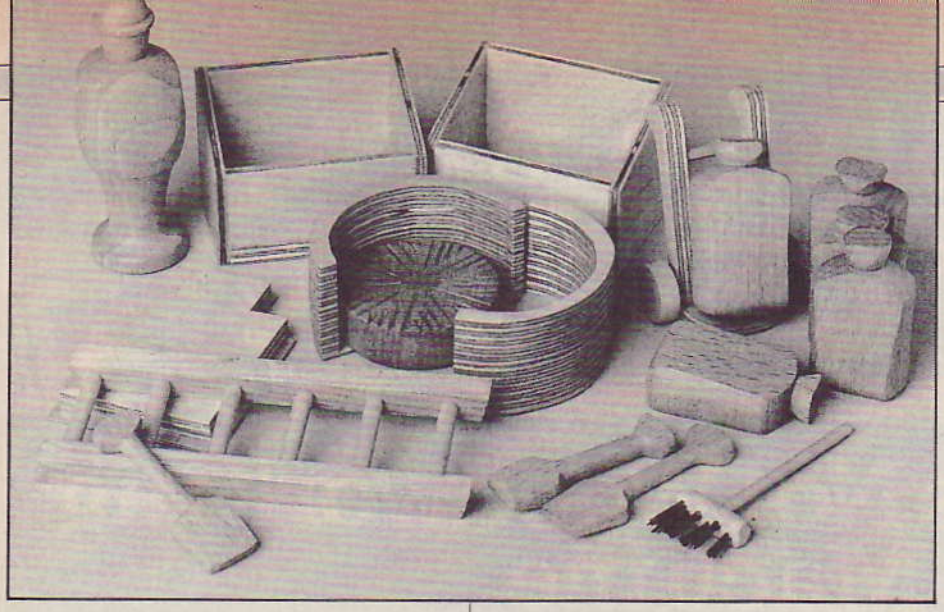

Box construction

I decided that as the whole body turns on the central post, it would make a very strong structure if a box construction was made first to which the sides, back and finally front would be fixed. This box construction was made of 6mm birch plywood. Pieces were cut for floor and first level 245 by 162mm and for the sides 110 by 162mm. One of these pieces had a door 85mm wide cut out of the centre. The two floor pieces had a ⅞in. hole drilled in the centre for the main post. The box was then glued using Cascamite glue. A check was made that all was completely square and two pieces of plywood were then positioned at the front and the back to retain squareness.

The back and front of the mill were then cut from 6mm birch plywood 162 by 310mm and the sides 257 by 310mm. This allowed for a piece to extend below the floor level. A door opening was cut out of the back 80 by 100mm and windows were cut in the sides. An opening for a trap door was cut out of the first floor. A piece of wood was also cut the same size as the floor and a square was cut out of the middle enabling the main brake wheel to turn and also for a child to be able to see the things moving. This whole structure was again carefully glued using Cascamite and cramped.

Roof section

The angle of the windshaft is between 10 and 15 degrees therefore the roof had to have this angle to allow for the sails. A 260 by 170mm piece of plywood was cut and a rectangle cut out of the middle to leave a framework. Two pieces of 6mm plywood were cut for each end and the front piece had the bottom edge cut at an angle of 12 degrees on the bandsaw. A piece of dowel was cut to length and a hole cut halfway through the top of each end piece. This gave support and provided an area to be glued against. This framework was all glued together. Craft plywood 1.5mm thick was then cut slightly larger than each side. Cascamite was put on to one half of each end piece and along framework and dowel. The thin plywood was pushed on at the bottom and cramped against two pieces of wood fixed to the bench. The edges were pressed on and masking tape pulled the top edge around the dowel. When dry the edges were sanded and the other half was glued in the same way.

Wheel mechanism

This was made so that it could be removed. First a template was made with four holes in the corners and there in the centre. This template was used to drill two 6mm pieces of plywood. The holes in the four corners were stopped but the three in the centre did go right through. The top and bottom were drilled together with the template to make sure the holes were really accurate as the dowel had to go through both pieces and run freely – ¼in. holes were drilled to take dowels. A mark was made on each piece to ensure they were assembled correctly.

The wheels were cut from plywood using a jig on the bandsaw. Another jig was then made to cut the chamfer. The wheel was placed on the jig after being fitted with ½in. dowel and rotated against a sanding machine so that an angle of 45 degrees was achieved. Three 48mm and three 60mm wheels were made. The casing for the wheels was made by gluing ¼in. dowel in the four corners of one piece and placing the other piece directly above it. The wheels were then placed on the dowels in the three centre holes. The wheels all worked very well and would act as a drive for the the mill stones.

PARTS TURNED ON THE LATHE

Shovels

Shovels were turned from beech 60mm long. The handle was approximately 15mm in diameter tapering sharply to 6mm for the shaft and out again to 20mm and then tapering to 15mm. The circular shape was then sanded flat on each side.

Flour sacks

Turned from beech two at a time and sawn in the middle. These started at the base of the sack 27mm tapering out to 30mm, in to 6mm and out again to 15mm. These too were sanded each side.

Miller

The miller was turned in beech starting at 10mm for his hat going out to 20mm for the rim, going in to 15mm for his face, 6mm for the neck and out again to 30mm for shoulders and body, tapering down to 18mm for feet and out to 30mm for his stand. Arms are incorporated in his body and the chest was slightly sanded.

Mill stones

These were turned from a length of beech to a diameter of 48mm and 13mm sections sawn off. Grooves were then cut in the top with a craft knife and hacksaw blade.

Tail post wheel

Walnut was used for this wheel to give a contrast in colour. It was turned to a diameter of 90mm down to 30mm forming a hub. The turning was extended to make a cap for the tail post, to be subsequently sawn off. A drill was then mounted in the lathe and whilst it was still turning a hole was drilled into the wheel nearly to the end, but not quite. The wheel was then taken off and the end piece cut off. So that the tail post fitted exactly it was then put into the lathe and the end piece turned so that it went easily through the wheel but was a tight fit in the cap.

Main post

The main post was turned from ash. Mortices are cut in the base to take the cross trees so this part was left square. The next section was turned round and tapering and the next section just had the corners rounded off because the pyramid structure needed a flat surface for gluing. The next section was going through the box construction, so had to be turned to exactly ⅞in. diameter.

Wind shaft

First of all 16mm holes were drilled into the square piece of wood as it would have been very difficult to drill when it was round. The holes were staggered so that it could take the dowels from the rails easily. The piece of ash was then put on to the lathe and the square piece turned. It then came in to a diameter of 12mm to set into the front of the mill which had had a ½in. hole drilled in it. When the mill was completed I decided that this

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could have been much larger but originally it was thought it would run much better with a small neck.

The next section was turned to mm which was the size of the hole in the wood which was going to be turned for the main brake wheel. The shaft then tapered down to 12mm – the size of the hole drilled in the back of the mill.

Main brake wheel

This wheel runs all the other wheels which turn the mill stones so it had to be turned very accurately so that it fitted exactly on to the wallower, as it is turned. Plywood (18mm) was used and it was pushed on to the windshaft and turned. It was continually taken out and tried against the wheel mechanism until it was exactly right.

PYRAMID STRUCTURE

The quarter bars and the cross trees were made from ash 21mm square. The cross trees were cut to length and glued in position – one on top of the other. Blocks of ash were placed underneath to make them level (as in the real mill). Because the cross trees are at different heights this means that the angle of two of the quarter bars is different to the other two. The ash was sanded until the right angle was achieved and the four pieces met at the same level. They were then glued in position – two at a time and taped until dry. When completely hard the structure was strengthened at the joints by drilling a hole through each piece and pushing a dowel in position.

SAILS

For the sails 2mm craft plywood was used as they needed to be as light as possible. It was considered putting half round each side and pushing into the holes drilled in main windshaft but it was not half round so dowel was used. A 53mm slit was cut in each dowel and a ¼in. shoulder cut out of each sail slightly off centre. Two slits were cut in the end of each dowel to make it springy to push into the holes in the windshaft. The dowel was then pushed over the sail and secured by a small dowel. This enables the sail to be replaced easily if broken.

ACCESSORIES TO WINDMILL

Small ladder

This was made by using two pieces of ash. A template was made by drilling six holes in a piece of wood the same size as one side of the ladder. Masking tape was put on to the drill but as a depth gauge. The 6mm dowel was cut to length, a tiny spot of Cascamite placed in each hole and the ladder put into a vice and slowly tightened.

Large ladder

This was made in the same way as the small ladder but provision had to be made for the tail pole. The top half was divided into two. Dowels were put into the top and located into two holes in the back and under the door.

Flour bins

Bins were made from plywood in a glued box construction

Doors

These were hung by means of dowel hinges. A hole was drilled in the top and at the bottom of the doorway by drilling right up. Holes were correspondingly drilled in the doors so that the dowel was a tight fit in the doors and loose in the doorframe.

Sack hoist

Made from ash, a block was first made with a piece protruding to which was dowelled to more pieces of ash. At the end was another dowel with a chamfered wheel in the centre which rests on the main windshaft.

Lever to lift outside stairs

A piece of ash was shaped and a small hole drilled for string. Another hole was drilled a little way up and not going right through the tail pole and the dowel was capped by a larger piece of dowel drilled half way through.