

Investigate Science in Action - Activity Guide

Purpose: To demonstrate an understanding of how and why wagons were hauled up and lowered down the inclines along the Cromford and High Peak Railway.

Time: Approximately 30 to 40 minutes

Location: At the base of the incline, just up from the wheel pit, (see map)

Resources: 3 lengths of track mounted on wooden boards and the experiment box containing: wagons to load, wagon fixing wire, supporting photos and information

Teaching notes:

Explain to the children that when the Cromford and High Peak Railway was first built in 1831 it was built to carry goods from Cromford Canal over the peaks (canals cannot go up and over steep areas of land) to Peak Canal at Whaley Bridge. It was designed for wagons to be pulled along the railway tracks by horses, much like horses pulled canal boats along the canal.

Over the course of the railway there are 9 inclines (steep hills). Do they think that horses could pull the wagons up the inclines? If not how did they get the wagons to the top? Listen to ideas, but do not agree / disagree with any ideas the children have. Go on to explain that even when steam trains were invented and used on the railway they too were not capable of hauling loads up steep hills. So their challenge will be to work out how the wagons got up and down the inclines.

Split the class into 3 groups and give out the selection of old photos, showing the railway tracks and wagons ascending or descending the inclines. Ask the children to look carefully at all the pictures, can they work out how the wagons ascended / descended?

Points to pull out from the answers / discussion:

- A wire rope moved up or down between the tracks
- Wagons were attached to the wire ropes with a chain
- It was usual to counterbalance the loads and have some going up and some down at the same time
- Question the children on what they think the wire rope was attached to

Show the class the wheel pit (it is near the water tower and surrounded by fencing, see the map). In it is a restored winding wheel and wire rope in the position it would have been when in use. Ask the pupils if there was a winding wheel at the bottom of the incline what would they need at the top?

Move the thinking on to: How would the winding wheels move?

At the top of each incline there would be a static steam engine that would power the top winding wheel to move it around. At Middleton Top Engine house this engine has been preserved and can be visited by the public.

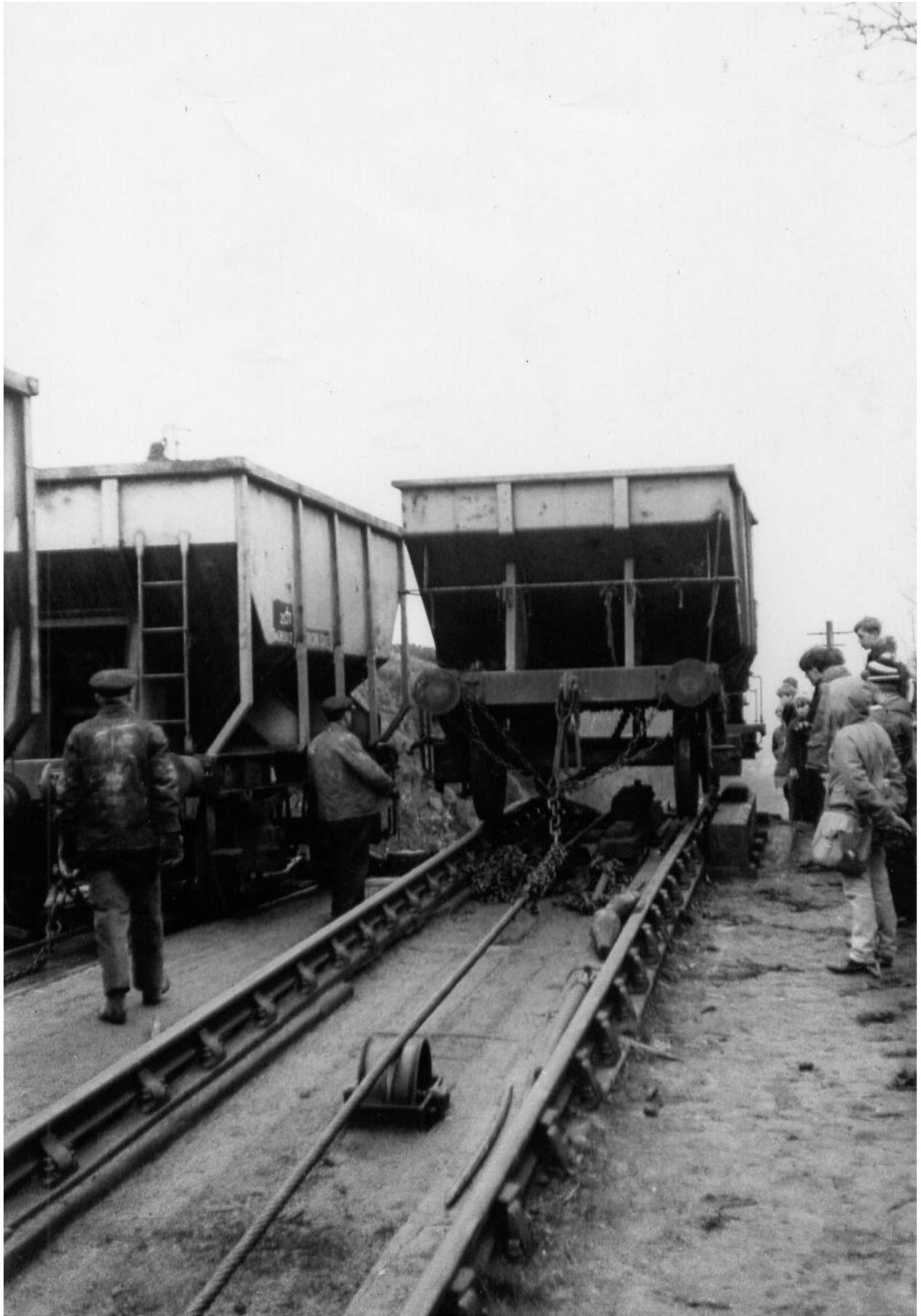
Explain or give out the information sheet about the job of the 'Hanger On' man explaining how the wagons were attached to the wire rope and the tools that he used.

When you are happy that the group has a rough grasp of how the wagons ascended and descended the inclines give out the model tracks and associated wagons and wires and ask the children to work in their groups to have a go at attaching the wagons to demonstrate the techniques used.

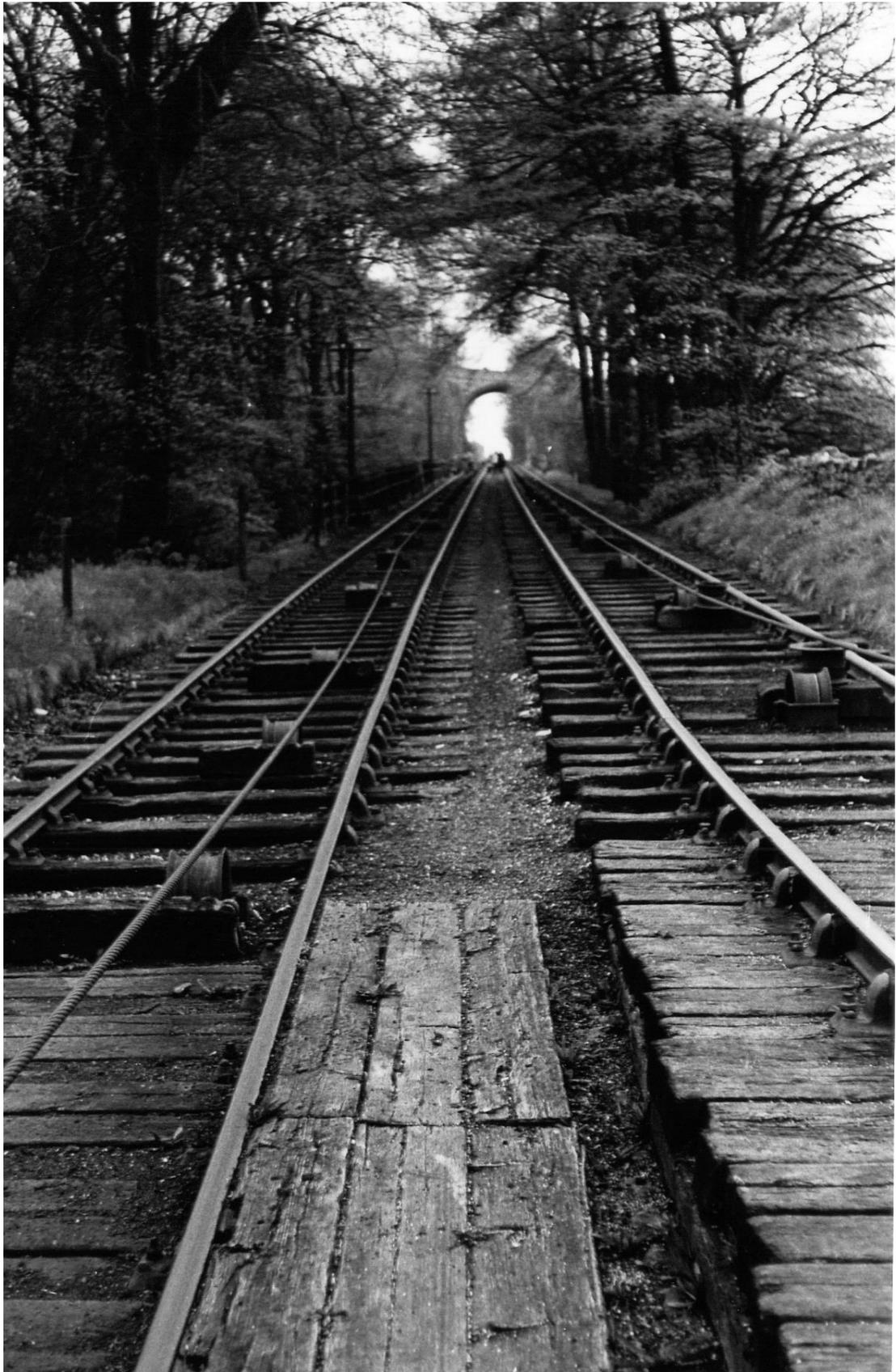
The models should be placed either on a sloping surface or lifted at one end to replicate the steep inclines.

The groups should use their time to experiment and play with their model, whilst you circulate to question them on their understanding. You could encourage them to experiment with the angle of the slope, the number of wagons attached, can they make the wagons heavier by putting stones inside the cargo boxes, get them to think about the job of the 'Hanger On', how difficult and dangerous it would be to wind heavy chains around the wire rope etc. Each group could demonstrate their understanding using their model to explain what they have found out or to explain how the wagons were hauled up in the past.





1960's – top of Sheep Pasture incline



1961 - Middleton Top incline



1960's – wagon chained and ready to descend



1960's – Loaded wagon at Middleton Top



1966 – Indicator moved to the correct position as a wagon is about to ascend the incline



1950's – Wagons ascending and descending an incline



STAFF MUST EXERCISE GREAT CARE
WHEN WALKING UP OR DOWN THE INCLINE
AND KEEP A SHARP LOOKOUT
FOR MOVEMENT OF THE WIRE ROPE
WHEN THE ROPE STARTS TO MOVE
STAFF MUST STOP AND STAND CLEAR
OF APPROACHING WAGONS
NO ONE MUST REMAIN WITHIN
THE "DANGER ZONE" NOTICE BOARDS
IN THE CENTRE OF THE INCLINE
WHILE WAGONS ARE MOVING

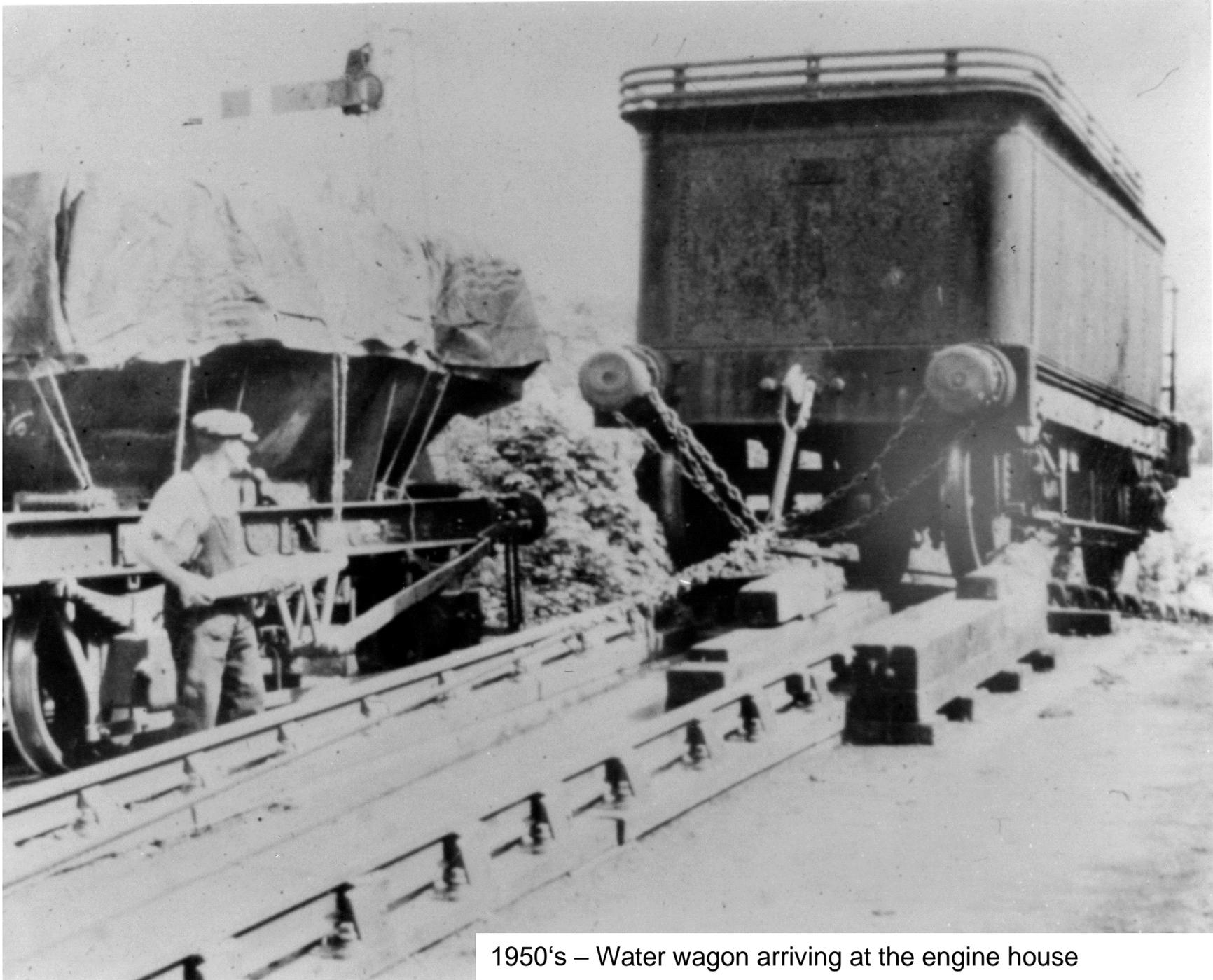
1960's – Safety sign



1950's – Wagons at the Engine House Middleton Top



1950's – Wagons on an incline



1950's – Water wagon arriving at the engine house

the hanger on's tools

A 'Hanger On' secured waggons to the metal rope that wound them up and down the incline.



shunters pole and couplings

Pig-tailed hooks on poles helped reach over buffers for coupling and uncoupling. Using one was a lifesaving skill.



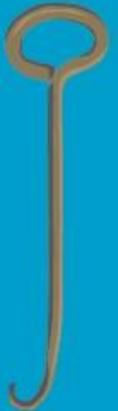
turn on scotches

Installed across the top of the incline whilst waggons were hung on or off, turn on scotches would block the path of a runaway waggon.



chain hook

Hangers On used chain hooks to drag tackling chains around the wooden landing decks at either end of the incline.



tackling chain

Tapered chains and leather straps secured waggons to a metal 'endless rope' that raised and lowered them on the inclines. Friction of chain on rope, held by straps, is all that stopped tons of waggons careering off down the track.

