WARWICKSHIRE
Industrial Archaeology Society
WIAS

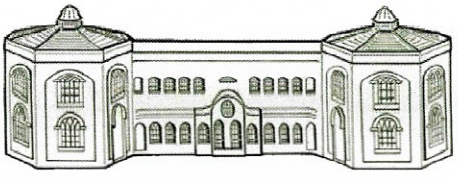
Occasional Paper No:6 February 2013

The Stone Pipe Company of Guiting Power Gloucestershire, 1805-1815

by
John Willock

SYNOPSIS

The history of the Stone Pipe Company is one of entrepreneurship, capitalism, technical innovation, volume production, business irregularity and finally, catastrophic product failure and bankruptcy. That all this activity was largely taking place in a rural Cotswold location, at the time of the Napoleonic wars, gives an added dimension to the story. The stone pipe story also further disproves the oft quoted saying attributed to Emperor Napoleon that, "...the English were a nation of shopkeepers...". This was no mere retailing venture but industrialisation on a large scale. Paradoxically, although the stone water pipe venture ended in ignominious product failure, the production engineering behind it was a triumph. Here then was, arguably, Britain's second automated factory. It is quite difficult now to comprehend how such frenetic industrial activity took place over a relatively short period of time, in a remote part of the Cotswolds, in the middle of a major European war. It is hoped that this paper will give a glimpse into this largely forgotten but nevertheless interesting piece of industrial history.



The history of the Stone Pipe Company is one of entrepreneurship, capitalism, technical innovation, volume production, business irregularity and finally, catastrophic product failure and bankruptcy. That all this activity was largely taking place in a rural Cotswold location, at the time of the Napoleonic wars gives an added dimension to the story. The stone pipe story also further disproves the oft quoted saying attributed to Emperor Napoleon that, "...the English were a nation of shopkeepers...". This was no mere retailing venture but industrialisation on a large scale and the enterprise could possibly qualify as the world's *second*, product-dedicated, automated production line.

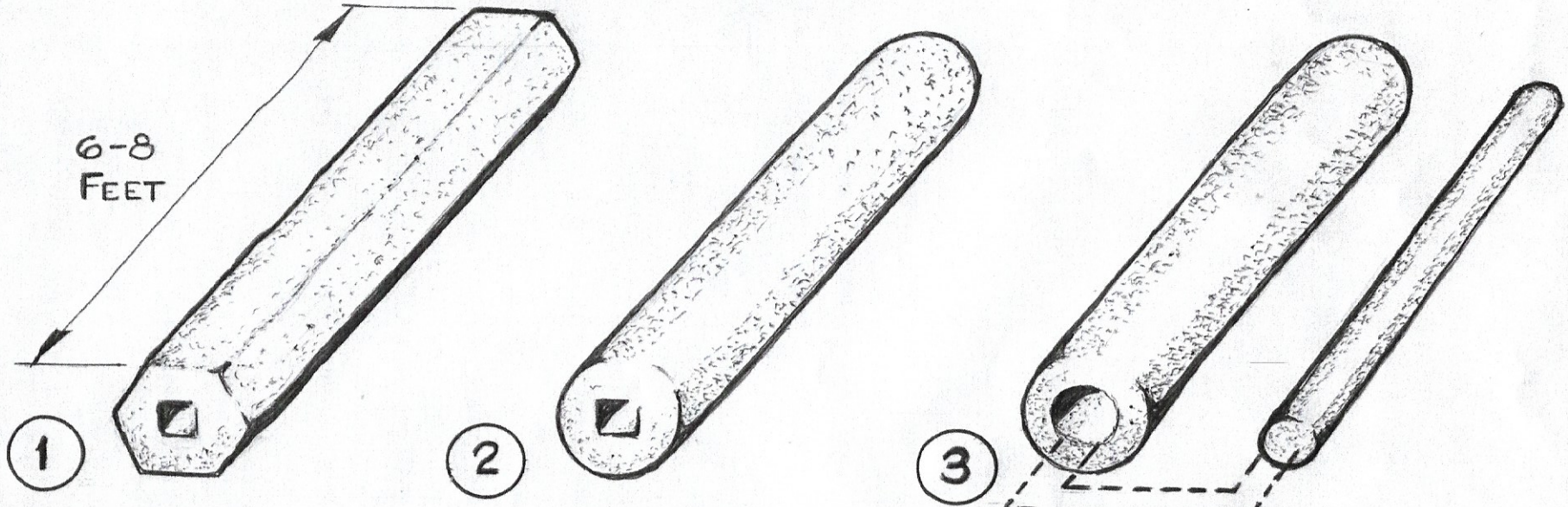
The Stone Pipe Company was set up to exploit a patent granted in 1805 to Sir George Wright, 2nd Bt., (d.1812) of Ray Lodge, Woodford, Essex, for "*Cutting Pillars or Tubes out of Solid Wood or Stone*". It was the intention of the company to manufacture and supply bored stone water pipes for Britain's larger cities. Traditional pipe materials such as elm, which had been used for centuries, leaked and had a relatively short life. Cast iron was expensive and degraded the water with rust. Therefore, there was a perceived need for an alternative material that could convey wholesome water in an efficient manner. Stone seemed to offer distinct advantages. Initially, the company used Portland stone from Dorset, but possibly, for reasons of expense and ease of manufacture, alternatives were soon considered. Eventually, a Limestone known as Inferior Oolite was selected. This material was sourced from quarries near Guiting Power, in Gloucestershire. Unfortunately, as events were to show, no one connected with the undertaking seems to have questioned the suitability of this type of stone for its designated task. It was, for example, 20% porous!

Known as "Tally-Ho," the quarry site was situated in an area called "Fox Hill", near the village of Guiting Power, about 8 miles to the East of Cheltenham. The stone processing works, which was to form a major part of the enterprise, was located near to the quarry to minimise transportation of the rough-hewn blocks. The works site can be found on ordnance survey map 163, at SP 093 236. It should be noted that the name "Fox Hill" does not appear on the ordnance survey map. A tributary of the River Windrush flows close to the site. This source of water was essential when the processing works was in operation. Water would have been required for boilers and steam engine condenser cisterns, as well as providing coolant for saws, boring machines and other cutting tools.

Apart from Sir George Wright, several other prominent personalities of the age were involved with the Stone Pipe Company. Perhaps the most notable of these were John Rennie (1761-1821), the civil engineer and William Murdoch (1754-1839), pioneer of gas lighting and right-hand-man to Messrs Boulton and Watt. The celebrated firm of Boulton and Watt also provided two 14 horse power rotary beam engines to power the stone processing machinery at the site.[1] In addition, Boulton and Watt may also have supplied the pipe boring machinery, although this is speculation on behalf of the writer and has not been established with any degree of certainty. It has also been suggested that James Watt Senior was consulted on the stone pipe project.[2] The writer cannot find, as yet, any written confirmatory evidence to this effect. However, it does not necessarily mean that Watt was not consulted and it went unrecorded!

The actual sequence of operations to produce a stone pipe was as follows. Stone was quarried in suitably sized blocks for the pipes being processed in the works. A variety of pipe sizes were manufactured in a stated range of diameters, 4.75" - 17.75" (120mm-450mm). However, examples of pipe have been discovered on the works site with a bore of about 2" (50mm) and smaller pipes than this may also have been produced. The standard length of pipe in contemporary accounts is stated as being between 6 and 8 feet (1830mm-

Sequence of Stone Pipe Manufacture.



1 Block sawn to length and hexagonal/octagonal section. Drive squares formed in ends.

2 Outside diameter turned on lathe using square for drive.

3 Bore of pipe trepanned, which results in a cylindrical core - if sufficiently large the core can be used for another pipe.

Fig. 1

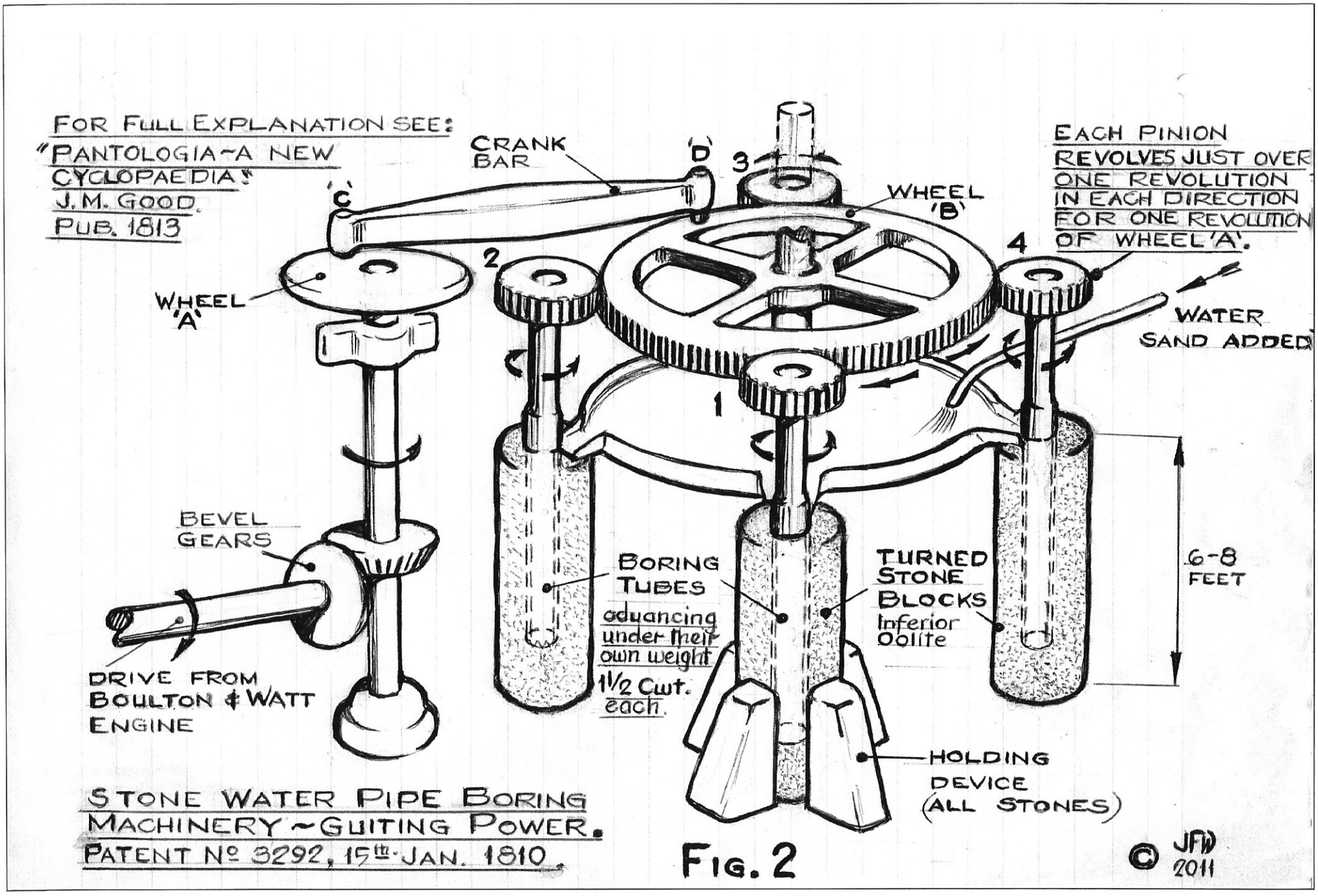
2438mm).[3] Other sources indicate a length of about a metre (39.37"). Nevertheless, irrespective of the actual dimensions, the block was cut to the required length and then formed by sawing into a pillar of hexagonal or octagonal section. A shallow square depression was then formed in the centre of one of the ends of the pillar. The square was necessary to provide a positive drive for the following operation. Fig. 1.1

For the next operation the hexagonal or octagonal pillar was positioned in a lathe, positive location being made at the headstock end by means of the square drive depression and at the tailstock end by some form of bearing, perhaps a centred wooden plug, to give support during the turning operation. After mounting in the lathe the pillar was turned on its outside diameter to form a cylinder, Fig. 1.2. The turning was probably performed using carbon steel lathe tools, with automatic feed and perhaps the addition of a supply of coolant water to extend the life of the cutting tools. Upon completion, the finished cylinder was removed from the lathe and placed in abeyance awaiting the boring operation.

The turned cylinder was then inserted vertically into the boring machine, along with another three similar units. Each cylinder was secured at its lower end by some form of gripping device or chuck. The trepanning tubes were positioned vertically on the ends of each of the cylinders to be bored and the machine started. Upon initiation, the machine proceeded to simultaneously bore the four cylinders automatically, the weight of the trepanning tubes providing their own downward feed. The boring action was not one continual unidirectional rotation, but a reciprocating bi-directional motion, with just over one revolution in each direction, the slotted trepanning tubes being driven by pinions and keys. To assist the cutting process, a mixture of sand and water was introduced to the cutting edge of the trepanning tool. In describing the trepanning process J.M. Good uses the word, "attrition," which is probably an excellent observation of what actually happened - both to the stones being cut and the cutting tools! The use of an abrasive slurry was apparently an important part of Patent No.3292, taken out on 15th January 1810, by William Murdoch.[4] Frequent re-edging of the trepanning tools, using grinding wheels, must have taken place in the company's workshops.

The trepanning cutting action, as envisaged in Sir George Wright's original patent, had two distinct features - it produced a bored cylindrical hole and a cylindrical column. Fig 1.3. If the cylindrical column was sufficiently large in diameter, it could be used as the basis for another, smaller pipe. The trepanning tubes, particularly those for the larger pipes, would have been very heavy. J. M.Good states that the weight of a 14" (355mm) diameter tube was about one and a half hundredweights (76 kg.).[5] This is obviously only a very nominal figure, as a 2" (50mm) diameter tube would have weighed very much less than a 17.75" (450mm) diameter tube. Whether additional weights were necessary to assist the feeding of the smaller diameter tubes is a matter of conjecture. How the waste from the boring operation was actually expelled during the process of cutting also requires some consideration. Perhaps the tubes had helical or even double helical (right and left handed spiral) slots cut along their working length or were perforated with holes? We know very little about these detailed but important technical parts of the process.

Boulton and Watt, through their agent John Rennie, were asked initially, in early January 1809, to supply "a 30 horse engine for the Stone Pipe Company". This order was modified, on 12 April 1809, to read "two (engines) of 15 horses each". Three days later, on 15 April 1809, the Stone Pipe Co. finally decided upon two 14 horse power engines. The engines were of 20.75" cylinder diameter and 4 foot stroke, double acting, with parallel motions and cast iron beams and connecting rods. The flywheels, of 15 feet diameter, were


FOR FULL EXPLANATION SEE:
"PANTOLOGIA~A NEW CYCLOPAEDIA"
J.M. GOOD.
PUB. 1813
CRANK BAR
'C'
'D'
3
WHEEL 'B'
EACH PINION REVOLVES JUST OVER ONE REVOLUTION IN EACH DIRECTION FOR ONE REVOLUTION OF WHEEL 'A'.
2
4
WHEEL 'A'
WATER SAND ADDED
1
BEVEL GEARS
BORING TUBES
advancing under their own weight
1½ Cwt. each.
TURNED STONE BLOCKS
Inferior Oolite
6-8 FEET
DRIVE FROM BOULTON & WATT ENGINE
HOLDING DEVICE (ALL STONES)
STONE WATER PIPE BORING MACHINERY ~ GUITING POWER.
PATENT Nº 3292, 15th JAN. 1810.
FIG. 2
© JFW 2011

Bored pipes in a dry stone wall at Guiting Power

Turned pipe showing drive square, in wall at Guiting Power

Partially trepanned pipe in wall at Guiting Power

Broken bored pipe & debris on "Tally-Ho" works site

fitted directly to the first motion shafts and cast iron spring beams were also specified.[6] In 1815, the Cheltenham Chronicle announced the auction of the Stone Pipe Company's assets. Unfortunately, the auction notice appears not to include a detailed inventory of the steam plant and manufacturing machinery on site at the time of closure.[7] It is just possible that some items were sold by private treaty. By 1830 one of the Stone Pipe engines was in the ownership of William Stanton and Sons of Stafford Mills, near Stroud.[8]

The two engines installed at "Tally Ho" would have been presented with quite arduous tasks; driving sawing machines, lathes, boring equipment, ancillary pumps and perhaps grinding wheels for cutting tool refurbishment. To meet the output figures detailed in a later paragraph, the engines would have been required to power multiple sets of machinery, the drive to them being supplied by a shaft that extended down the length of the works.[9] Although manufactories of the 19th Century were by their nature very dangerous places and the norm for that age, a particularly nasty accident is recorded as occurring at the Tally-Ho works in 1812. Apparently a man, William Cook by name, was working on the engine house roof when he inadvertently fell "... through a trapdoor, which had been carelessly left open..." on to the engine below. His death, by decapitation, was a particularly grisly end.[10]

The sawing equipment and lathes would probably have been quite standard units used in quarries etc., throughout the country. However, the boring machines would have been special purpose dedicated items, built by a specialist supplier. In the early 19th Century there were not too many specialist machine tool suppliers in existence and apart from Henry Maudslay & Co., the only other firm that comes to mind is Boulton and Watt. By 1809, Maudslay had completed his contract to supply Ships' Block Making Machinery to the Admiralty at Portsmouth, the world's first application of dedicated automatic and semi-automatic machines assembled in a production line, and could have been free to manufacture the stone pipe boring machines. However, when making the sketch of the boring machine from Good's description, Fig. 2, the writer was reminded of the superficial similarity with Boulton's automated screw coining presses at the Soho Mint.[11] Although the similarity is only very slight and the application totally different, there is still a hint of Boulton and Watt about it. It is known through Rennie's correspondence that Boulton and Watt definitely supplied some of the trepanning tubes to the Stone Pipe Company and that Murdoch held a patent for stone pipe boring.[12] Therefore, it follows that the Birmingham firm must have had, at the very least, a working knowledge of the machines themselves. A conjectural view of the stone processing works with one beam engine is shown in Fig. 3.

Professor Hugh Torrens, in a paper on the Stone Pipe Company read before an audience at Durham University, indicated that 30 tons of bored stone pipes were leaving the works per day.[13] This is a colossal figure by any standards. Even if this were 30 tons per week, it would still be a very large output. If production was actually taking place on this scale, it begs the question how the finished pipes were transported from the works to a port or navigable river, for onward transmission to the customer. A tramway extension of just over ll miles, from the existing Gloucester and Cheltenham Railway to "Fox Hill" was projected in 1811, but never gained parliamentary approval. Thus a tramway cannot have been the mode of transport.[14] It follows, therefore, that a very large number of horse-drawn wagons must have been employed. In this extremely hilly part of the Cotswolds, over 980 feet (300m) in places, heavily laden vehicles must have had a very destructive effect on the inadequate roads and provided carters and horses with many logistical problems. Newspaper articles of the period attest to this fact. The writer's personal view is that the output figure quoted above is extremely high and could not have been

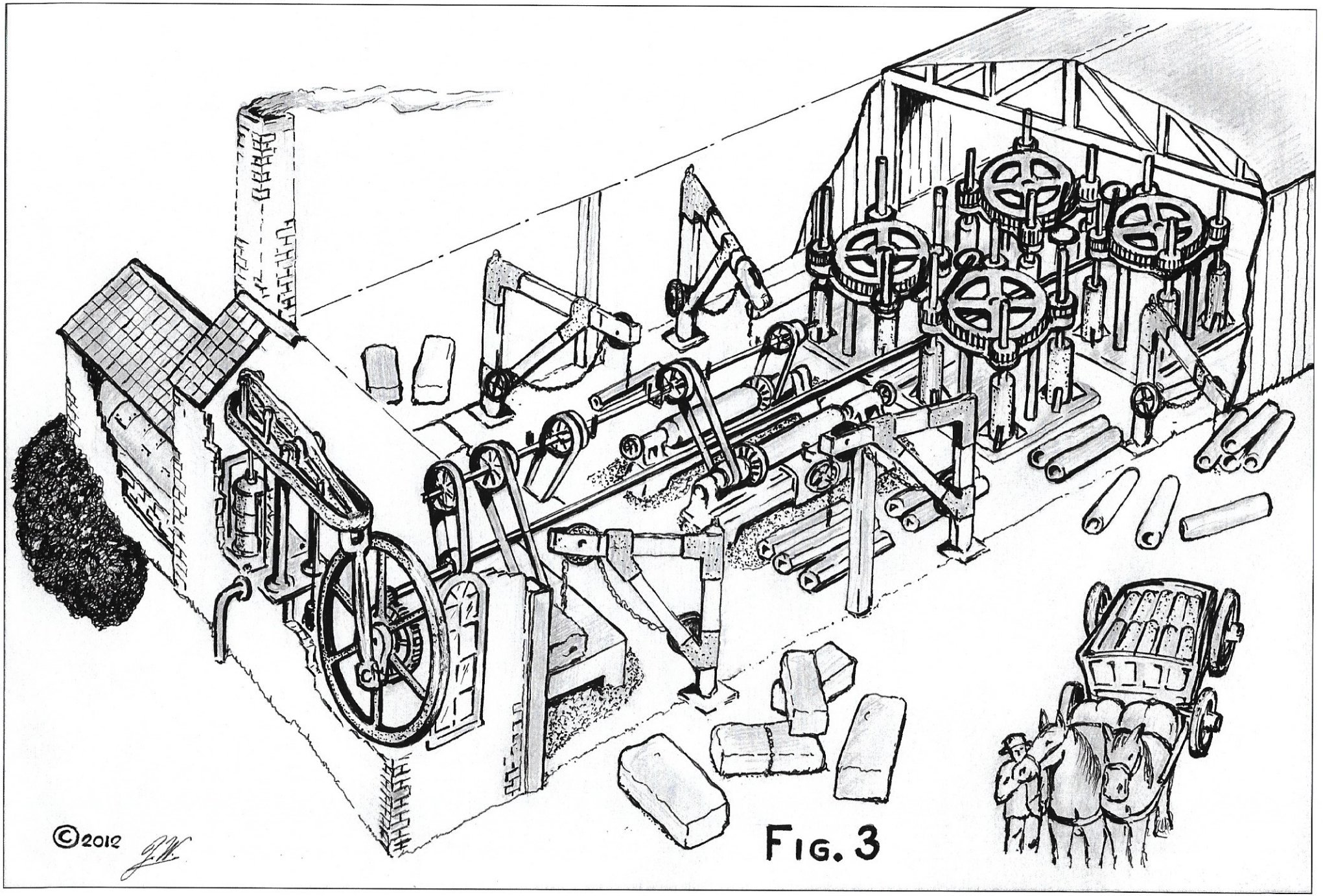


FIG. 3

sustained on a *regular* daily basis. Against this is the indisputable fact that very many thousands of pipes *were* dispatched from the works.

Several cities were involved in the stone pipe venture, including London, Manchester and Dublin. It has been much quoted that Manchester had by 1812 over 60 miles (96km) of stone pipes supplied and installed. If each of the pipes supplied to Manchester was nominally 6 feet in length, a simple computation indicates that nearly 53,000 pipes were manufactured for this contract alone. The extent of pipes supplied to London and Dublin is not known. Apparently trouble first started with a 3.5 mile (5.6km) section of pipe in London, in June or July, 1812. When the system was pressurised it began to leak, due to porosity and faulty joints. The pipes also burst because of insufficient strength. An elementary test for porosity and strength should have been carried out when Gloucestershire Inferior Oolite was first considered as a possible material by the Stone Pipe Company.

The company directors must have known by July 1812 that they had a major problem upon their hands. By then, however, the city of Manchester had a considerable network of installed pipework. It has been suggested, to conceal this deficiency, the pipes in Manchester were installed in disconnected sections, in order to avoid pressure testing until the very last possible moment. If this was actually the case it indicates that the directors were, at the very least, complicit in a cover up. It is also known that several directors of the Stone Pipe Company sat on the board of the Manchester and Salford Water Works Company. In August 1812, before pressurisation of the Manchester network had taken place, the Stone Pipe Company received £36,984 in payment. Events, however, were catching up with the company and in 1814 it had accumulated debts to the various Water Companies in excess of £81,000.[15] Bankruptcy followed in 1815.

In 1984-85 the "Tally-Ho" works site was excavated by The Gloucestershire Society for Industrial Archaeology. Apart from some evidence of brick walls delineating the outline of the building, a few hidden steps, mounds of rubbish and many discarded stone pipes, little was found. This is not at all surprising as the assets of the company were auctioned after bankruptcy in 1815. A few dry stone walls in the vicinity of Guiting Power and the "Tally-Ho" works site itself, still contain some evidence of stone pipe production. Pipes in all stages of the manufacturing process are there for the keen observer to see; one or two as hexagons, some turned on their outside diameter with occasionally a drive square in the centre and others with partially-formed blind holes.

Professor Torrens, in his paper delivered at Durham University, placed greater emphasis on the fact that the Stone Pipe Company had a "systems failure," to use modern parlance, rather than other aspects of the company's trading activities. It certainly had a gigantic "systems failure." Perhaps "business ineptitude" should also be included. Whether fraudulent intent was present in the company from the outset or developed as a consequence of product failure, at a later date, is open to conjecture. Professor Torrens further suggests that this technical failure heralded a significant turning point, resulting in the initiation of "systematic testing of engineering materials for a first time in these islands".[16]

Paradoxically, although the stone water pipe venture ended in ignominious *product* failure, the production engineering behind it was a triumph. Here then was, arguably, Britain's *second* automated factory. It is quite difficult now to comprehend how such frenetic industrial activity took place over a relatively short period of time, in a remote part of the Cotswolds, in the middle of a major European war. It is hoped that the foregoing narrative has given a glimpse into this largely forgotten but nevertheless interesting piece of industrial history.

I am indebted to Derek Billings, Peter Coulls, Martin Green, Mike Hurn and Arthur Astrop for their kind assistance in the preparation of this article and to Peter Chater for initiating this adventure into the history of the Stone Pipe Company of Guiting Power.

It should be noted that the "Tally Ho" quarry and works sites are on private land and should be regarded and respected as such.

Photographs: D Billings/P Coulls

Researched and Compiled By: J.F.Willock July, 2012.

References

1 Rennie, J., Letters to Boulton and Watt & Co. Jan. to April 1809. MS3147/3/311/12, Boulton and Watt Archives, Birmingham.

2 Torrens, Prof. H., Reflections on Water, Public Lecture - *The incredible Story of the Guiting Stone Pipe Company 1805-1815, and its operations in London, Manchester and Dublin.* Lecture paper delivered at Durham University, 18th November 2009.

3 Good, J.M., *Pantologia - A New Cyclopaedia*, 1813.

4 Griffiths, J. *The Third Man, The Life and Times of William Murdoch*, pp 309 Andre Deutsch, London, 1992.

5 Good, J.M., Ibid.

6 Boulton and Watt Archives, MS 3147/5/414.

7 Cheltenham Chronicle 1815. Quoted in The Gloucestershire Society for Industrial Archaeology, Newsletter No.13, February, 1969.

8 Boulton and Watt Archives, MS 3147/3/453126 and 4/93 (Engine Order Book No.7).

9 Good, J.M., Ibid.

10 Cheltenham Chronicle, 6 February, 1812. Quoted in Gloucestershire Society for Industrial Archaeology Newsletter, No 13, February, 1969.

11 Mason, S. (Ed.), *Matthew Boulton, "Selling What All The World Desires."* Tungate, S., *"Matthew Boulton's Mints"* pp. 82, Birmingham City Council and Yale University Press, New Haven and London, 2009.

12 Walker, J., Letter for John Rennie (London) to Boulton and Watt & Co. 3 Aug. 1809. *"Tubes for Boring Stones for Stone Pipe Co."* MS3147/3/311/23, Boulton and Watt Archives, Birmingham.

13 Torrens, Prof. H.,Ibid. Torrens may have obtained this figure from a letter published in the Cheltenham Chronicle or a reference quoted in The Gloucestershire Society for Industrial Archaeology, Newsletter, No.13, February, 1969.

14 Gloucester and Cheltenham Railway, Proposed Extension to Fox Hill dated 1811, Gloucester Record Office. Quoted in The Gloucestershire Society for Industrial Archaeology, Newsletter, No. 13, February, 1969.

15 Jackson, Dr. D., *The Stone Pipe Company (1806-1815) of Guiting Power,* Stow Times, Issue 98, March 2012.

16 Torrens, Prof. H., Ibid.

I am indebted to Derek Billings, Peter Coulls, Martin Green, Mike Hurn and Arthur Astrop for their kind assistance in the preparation of this article and to Peter Chater for initiating this adventure into the history of the Stone Pipe Company of Guiting Power.

It should be noted that the "Tally Ho" quarry and works sites are on private land and should be regarded and respected as such.

Photographs: D Billings/P Coulls

Researched and Compiled By: J.F.Willock July, 2012.

References

1 Rennie, J., Letters to Boulton and Watt & Co. Jan. to April 1809. MS3147/3/311/12, Boulton and Watt Archives, Birmingham.

2 Torrens, Prof. H., Reflections on Water, Public Lecture - *The incredible Story of the Guiting Stone Pipe Company 1805-1815, and its operations in London, Manchester and Dublin.* Lecture paper delivered at Durham University, 18th November 2009.

3 Good, J.M., *Pantologia - A New Cyclopaedia*, 1813.

4 Griffiths, J. *The Third Man, The Life and Times of William Murdoch*, pp 309 Andre Deutsch, London, 1992.

5 Good, J.M., Ibid.

6 Boulton and Watt Archives, MS 3147/5/414.

7 Cheltenham Chronicle 1815. Quoted in The Gloucestershire Society for Industrial Archaeology, Newsletter No.13, February, 1969.

8 Boulton and Watt Archives, MS 3147/3/453126 and 4/93 (Engine Order Book No.7).

9 Good, J.M., Ibid.

10 Cheltenham Chronicle, 6 February, 1812. Quoted in Gloucestershire Society for Industrial Archaeology Newsletter, No l3, February, 1969.

11 Mason, S. (Ed.), *Matthew Boulton, "Selling What All The World Desires."* Tungate, S., *"Matthew Boulton's Mints"* pp. 82, Birmingham City Council and Yale University Press, New Haven and London, 2009.

12 Walker, J., Letter for John Rennie (London) to Boulton and Watt & Co. 3 Aug. 1809. *"Tubes for Boring Stones for Stone Pipe Co."* MS3147/3/311/23, Boulton and Watt Archives, Birmingham.

13 Torrens, Prof. H.,Ibid. Torrens may have obtained this figure from a letter published in the Cheltenham Chronicle or a reference quoted in The Gloucestershire Society for Industrial Archaeology, Newsletter, No.13, February, 1969.

14 Gloucester and Cheltenham Railway, Proposed Extension to Fox Hill dated 1811, Gloucester Record Office. Quoted in The Gloucestershire Society for Industrial Archaeology, Newsletter, No. 13, February, 1969.

15 Jackson, Dr. D., *The Stone Pipe Company (1806-1815) of Guiting Power,* Stow Times, Issue 98, March 2012.

16 Torrens, Prof. H., Ibid.