

# WORLDWIDE WHEELWRIGHT

By Phillip Gregson  
Master Wheelwright  
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## INTRODUCTION

The demand for traditional wooden wheels, carts and alike has seen a massive decline since the turn of the 20<sup>th</sup> century and at times the skills have neared extinction. Fortunately small firms and enthusiasts in the UK managed to keep the skills alive and today there is a steady resurgence in demand enabling new wheelwrights to be trained and the skills to be carried onwards to the next generation.

There are many problems facing Wheelwrights in today's world, not only must they remain competitive but they must produce a viable and sound product that is 'fit for purpose'. This must be achieved despite out dated production methods and a shortage in the traditional construction materials.

A traditional British wooden wheel is made up of three main timbers, oak, ash and elm, all used for their specific abilities. Elm, traditionally used for the nave or 'hub' of the wheel is selected for its tough interlocking grain structure. Unfortunately the English elm tree is in short supply due to Dutch elm disease bringing the species close to extinction in the UK.

Not only is the supply of elm now dwindling but, both oak (used for spokes) and ash (used for the outer wooden sections known as felloes) in the UK are faced with similar diseases threatening them with the same fate.

One country that still has a thriving wheelwright industry is the USA. The States has always retained a passion for the 'Wild West' and being such a vast country there has remained a steady demand for the skills of the wheelwright. Coupled with the passion for retaining heritage both with museums and enthusiasts, the USA is a great resource for knowledge in the trade of wheelwrighting.

The American timber trade caters to a massive international market. With vast swathes of the country covered in trees it is also a great resource for alternative timber varieties and supplies to those currently used in the UK.



## AIMS

The Worldwide Wheelwright project aims to bring together the knowledge and skills of wheelwrights from the USA and to make that knowledge available for both current and future Wheelwrights in the UK. I intend to also use the project to spread the word about wheelwrighting and to help encourage future generations into the trade. As well as helping create a line of contact between wheelwrights both in the USA and the UK, to help enable future international discussion and cooperation.

The knowledge gathered and documented in this report is intended to assist with the issues faced by UK wheelwrights and to provide useful advice as to alternative production techniques and materials.

## OBJECTIVES

- To make contact with wheelwrights and associated tradesmen in the USA and Canada to ask their advice on the issues faced in the UK.
- To observe production techniques and materials employed by wheelwrights in the USA and Canada
- To work alongside other wheelwrights and tradesmen where possible to gain a greater understanding of the work and techniques they undertake.
- To discuss types of timber and the reliability of supplies in the USA.
- To visit museums throughout the USA and Canada to gain an understanding of the history of demand for wooden wheels, implements and vehicles.
- To present my findings in a report that is useful for both tradesmen and enthusiasts.

## ITINERARY

- **Colonial Williamsburg, Virginia** - visit and work alongside the Colonial Williamsburg wheelwrights.

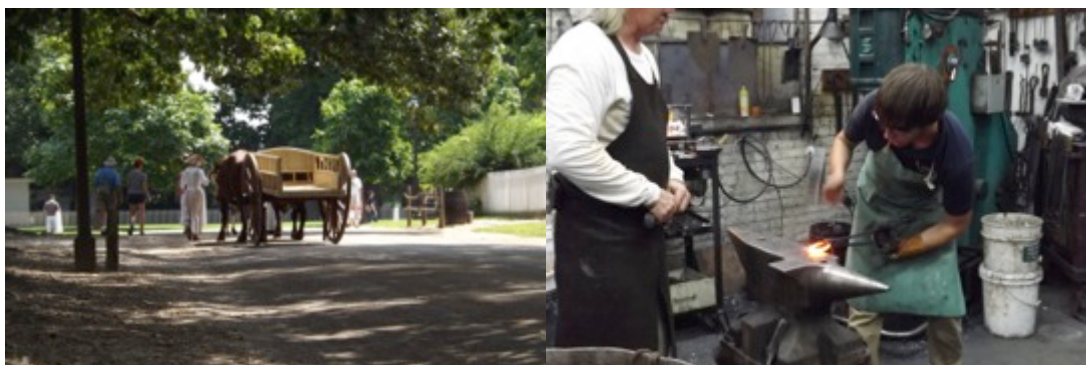
Colonial Williamsburg is an 18<sup>th</sup> century living history museum in Virginia. Known to be the largest museum of its kind in the northern hemisphere, it is home to some of the worlds finest craftsmen and women who not only work in period dress but perform their work true to the period.

- **Ohio**- the Stutzman Amish wheelwright's shop.

A last minute chance encounter grants me access to an Amish wheelwright's shop where they can produce as many as 200 wooden wheels in just two weeks.

- **Pennsylvania** - visit and work alongside blacksmith Jymm Hoffman.

An opportunity to work in a modern blacksmith's shop with Jymm Hoffman. Jymm regularly makes ironwork for historic cannons and re-enactment work.



- **Kentucky** - Harley Chandler's wheelwright's shop.

Harley Chandler's shop is a step back in time to a period when wheelwrighting was at its peak. Harley, despite being retired, still produces quality vehicles from scratch and has a fantastic collection of both machinery and hand tools designed specifically for wheel and wagon work.

Harley is a very interesting character with a great sense of humour, visiting his workshop was intriguing and it was great to hear ways he had adapted to different conditions.

Amongst all the stories he had to share I was most impressed by the way he had used corn cobs to fuel his hooping fires when he demonstrates wheelwrighting at a public event up north where there is very little wood to hand

- **Walnut Grove, Minnesota** - The Laura Ingalls Wilder museum.

Walnut Grove is famous for the writings of Laura Ingalls Wilder who documented the day-to-day life of a family living on the plains. Laura's writings and the museum give a fantastic insight into the challenges faced by settlers moving across the plains.

- **Mitchel, South Dakota** - Hansen's Wheel and Wagon works, Dakota Discovery Centre and blacksmith Clark Martinek.

Hansen's Wheel and Wagon works is world famous for its vehicles. Stunning stagecoaches and wagons roll out of their premises to be shipped all over the world. Having a reasonably large workforce and being located in a relatively resource-less area it is a great way to see how to keep up with demand despite shortages in materials.

The Dakota discovery centre houses a very interesting collection of artefacts related to living on the plains. Not only do they

believe in preserving artefacts but have a close working relationship with blacksmith Clark Martinek, who I had a brief opportunity to work alongside.

- **Journey Museum, Rapid City, South Dakota**

The Journey Museum boasts a great collection of artefacts from the area and a selection of horse-drawn vehicles to view.

- **Buffalo Bill Center of the West, Cody, Wyoming** – View collection of horsedrawn vehicles.
- **North West Carriage Museum, Washington State** – view collection and observe interactive displays.

The NWCM has a stunning collection of carriages from all over the world. Not only do they display their vehicles for people to look at but they have made their exhibit interactive. Some of the activities range from assembling a mock wooden wheel to dressing up in period costume and driving a mock up wagon and horse.

- **Remington Carriage Museum, Cardston, Alberta, Canada** - meet wheelwright, visit the buggy repair and wheelwright's shop.

The Remington Carriage Museum is by far one of the largest collections of horse-drawn vehicles I have ever seen. The vehicles range from fine carriages once ridden in by the Queen through to early Contestoga wagons. The jewel in the Remington's crown is it's working restoration and wheelwright's shop where they maintain vehicles for the collection and for outside custom.





## FINDINGS

### ALTERNATIVE TIMBERS

- Supplies of elm in the USA, especially towards the East coast, are still reasonably plentiful. Despite the steady spread of Dutch elm disease most wheelwrights in the east have access to enough stock for the next decade at least. There is the potential for importing elm into the UK from America although the sourcing and shipping costs would be considerable and therefore potentially un-viable.



Elm hub or Nave blanks being dressed ready for seasoning at Colonial Williamsburg. A tour of the timber drying loft stocked with elm was a big tease to me, I haven't seen such a beautiful stock of elm since I was a child in my families workshop back in the 1980's

- Black locust, commonly known as robinia or false acacia in the UK, has been used in the USA as a substitute for elm. Found growing across Europe, America, Canada, Asia, New Zealand and North Africa. It has very similar heartwood qualities to elm and is known for its resistance to rot. Rough, knotty and twisted sections of the

tree can be ideal for naves/hubs as the grain can twist and interlock, being the properties sought in a specimen piece of elm. For wheelwright's working in the UK there is the potential to buy in stocks of robinia on occasion from local sawmills or from Europe where it is used as a construction timber (South of France and Spain). Using a European source can be reasonably viable as it is cheap to buy as a construction timber, the distance for transport is less than that of timber from the USA and there are currently no import duties within the EU.

- In the case of wheels produced for outdoor 'static' displays the use of oak for hubs, spokes and felloes may be deemed suitable. The use of oak for all the parts would produce a longer lasting wheel that would be more resistant to rot and parasites. But this is not always suitable for normal wheels in use as oak doesn't absorb shock well and tends to split easily, short grain in felloes and through naves would tend to split apart during everyday use and abuse.



Oak hub or Nave blanks  
seasoning at Stutzman's  
Wheelwright's shop



Oak felloes for an outdoor display cannon being straked (fitted with iron tyre segments) at Colonial Williamsburg. Myself on the left assisting Journeyman Wheelwright Andrew DeLisle. Colonial Williamsburg has a fantastic approach to teaching and maintaining historic skills and it was a pleasure to work alongside such talented and dedicated individuals. Every aspect of their work is to period including their clothing that are also hand made.

- Lighter production wheels can be constructed with hickory in replacement of oak spokes. The use of hickory allows the spokes to be more pliable and easier to dog into position whilst fitting into continuous felloes such as steam bent or laminated. In some cases oak spokes can be hard to dog into position in steam bent felloes due to it's stiff and brittle nature. 'Ready made' spokes can be purchased from some suppliers in the USA, both in oak and hickory. They are produced to a reasonably high standard but the cost of importing may be prohibitive. Some timber importers do stock hickory in the UK and the price is comparable to American oak.
- In the case of display wheels, cheap yet stable timbers such as American white wood (tulip wood, poplar, aspen) and ash may be viable. The use of such substitutes would be ideal for interior display wheels such as chandeliers, tables or decorative displays. Such materials would not however be recommended for all parts on working wheels as ash spokes have a tendency to bend and follow dish, while ash naves split and rot easily when left outside for extended periods.



An impressive set of 6' chandelier wheels at Stutzman's Wheelwright's shop. Being produced for an interior fitting these wheels do not need to be made for strength and are therefore made from poplar.

- Steam bending of felloes is widely adopted in the USA, it is a practical way to reduce waste and improve the quality of felloes. By taking a straight length of timber and bending it the grain is kept intact, leaving no sections of 'short grain' which is found in cut out felloes. The usual waste associated with cut out felloes is no longer produced as the strips of timber for bending can be cut neatly and efficiently. Drying times for steam bent felloes can be dramatically reduced, the timber is machined and bent green then kiln dried. Green timber is much cheaper to buy than pre seasoned or kiln dried timber. Being a smaller cross section the kiln drying time and the distortion from drying are significantly reduced.



Steam bent Ash felloes in stock at Stutzman's Wheelwright's shop



## EQUIPMENT

- Investment in machinery for large batch production work is not always necessary but can prove profitable. The ability to produce larger batches of wheels of a uniformed nature has the potential to win tenders with companies that require large orders (for sales display carts as an example). Making large numbers of the same type of wheel by traditional methods would most likely be cost prohibitive to the customer unless they were being constructed in that nature for a specific purpose such as historical display use. Copying lathes, cutting jigs, spindle moulding jigs, tenoning machines and bending jigs can take a lot of time and investment to set up but they will produce large quantities of identical parts with vastly reduced man hours.



A view from Harley Chandler's Wheelwright's shop and a Variety woodworking machine from the 1800's specifically designed for wheelwrighting. Visible on this machine is a tonguing cutter for cutting round tenons on the outer end of spokes.

Harley is an interesting character, visiting his workshop was intriguing and it was great to hear ways he had adapted to different conditions. Amongst all the stories he had to share I was most impressed by the way he had used corn cobs to fuel his hooping fires when he demonstrates at a public event in an area with little wood to hand.



- Innovation and adaption of equipment to improve handling and construction practices is, I believe, another worthwhile venture. With less lifting and manual handling time can be saved and injuries avoided. Adjustable stands that tilt the wheel up from the ground for working on and sanding can prevent standing in awkward positions and avoid the need to lift wheels up onto high benches or stands. Extraction boxes whereby the wheel would be sat above a large extraction duct whilst being sanded reduces the amount of hazardous dust in the atmosphere and keeps the workshop dust free and tidy. Having hoisting equipment in place for handling large wheels and equipment also saves time and the risk of injury.



A ball vice system can be adapted to hold wheels during production and finishing. This system had been adapted for use in Hansen Wheel and wagon shop, it was great to see a reasonably modern workshop producing wheels and adapting up to date equipment to their needs. They also had an interesting spoke setter that could hydraulically reposition their spokes accurately as they are driven into the nave.

A home built steam bending machine at the Stutzman Wheelwright's shop. The Stutzman family build and maintain most of their equipment themselves making very sophisticated machinery that works perfectly to manufacture multiple articles.



- In the late 19<sup>th</sup> century wheelwrighting equipment was common and companies such as Dominion could provide machinery for every task in the wheelwright's shop. These machines, in most cases, became obsolete and would be scrapped as a result. It is worth paying attention to old machinery and making or adapting new machinery to copy the original processes. There are surviving specimens of these machines and drawings, pictures etc. They can save a great deal of time when setting up or improving a wheelwright's shop. In some cases machinery, tools and equipment can be left dormant in museum storerooms and collections, and there is in my opinion a shift towards putting 'antiques' to use. Cooperation with museums and organisations could grant you use of said equipment, often in return for public displays or interactions (where safe to do so).



Original equipment in use at the Remington museum. Blacker power hammer (left), tyre setter (front right), rubber wiring machine (back right)



Original axle shaping machine dated 1874 at the Stutzman Wheelwright's shop.



## BUSINESS ACUMEN

- Building up trade related stock to assist the business in raising income from a captive audience is quite possibly a worthwhile investment. Wheelwrighting, carriage driving and related books could be easily sold to customers who come to your shop to have their wheels repaired. Being known as a wheelwright can also bring enquiries for 'stock sized' display wheels eg to be stood in a garden or fixed onto a wall. These can be cheaply produced in batches in the knowledge that a traditional wheel would be too expensive for such a job. Wooden buckets, casks, traditional ropes, fittings, harness etc are all products that can be associated with the hobbies or work of your existing customer base (be it battle re-enactments, carriage driving, wild west re-enactors and alike), where possible take advantage of the captive custom.



Camp cooking utensils in stock at Hansen Wheel and Wagon works. Great to see a business adapted to cater for all aspects of their core customers needs. A 'one stop shop' so to speak.

Wooden storage casks in stock at Hansen Wheel and Wagon works.







Novelty wooden steering wheels and pram wheels in stock at Stutzman's Amish Wheelwright's shop.

- With trades such as wheelwrighting, affiliation with museums and organisations can help to support and assist income as well as spread the load with regards to paperwork and other responsibilities. In my experience most wheelwright's shops are small businesses often one-man bands or just a couple of employees. The day-to-day tasks of running any business can be a strain and massively reduce the amount of time the manager can spend on the shop floor actually producing saleable items. By affiliation with other organisations such as museums and trusts some of the load can be spread as these organisations tend to have staff that will specifically deal with the paperwork side of running the organisation. Granted, there will in some cases be paperwork generated by the public interaction side of the affiliation ie risk assessments and health and safety box ticking. Yet I believe a regular income from the organisation and the time saved by shared staff will allow more time on the shop floor in production. This in hand helps ensure the continuation of the skill not only by keeping the wheelwright in steady employment but also by spreading the word about the trade and hopefully encouraging future generations of wheelwrights.



Wheelwright's interpreting outside the Dean shop in Colonial Williamsburg. Including John Boag, (Master Wheelwright), Andrew DeLisle (journeyman) Paul Zelesnikar (journeyman). Assisted by Phill Gregson Master Wheelwright and volunteers.

A view inside the working buggy repair shop at the Remington Museum, Cardston, Alberta, Canada. A selection of the equipment on use in the shop is out of the museums collection and is being used and demonstrated to the public on a regular basis.



- It is important, in my belief, to establish links and communication with other wheelwrights enabling skills and knowledge to be shared. Wheelwright's are now so few and far between that we rarely compete with each other over work. It is far better to ask advice than to make massive costly mistakes with processes that you have not come across before. And as I have seen personally, it can be beneficial to pass details of other wheelwright's on to customers in their area, this then often reciprocates keeping custom reasonably local and easier to deal with. Organisations such as the Worshipful Company of Wheelwrights (London, UK) are a great way of keeping in touch, plus the use of social media to make and maintain contact with other wheelwrights.



## THE WORSHIPFUL COMPANY OF WHEELWRIGHTS

The Worshipful company of Wheelwright's was granted a Royal Charter on 3<sup>rd</sup> February 1670 by King Charles II and still thrives to this day facilitating the training of new apprentices and maintaining contact with working Wheelwrights.

- As I have seen in many of the museums I have visited history sells. Maintaining historic vehicles may be costly but if the vehicle has a good backstory it can be more desirable to a collector and therefore more valuable at the point of sale. Making the effort to trace a vehicles background is often worth the effort. Simple things like being used in a film or belonging to a member of the royal family or even being associated with a local business or town can help.



Part of the collection in the North West Carriage museum, some of which used in classic film productions such as 'Gone with the wind'



Mock up stagecoach used in a recent Jackie Chan film 'Rush hour' at the Remington Carriage museum.

## IN CONCLUSION

- I would say it is advisable to have an open-minded attitude to importing timbers from different areas where supplies are more prevalent. Some wheelwright's shops in the USA have to import timbers thousands of miles by road yet they are still thriving. The UK being a small island may lead to very insular attitudes towards importing timber. There are often suitable alternatives within reach, in some cases it may be just across the channel in France, Germany or Spain.
- Don't be afraid to adapt, it is important to maintain traditions and skills but this has to be backed by viability and a reasonable living wage.
- Investment not only in new equipment but in training new staff when possible will ensure the skills continue to flourish. Business expansion, when the workload allows, can help the business take on bigger tenders that can potentially be more profitable.
- Make efforts to get 'known' there is a very specific target audience for wheelwrights and the most successful companies seem to be the most well known be it through quality of product, a good website or good advertising. Relying on customers simply stumbling across your business is no longer viable, word of mouth is a great way of finding trade but increasingly now the word of Google<sup>®</sup> is king.



## WITH THANKS TO...

The Winston Churchill Memorial Trust – [www.wcmt.org.uk](http://www.wcmt.org.uk)

The Worshipful Company of Wheelwrights – [www.wheelwrights.org](http://www.wheelwrights.org)

The staff and volunteers of Colonial Williamsburg - [www.colonialwilliamsburg.com](http://www.colonialwilliamsburg.com)

Jymm Hoffman's Forge – [www.hoffmansforge.com](http://www.hoffmansforge.com)

Stutzman's Wheelwright's Shop

Harley Chandler's Wheelwright's Shop

The Laura Ingalls Wilder Museum - [www.walnutgrove.org](http://www.walnutgrove.org)

Hansen Wheel and wagon Shop – [www.hansenwheel.com](http://www.hansenwheel.com)

The Dakota Discovery Museum – [www.dakotadiscovery.com](http://www.dakotadiscovery.com)

Clark Martinek – [www.clarktheblacksmith.com](http://www.clarktheblacksmith.com)

The Journey Museum – [www.journeymuseum.org](http://www.journeymuseum.org)

Buffalo Bill Center of the West – [www.centerofthewest.org](http://www.centerofthewest.org)

The staff of the North West Carriage Museum – [www.nwcarriagemuseum.org](http://www.nwcarriagemuseum.org)

The Remington Carriage Museum – [www.history.alberta.ca/remington](http://www.history.alberta.ca/remington)

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