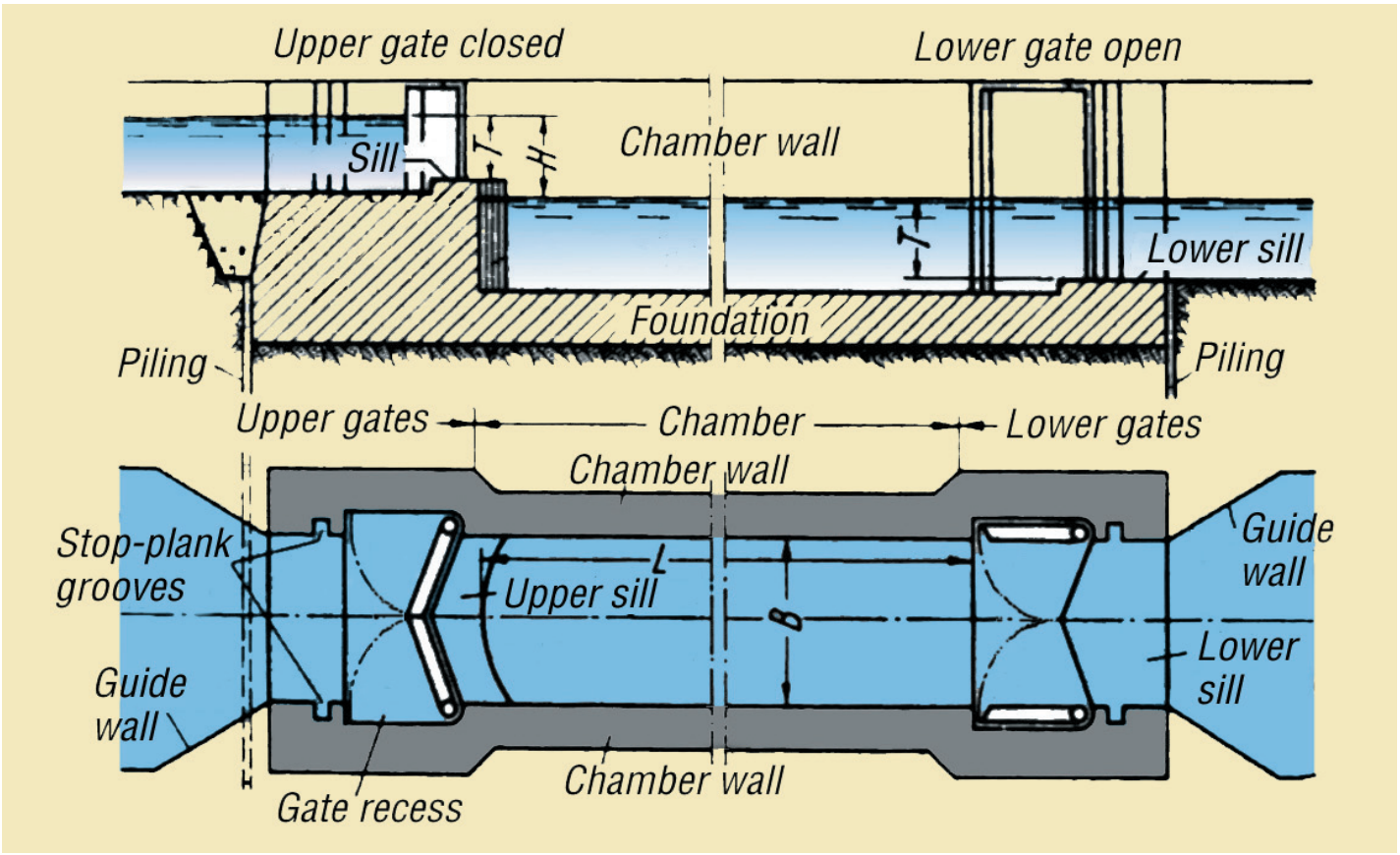
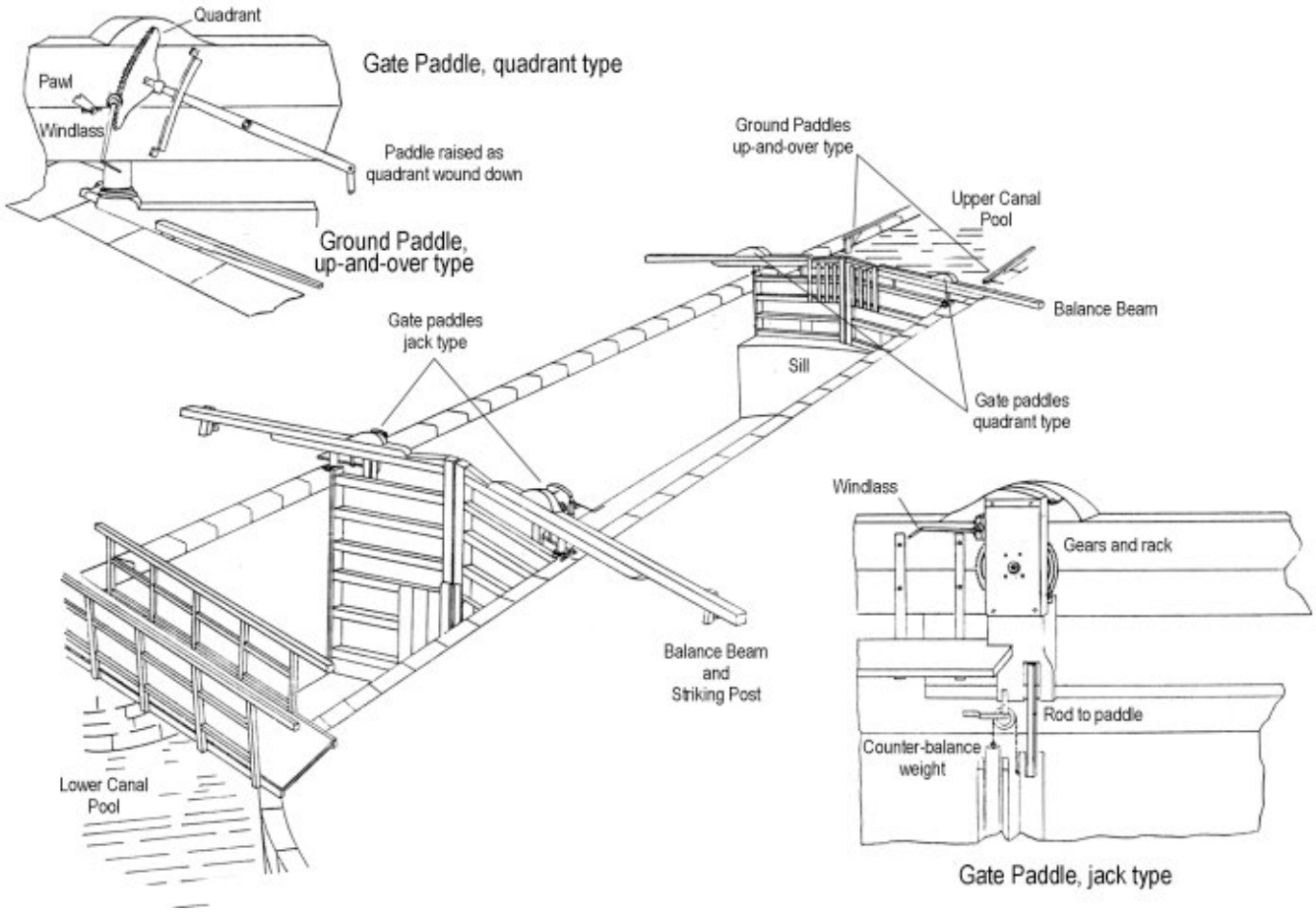


Above: The main structural features of a lock identified.



A Leeds & Liverpool Canal lock, with some of the many types of paddle gear found on the canal. More examples can be found on these pages.

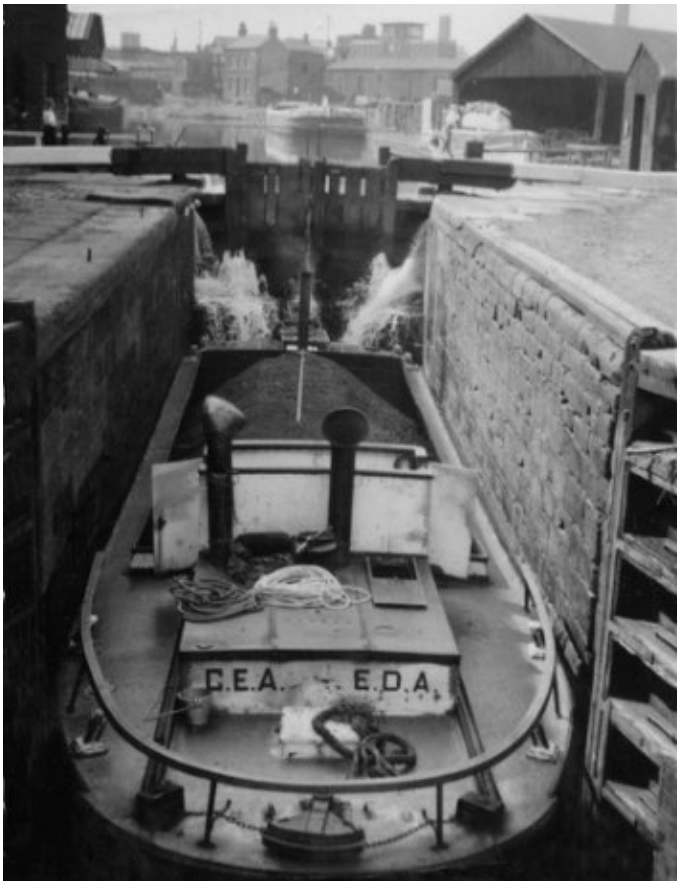
LOCKS

Going uphill, it is important to open the ground paddles first, and even then the water can be quite turbulent, as on the left.

Below, the gate paddles have been opened before the water level has risen. With a boat which does not fill the lock, as here, it is not that dangerous, but should not be done with a full length boat.

With a full length boat, as below left, if the gate paddles are opened too soon, the water can pour straight into the hold and sink the boat.

Today, baffles reduce the flow through gate paddles, but they used to be unrestricted, as below right, when it was much more important to be careful with opening the paddles.



This is ***Kennet*** in Bingley 5-rise locks showing how close a full length boat gets to the gate paddle openings. Here they have been fitted with baffles. When the gates get older and start to leak, the hatch into the caabin has to be closed when working through locks.

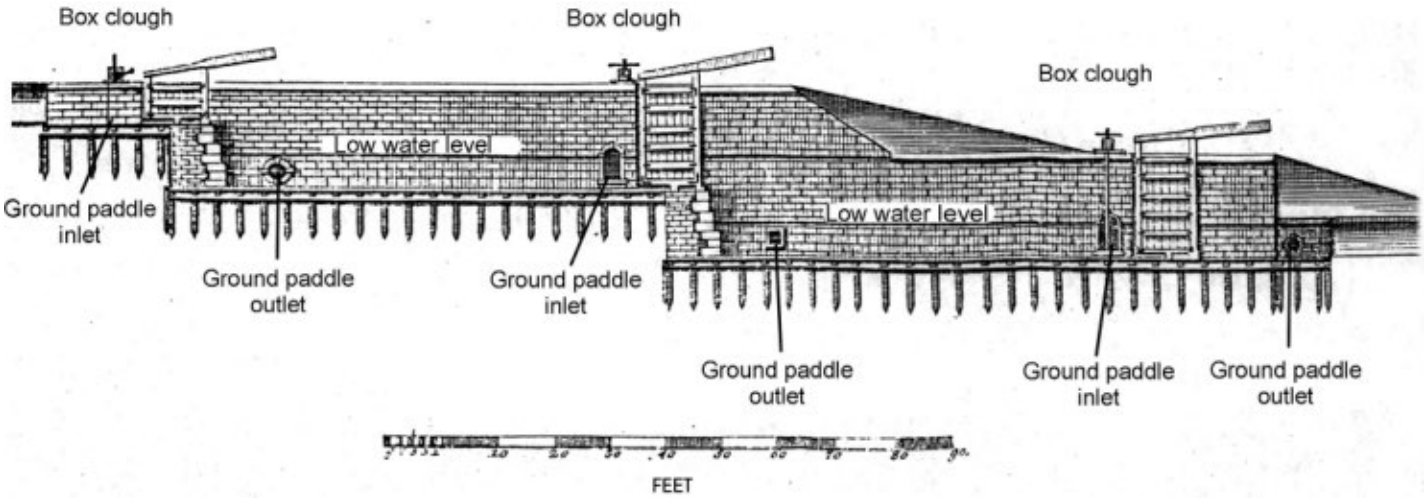
Having too much water, such as after heavy rainfall, can also be a problem in locks. The water level only needs to rise an inch or so for the water to flow over the top of the gates, and this too can cause problems for a full length boat working through the lock in either direction. Going downhill, it can become very wet for the steerer.

Lock chambers can also leak if water gets trapped behind the walls. This lock is at Wigan, where subsidence due to coal mining has caused many problems with lock structures. Today, concrete can be pumped into any spaces behind the wall to make the lock more structurally sound.

LOCKS

The locks built in the first phase of construction, in the 1770s, had wooden floors, with the stone lock sides built on top of a wooden foundation. Many of these lock floors have been replaced with concrete, though some are retained on listed locks.

The design of canal locks was improved over the years. These early locks had square entrances, as seen in the bottom photo of Forge Locks. The ground paddles were fitted to the front edge of the lock, where the square corners must have damaged boats as they entered the lock chamber. To overcome this problem, large pieces of timber were fitted which helped to guide a boat into the lock without striking a sharp corner. These can still be found on the locks between Leeds and Bingley, and at Appley Bridge in Lancashire, the earliest locks on the canal.

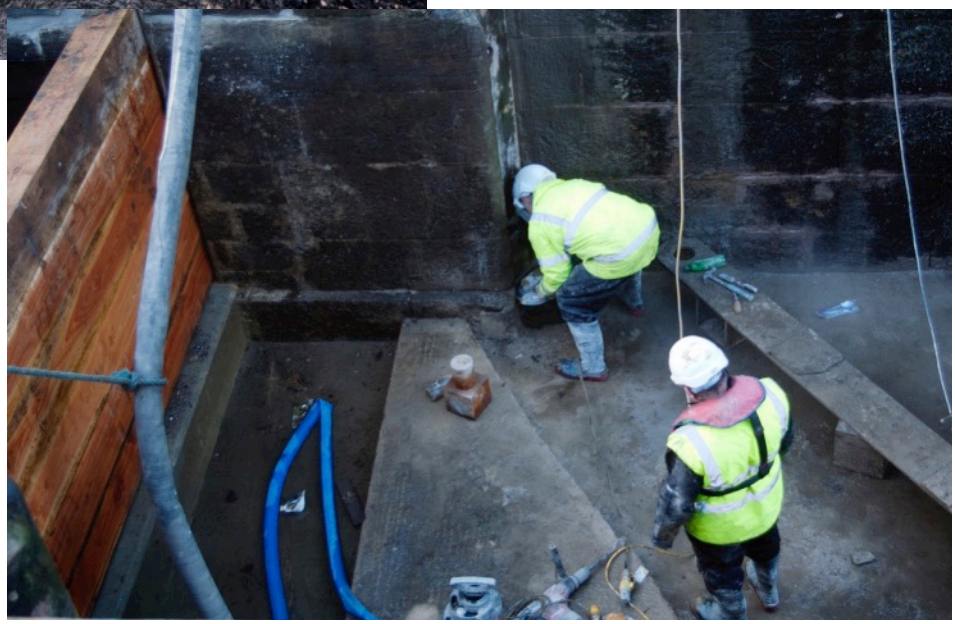


The drawing above was published in Germany in the 1780s, and shows a two-rise lock on the Leeds & Liverpool Canal as built on a wooden foundation. The wooden piles which formed the foundation were pushed into the ground by man-powered pile drivers, and the bottom photo is of a museum model showing how this was done, in this case for a bridge.

Manual pile driving continued to be used on the canal, as the 1953 photo on the right of Dobsons Locks at Apperley Bridge shows. They are putting a line of piles across the lowest end of the two-rise lock, probably to ensure that the sill, the wooden beams that the gates seal against, remains immovable.

By the 1790s, canal engineering had advanced, and the locks were built with stone inverts, the slightly curved stone floor forming the foundation. The lock at Blackburn, shown above left and built around 1810, is typical. On riser locks, as at Bingley 3-rise on the right, the upper chamber had a stone floor, while the lower ones were wood. The sill floor could be built of stone, though sometimes it continued to be made from timber, as shown below on one of the Yorkshire locks. The baulk of timber fitted across the lock is there to help stop rubbish from settling on the sill and spoiling how the gates seal.

The photo on the left shows a wooden sill being fitted. The gates press against the wood to form a watertight seal, the sill, which is bolted down, also resting at either end against the chamber walls to help withstand the water pressure.



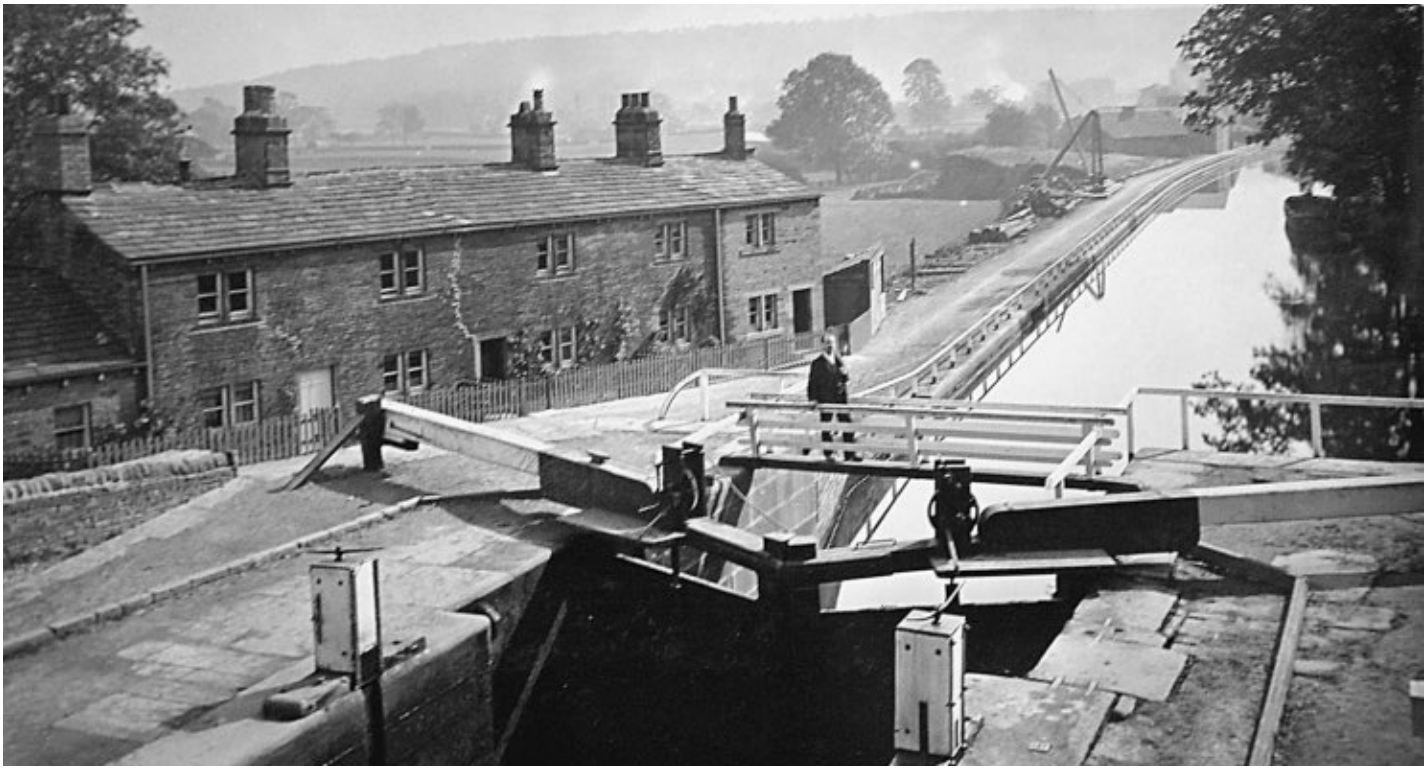
The gate swings on a pin fitted to it which sits in a bearing box. Here, the hole for the bearing box is being cleaned, with a new one sitting upside down on the stonework of the sill ready to be fitted. It has to be positioned accurately, such the the gate forms a seal in the quoin but can still be turned easily.

Working conditions can be very muddy, as this photo shows. Note the beam across the lock tail which is keeping the water out. This also serves to keep rubbish away from the sill when in use.

At one time, lock repairs were done in the summer, when the long days ensured that stoppages were not long. A gate would be replaced in a couple of days, though there was much preparation beforehand. Summer was also the best time as the coal trade was not as busy. Today, repairs have to be done in the winter as the canal is expected to be open for leisure use in the summer.

The edge of the gate swings against the 'quoin', curved stonework recessed into the side of the lock chanber. Over the years, this stonework can become damaged and leak, and today curved cast iron plates can be fitted to improve the seal. The seal should be against the 'nose' of the quoin, the rounded outer edge, and this should be straight and true, even if the curved recess is distorted or worn.

Gate anchors are used to hold the gate in place. The design of these has changed over the years, and two are shown here. The lower photo shows one of the early three-pronged designs, while the second photo shows a cast iron triangular pattern used in the second half of the 19th century. Other designs can be found, such as the modern welded pattern used more recently.



The gates, although basically similar, had variations in the balance beam depending upon where they were installed and which workshop built them. Old-style gates, they would last about thirty years, had 'piggy-backed' balance beams made of two pieces of timber, as above at Apperley Bridge.

At Bolton Road, Blackburn, the road bridge was widened and special cast iron quadrants had to be fitted to allow the gates to open.

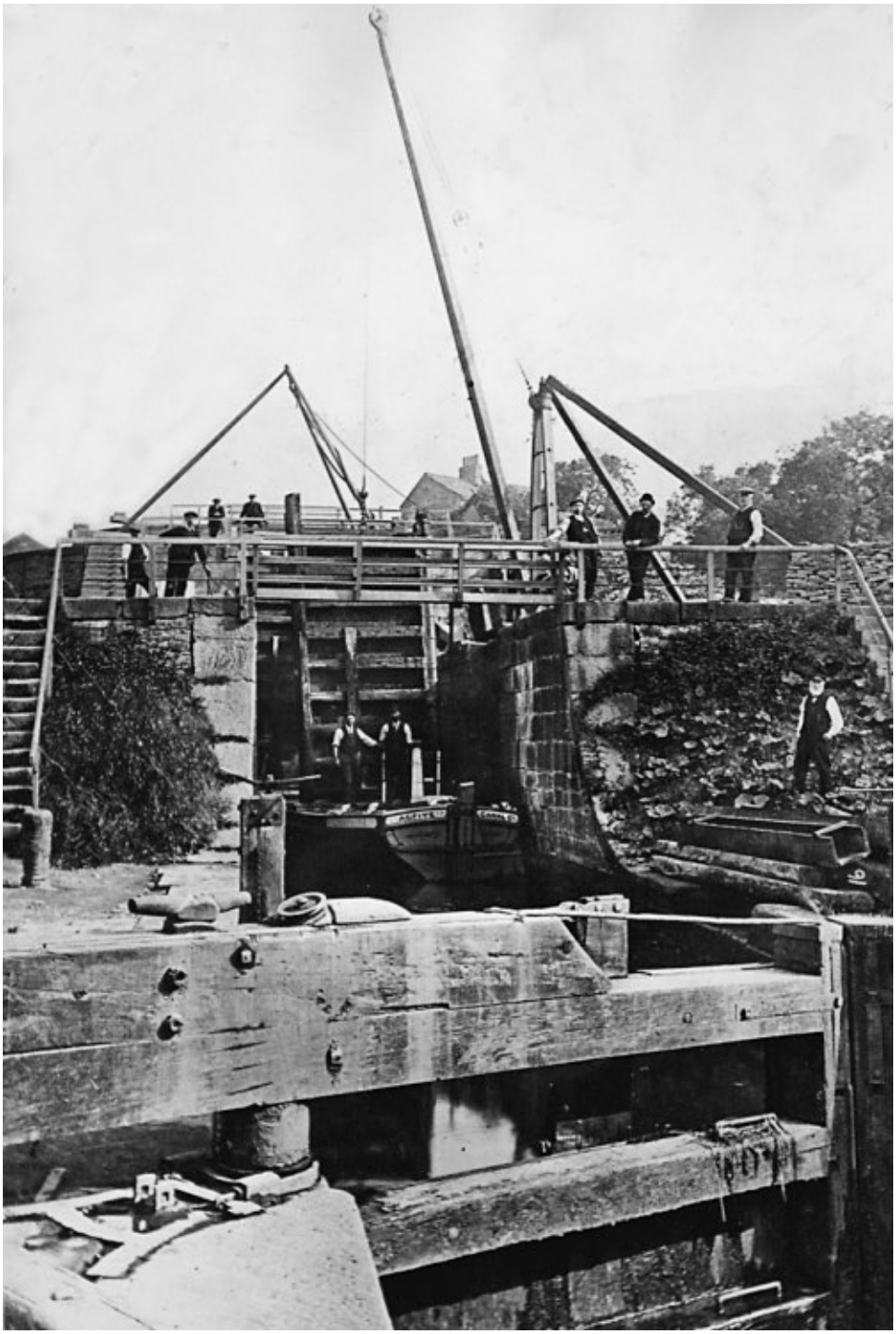
Wigan locks, the Top Lock is shown left, had a major problem with subsidence both varying the fall and distorting the chamber shape. Several locks had to have wooden strengthening fames fitted, as here, to ensure the mitre met correctly each time the lock was used.

LOCKS

This is Anchor Lock chamber wall during a major repair. The wall is mainly a single stone thick, so there is always a danger of leakage through the wall causing a problem. This photo shows the lower gate recess, where the stonework just below has been built stronger, as this is where the pressure from the gates acts. The force in line with the stonework is greater than that trying to push the walls outwards.

Bingley 5-rise, with a gate being replaced using sheer legs. There was a carpenters' yard at Bingley, seen here on the left, and new wooden swing bridges were certainly built on the ground on the right-hand side. The new gate may have been built here, or it could have been brought from Apperley Bridge on board the carpenters' boat seen below the locks. These boats were smaller than normal canal boats, being around 10 feet wide and forty feet long. They could easily carry a lock gate and were stable enough to provide a platform for working from when the lock was still in water. There were smaller 'flats', as seen in the foreground, but these were only used by men working on the locks or elsewhere, and they were not large enough for carrying objects.

Bingley 5-rise locks during gate repairs. A large derrick crane has been erected for lifting one of the bottom gates — they were taller than on conventional single locks, where sheer legs were used for lifting, as can be seen in the background, ready for use on the smaller top gates. The photo also shows the carpenters boat ***Active***, which could be making ready to load one of the larger gates. Note the lock gate furniture — the staples which allowed boatmen to climb up and down the gates, the pulley for the towline, and the cleat for holding a boat forward, away from the sill.

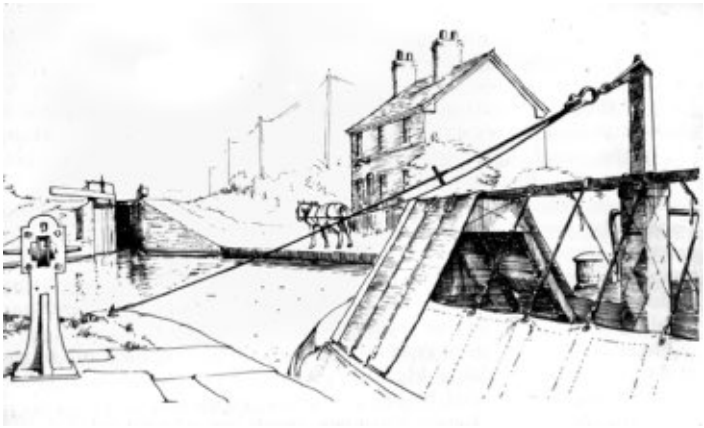


Lock wall repair was quite common, and in a few cases a date stone was added. This is a more typical repair, possibly to Kirkstall Lock. Note how some of the stones have been numbered to make refitting easier.

Horse-drawn boats entering a lock were stopped by a rope around a bollard. As it stopped, the boat would hit the side of the lock, and the damage caused can still be seen today.

Motor boats were also strapped into locks, as this was faster than using the reversing gear. Here, on Wigan Locks, the boat ***Wharfe*** has broken through the gates after the strapping rope broke. The gates have been pushed backwards in the wrong direction, and the boat is stuck as the gates have no recess when folded back this way. Mining subsidence causing the chamber to distort could have made this more likely to happen, but it was no a common occurance. Note the paddle gear on the gate, which has the counterbalance fitted when the paddles were enlarged to speed up traffic when railway competition began in the 1840s.

Very few of the 'starting pins' used to make it easier for horses to pull boats out of locks now survive, and the example on the right, at Barrowford, has now disappeared. They were always on the off side of the lock, and it is still possible to find where they have been cut off. The drawing below shows how they were used to create a 'double purchase' effect which halved the effort needed by a horse to start the boat out of a lock.



It is still possible to find rope marks from the days of horse boats, such as the groove on the cast iron ground paddle top here at Johnsons Hillock. When starting the boat out of the lock, the tow line was passed over the ground paddle and around the spindle such that it did not catch on anything. Few marks such as this remain, but there are still many to be found on stonework around locks and bridges.

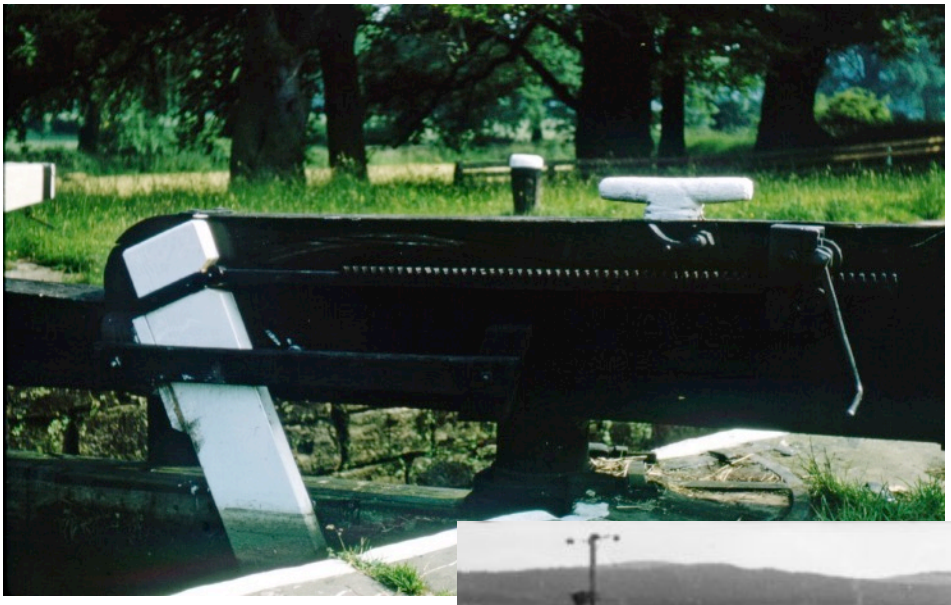
LOCKS

Four types of ground paddle used on the canal. Top left is ane up-and-over type, here on the Bank Newton locks. Top right is an open frame box paddle found on the Rufford branch. Bottom left is a sloping box paddle as found at Barrowford and Gargrave, with bottom right a vertical box paddle with brake lever used at Greenberfield.

Bingley 3-rise is one of the earliest locks, and they had box ground paddles set at right angles to the chamber. Wooden guide rails were fitted later to stop boats hitting the sharp corner at the lock entrance. Later locks had curved walls to guide boats into the chamber. The gate paddles are the old scissor pattern, operated by a rack and gear.

The ground paddle here, on the Rufford branch, has had a temporary repair after one of the wooden uprights had failed. The gate paddle is of the quadrant design using a gear operated pivotted lever to raise the paddle.

Box cloughs, as paddles were called on many northern waterways, had many different designs. In Yorkshire, as in the top photo, they were completely enclosed, while those in Lancashire often had open sides, as on the left at Johnsons Hillock Locks. The rack operated gate paddles were found everywhere on the canal.



A rack operated gate paddle on Anchor Lock at Gargrave, with a wooden cleat above which was used for holding boats forward in the lock and away from the sill.

Some gate paddles in Yorkshire, such as here at Gargrave, were called jack cloughs as the paddle was raised by a geared jack system.

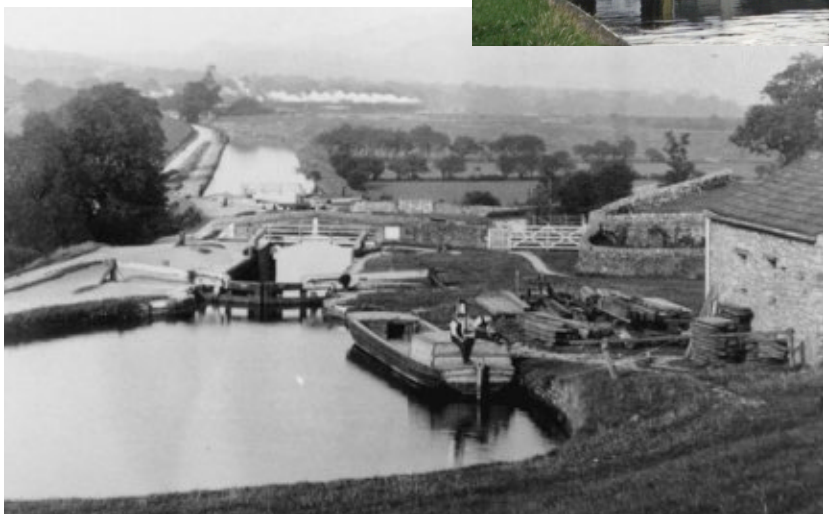
Lancashire jack cloughs, such as here at Poolstock, were slightly different, although both had to be worked from a platform fitted to the side of the gate. These are now considered dangerous, and none survive. The paddle opening size was increased in the 1850s to speed passage through the locks, and counter balances were provided to make them easier to operate.

For a short period around 1970 hyraulically operated gate paddles were fitted, but they were not very successful.

For maintaining the canal, workshops were provided at various points. The original workshop in Lancashire was at Briers Mill, near Burscough, seen on the right. The engineer for the westen end of the canal was based here for many years, and there were carpenters and blacksmiths shops on the right of the photo.

After the canal opened throughout in 1816, Wigan became an important centre, with workshops for maintaining the locks. The old carpenters shop, seen on the left, was once two storeys high, but the upper storey burnt down.

In East Lancashire, the main workshops were at Finsley Gate, Burnley, as seen on the right in 1972. As with other yards, there was a large sawmill for preparing timber.



Bank Newton and Gargrave locks were maintained by the workshop at Bank Newton, which also looked after Greenberfield locks and the canal as far as Skipton.

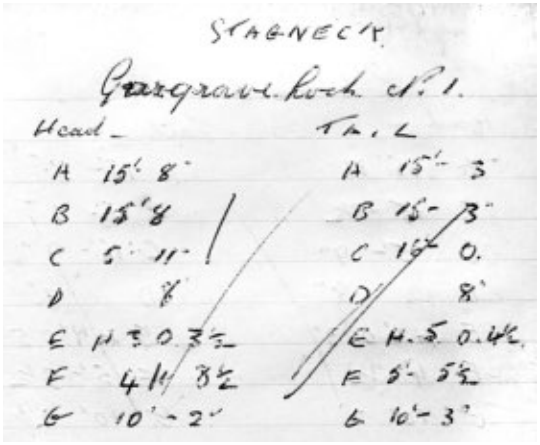
LOCKS

There was a carpenters shop at Bingley for maintaining the locks there, as well as the numerous swing bridges on the Skipton Pool. There was a crane at the bottom of the locks to serve the workshop, with swing bridges built on land opposite at the bottom of the locks. They were carried by boat to site for installation.

The main Yorkshire workshops were at Apperley Bridge, with the blacksmiths shop in the single storey building on the right. Lock gates were built in the wooden extension, and swing bridges built on the lock side on the left.

In the 1950s, new workshops were built at Wigan, where lock gates for all of the canals in the north west were made. There were also new slipways for maintaining the work boats.

Today, work has been centralised, and most of the lock gates used on the Leeds & Liverpool Canal are made at Stanley Ferry workshops on the Aire & Calder Navigation, near Wakefield.


STAGNECK

Gargrave Lock No. 1.

	Head	Tail
A	15' 8"	15'- 3"
B	15'8	15'- 3"
C	5' 11"	16' 0.
D	8'	8'
E	H 3 0 3/4	H. 5 0. 4½
F	4 11 3½	5'- 5½
G	10'- 2"	10'- 3"

There were no drawings for the lock gates, with each workshop having its own traditional design. All that was needed were the basic dimensions for a particular lock, such as the ones on the left for Stegneck, on the Gargrave flight. These gave the various widths (A & B) and height (C) necessary for making suitable gates.