



## LXIX. Improvement in the axis of large water-wheels, to prevent the gudgeon from getting loose in the shaft, or to repair it when damaged

Mr. Robert Hughes

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LXIX. *Improvement in the Axis of large Water-Wheels, to prevent the Gudgeon from getting loose in the Shaft, or to repair it when damaged.* By Mr. ROBERT HUGHES, of Ruabon, Denbighshire\*.

SIR,—I BEG leave to observe to you, that from the common mode in which the gudgeons, for cranes or water-wheels, are now fixed, they are liable to heat in working, and soon become loose; and by attempting to secure them with wedges, the shaft gets split, injured, and rendered useless.

To obviate such inconveniences, and even to repair an injured shaft, I have invented and practised a plan, which has perfectly succeeded, and of which I have sent a model to the Society.

Upon this plan, more firmness and security is given, without weakening the shaft by the deep mortices usually cut therein for fixing the gudgeons. My invention is also cheaper than the old method, in which the hoops alone cost about four guineas, and the cast-iron gudgeon 2*l.* 12*s.*; whereas on my plan the expense of the whole will only be 4*l.* 16*s.* If necessary, I will furnish certificates from persons who have made trial of my invention.

I am, sir,

Your humble servant,

Ruabon, Feb. 12, 1812.

ROBERT HUGHES.

To C. Taylor, M.D. Sec.

#### *Certificates.*

On the 14th of June, 1811, Robert Hughes, of Ruabon, instructed me in making a cast-hoop gudgeon, for a tumbling shaft of a large and powerful water-wheel for grinding clay for bricks, tiles, &c. which I have found to be a great improvement, as witness my hand this 3d day of October 1812.

Trefynant, Ruabon, Denbighshire.

THOMAS EVANS.

This is to certify, that Robert Hughes, of Ruabon, formed a new construction of gudgeons, for the shaft of a water-wheel he built for me, in the year 1806, which wheel is 28 feet diameter. These gudgeons took in the whole body of the shaft, and wedged the outside. I have not been put to any expense since the making thereof, nor am likely so to be until the shaft decays by time. In short, I cannot speak too much in his praise, with regard to his ingenuity and workmanship. Witness my hand, at the Pant Mill, August 20, 1812.

THOMAS MANLEY.

\* From *Transactions of the Society for the Encouragement of Arts, &c.* for 1813.—The Society's silver medal was voted to Mr. Hughes for this communication.

### 322 *Improvement on the Axis of large Water-Wheels.*

The wood shaft of a water-wheel, 18 feet diameter, was so worn and decayed at one end, by frequent putting in and wedging of the gudgeon, as to render a repetition of that process impracticable. Robert Hughes, in this difficulty, contrived a cast-iron gudgeon, with a hoop to it, which inclosed the end of the shaft; it was put on and fastened, and has worked steadily ever since. I am informed, that he puts the hoop gudgeon now on new shafts, and it seems to me a great improvement upon the gudgeons formerly in use.

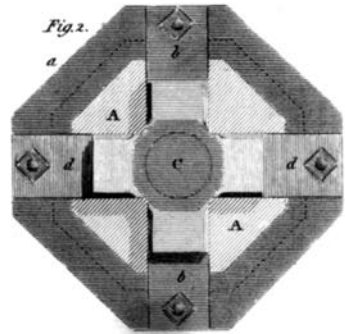
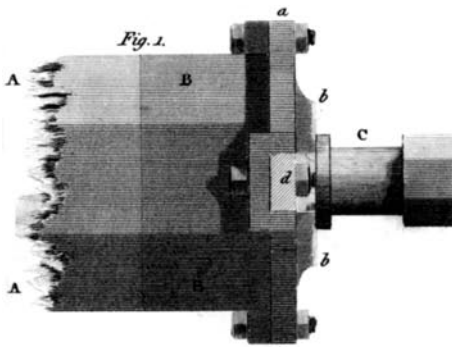
Ruthin, Sept. 14, 1812.

JOHN JONES.

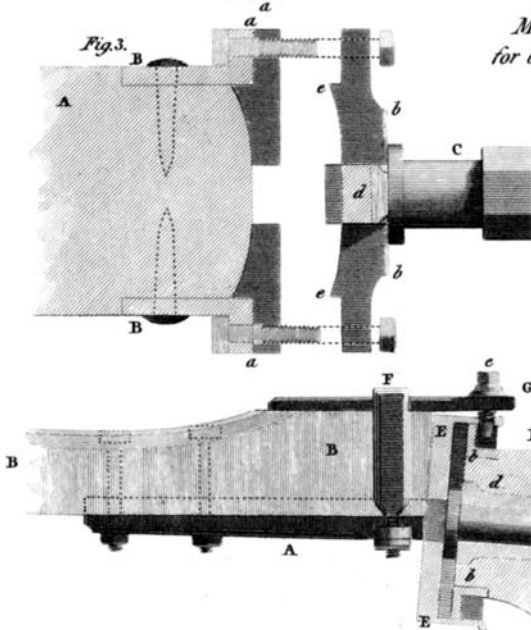
*Reference to the Engraving of Mr. ROBERT HUGHES's Method of fixing Pivots, or Gudgeons, into the Shaft or wooden Axis of a Water Wheel, which will prevent the Danger of their getting loose in the Shaft, and permit their being repaired when damaged.* Plate V. Fig. 1, 2, 3.

The ordinary method of fixing gudgeons into wooden shafts, is to have an iron cross, formed on the end of the gudgeon, which is let into the wood, to a considerable depth, and is held fast by small wedges, driven in round it, hoops being fitted round the outside of the shaft, to prevent the wedges splitting it. The defects of this method are, that the shaft is much weakened, by the cutting into it; and the constant strain of a heavy wheel, always acting in different directions, causes the wedges to become loose, and at length fall out; the failure of the gudgeon is frequently attended with more serious damage, for the wheel falling upon the bottom of the race, generally breaks the rim and buckets by its own weight.

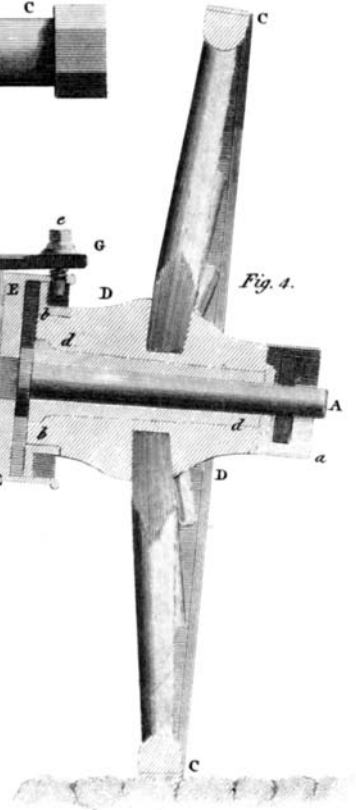
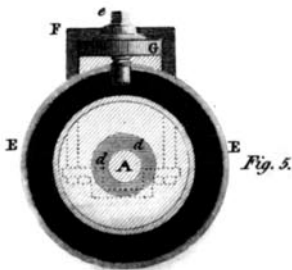
The improvement made by Mr. Hughes, consists in applying a cast-iron box to the end of the shaft, and to this the iron cross of the gudgeon is screwed, so as to fasten it more firmly than by the old method, and without weakening the wood by cutting it away. AA, fig. 1, of Plate V. represents a portion of the end of the wooden shaft, which is of an octagonal form, and has the water-wheel fixed upon it; it is long enough to reach across the pit, in which the wheel works, and having a gudgeon at each end, is supported and revolves upon them in proper bearings. BB is the cast-iron box, fitted fast upon the end of the shaft, and being wedged tight, preserves the wood from splitting as effectually as any hoops can do; upon the end of the box is a projecting flanch, aa, and in the face of this four grooves or notches are made, for the reception of the arms of the iron cross bb, dd, which is part of the gudgeon C, on which the shaft revolves; this cross is firmly attached to the box, by four screw bolts, which pass through the flanch, and also through the ends of the arms of the cross, having nuts screwed on the outside to make



*M<sup>r</sup>. R. Hughes's Gudgeon,  
for the Shaft of a Water Wheel.*



*M<sup>r</sup>. Padbury's Guard, for a Carriage Wheel.*



make all fast. The section, fig. 3, shows the cross *bb*, and box *BB*, separated, to explain the manner of fitting them together, the inside face of the cross having projections *ee*, which enter the end of the box, and keep the pivot in its true centre: thus the bolts have only to hold the gudgeons fast on the end of the box, the principal strain being taken off by this manner of fitting the cross into the box.

When the gudgeon of a wheel, fitted on this plan, becomes worn out, so as to require a new one, it can be removed, by taking off the four nuts, and a new one applied.

The cross and gudgeon, being of small dimensions, admit of its cylindrical part *C* being very conveniently turned in the lathe.

**LXX.** *Description of a Carriage-Wheel Guard, by which the Wheel is retained safe upon the Axis in case of the Linch-pin coming out.* By Mr. JOHN PADBURY, of Speenhamland\*.

SIR,—FROM a conviction of the good wishes which the Society, for which you act as Secretary, ever feel for ingenuity, in its various branches, I am induced to lay before you a plan of my invention, for the more effectually giving safety to the wheels of carriages, to prevent their breaking, or to avoid any mischief from loss of that very considerable support, the *Linch-pin*, on the dependence of which the lives and limbs of so many are continually exposed.

The plan I now offer for the investigation of the Society, is calculated to obviate the danger which may arise from such an accident; the great repute it has obtained, and the almost general application of it by the coach proprietors of the Bath and other roads, together with the prevention of many accidents since its adoption, will, I flatter myself, plead a sufficient apology for my offering it to your notice.

I am, sir,

Your obedient humble servant,

Speenhamland, Oct. 1812.

JOHN PADBURY.

*To C. Taylor, M.D. Sec.*

The following gentlemen, residing in this neighbourhood, have inspected the apparatus, and much approve of it. They have

\* From *Transactions of the Society for the Encouragement of Arts, &c.* for 1813.—The silver medal of the Society was voted to Mr Padbury for this communication.