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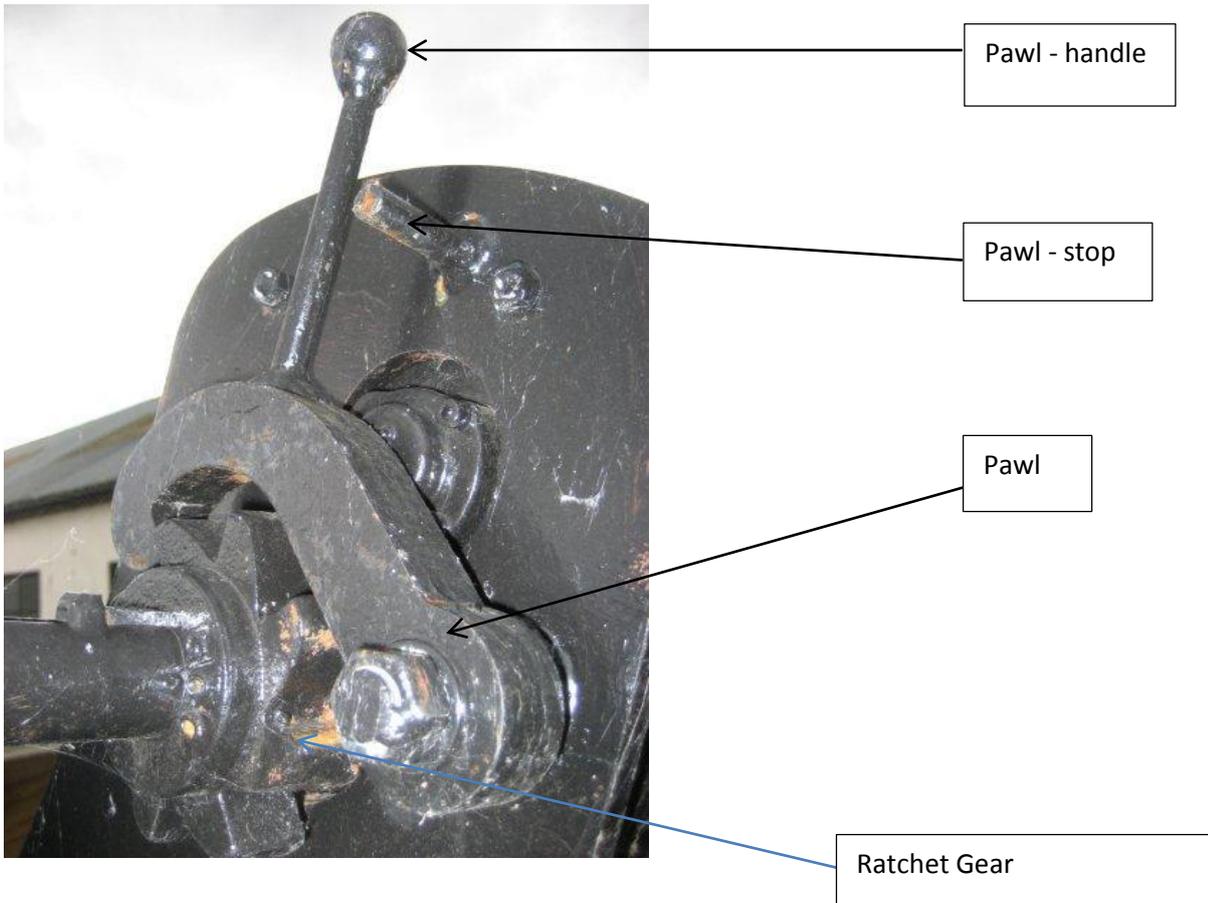
## PAWLS AND SPINDLES – NATIONAL PROJECT

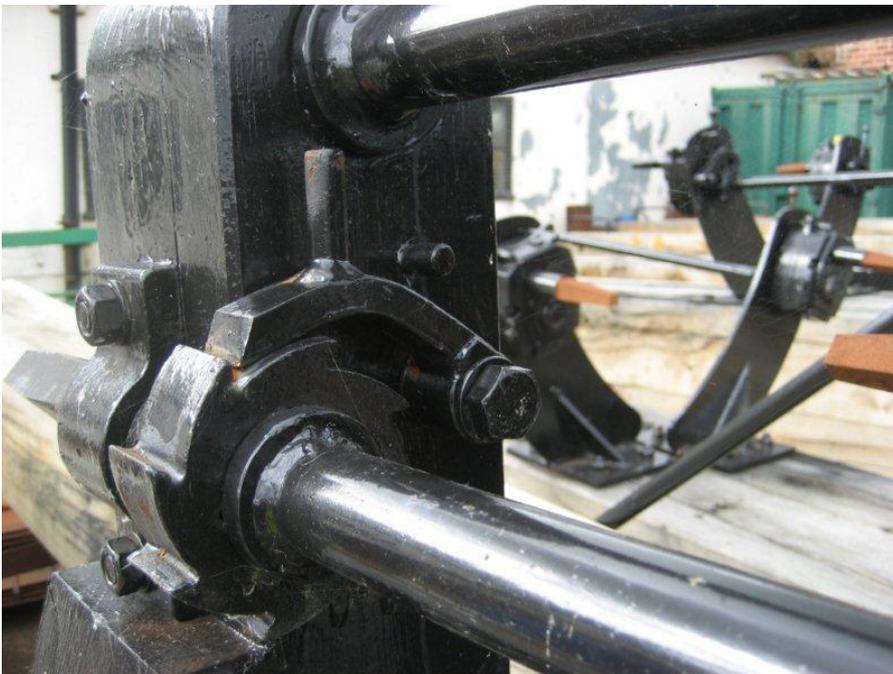
### Nature of Project

This project covers modifications to spindle and pawl components of lock paddle gearing and a small number of the same modifications at sluices and moving bridges.

### Pawl Catches:

Pawls are a safety component of lock gearing. The function of the component is to prevent the sudden drop of the paddle if grip on the operating windlass is lost and thereby preventing the uncontrolled back winding of the windlass that could cause a serious injury to the operator or persons nearby. The pawl will also provide some protection to the paddle and gearing from accidental damage during such instances. A pawl typically consists of a curved, hinged metal component and should be balanced to engage the ratchet gear, have a handle to prevent the user coming into contact with the ratchet gear. A pawl stop should be provided to prevent the pawl from being swung away from the ratchet gear without user intervention. There are several variations present on the canal network and the photographs below illustrate typical examples:





- Pawl catch stops: If pawl catch stops are not present, users frequently disengage the pawl catch therefore its fundamental safety function as described above will be absent.
- Pawl catch handles: If pawl catch handles are not present, users will have to grab the pawl close to the gearing (when lowering the paddle only) and put their fingers at risk of entrapment in the gearing.
- Unbalanced pawl catches may disengage the pawl catch, therefore the safety function as described above will not be effective. Pawl catches which are not weighted so that they naturally engage the teeth of the ratchet gear, will be ineffective.



The project seeks to identify those locations where the following defects are identified, and then to orchestrate the necessary works to ensure Pawls are effective and compliant with Minimum Safety Standards:

- Pawl missing altogether e.g. none present.
- Pawl without an effective stop e.g. if the pawl can be completely swung away from the ratchet gear.
- Pawl catch present but has no handle e.g. so users fingers have to be used in a dangerous way to operate the pawl.
- Unbalanced pawl e.g. a pawl is present but its balance means that it can disengage from the ratchet gear if not held manually in place.

There are currently in the region of 2507 notifications raised for such defects however on analysis several of these notifications relate to multiple defects and also to multiple locations. The total number of modifications required is approximately 4,359. The most frequent defects are for pawl handles and pawl stops.

### **Spindles:**

Spindles are the component of the lock gearing on which the windlass is slid and rotated to drive the gearing to lift and lower the paddle.

- Standard square spindles are either tapered or parallel.
- Tapered spindles are most commonly found on geared lock paddles.
- Parallel spindles are generally found on hydraulic powered locks and bridges.

The project seeks to identify the following defects:

- Spindles that are worn.
- Spindles that are non-complaint (min 10mm end distance to windlass)
- Spindles with weld cracks
- Spindles with protrusions present

There are 850 notifications raised for such defects.



Taper Spindle: Windlass can't be fully engaged on to spindle due to old inferior casting.



Taper Spindle: Windlass has minimal end distance which is less than 10mm required.



Taper Spindle – Unable to engage on to the spindle fully due to weld protrusions.



Square Spindle – Wear due to locking mechanism.



- Between 2007 and 2013 there have been 13 incidents recorded (ZQ's) relating to the use of a windlass.
- Injuries sustained are often to the hand, arm and face. It is probable that there are many more minor injuries sustained that are not reported to CRT.
- Maintaining effective pawls and spindles is an important factor in reducing the number incidents. User error may also be a contributing factor in these incidents. Incidents have resulted in legal claims for compensation and are therefore a cost to CRT.
- A project is being developed to rectify the problems identified.
- The project has been initiated by the Technical & Operations Director, Vince Moran and Head of Asset Management, Graham Holland.

**BCN Examples:**



Stewponey Lock – Ground Paddle Hammer Catch



Stewponey Lock – Gate Paddle with Pawl Catch



**Hatton GU Canal:**



'Ham & Baker' Paddle Gearing on the GU Canal, also known as 'Candlestick' paddles.

**Other examples:**



Trent Lock – Erewash Canal.



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Caen Hill Flight Ground Paddles – K&A



Caen Hill Flight – Reduction Boxes