

Timber For the Wheelwright

The hub of the wheel was invariably made of elm, although poor quality ones were at times made of oak or ash. Elm was chosen due to its resistance to splitting, this being caused by its twisted grain. This made it particularly suitable for hubs, as these had to be able to withstand heavy hammering when the spokes were driven home. Elm was, unlike most common timbers, mainly a farm lands tree with little being grown in plantations. It was due also then to this wide distribution throughout Britain that it was used by wheelwrights.

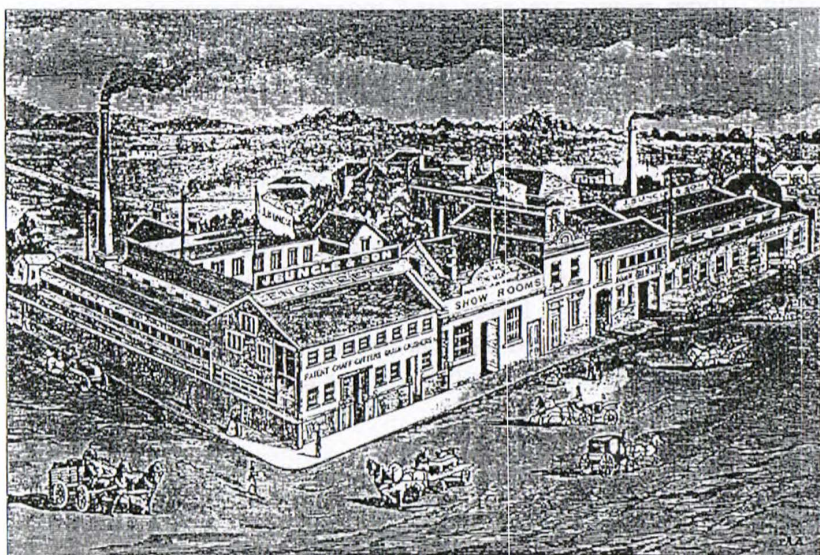
Ash is a tough and elastic wood but does not stand exposure to the elements well. Ash was used for felloes, shafts and frames of wagons. It was also lighter than oak.

Spokes were made of oak or hickory. It is noted in 'The Wheelwright's Trade' (John Thompson 1983) that the Westyres firm in Sydney supplied wheels with naves of ironbark and felloes of blue gum.

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METROPOLITAN MANUFACTURERS AND ARTIZANS.

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MESSES. J. MUNCE AND SON'S PARKSIDE IRON WORKS, NORTH MELBOURNE.

WHEEL MAKING

WOODEN WHEELS

HAND-MADE WHEELS

Types of Wheels.—There are several types of wheels in use for vehicles of every description, some wheels being made of wood and others of metal. The various methods of constructing the latter do not concern the woodworker, as their manufacture is a branch of engineering; hence, only wooden wheels will be dealt with in this Section. The type of wheel that is most widely used is known as the *plain English pattern*, which is suitable for vehicles of all classes, from the lightest to the heaviest. The *Warner wheel*, the *Star wheel*, and the *Sarven wheel* are modifications of the English pattern, and are used only for vehicles carrying light loads. What are termed *artillery wheels* were originally used for gun carriages and army transport wagons only; these wheels are now used extensively for motor cars also, as well as for heavy commercial vehicles.

ENGLISH-PATTERN WHEEL

Parts of Wheel.—A plain English-pattern wheel is illustrated in Fig. 1, the various parts of which it is composed being the hub *a*, which is also called the *stock* or *nave*; the spokes *b*; and the felloes *c*. The hub is made of oak or elm, the spokes of oak or hickory, and the felloes of ash. The latter form the rim of the wheel and are bound together by a tire *d* of wrought iron or steel. An iron hoop *e*, generally known as a stock hoop, is fitted

on the outer end, or *nose*, of the hub, a similar hoop being fitted on the inner or back end of the hub. The spokes are fitted into the hub with rectangular tenons, and the outer ends are fitted into the felloes with cylindrical tenons which are known as *tangs*. The wheelmaker is responsible for the construction of the wheel so far as the woodwork is concerned, but the tires and stock hoops are usually put on by the blacksmith.

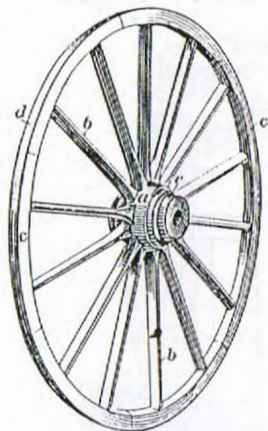


FIG. 1

the ends of the mortises into which the spokes are fitted. There is a hole *c*, about $1\frac{1}{2}$ inches in diameter, through the centre of the hub; this hole is subsequently rebored to suit the axle bush. The front end *d* and the back end *e* are turned down to receive the stock hoops. The appearance of the hub, when it has been mortised to receive the spokes, is shown in (b), in which it will be seen that the spokes are not in line with each other, but are staggered. The *front spokes* fit into the mortises *a''*; those fitted into *b''*, which are nearest to the body, are termed the *back spokes*.

Preparing the Hub.—A perspective view of the hub, as it is received by the wheelmaker, is shown in Fig. 2 (a). The gauge lines *a*, *a'*, and *b*, *b'*, indicate

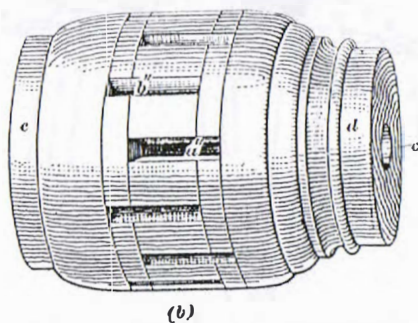
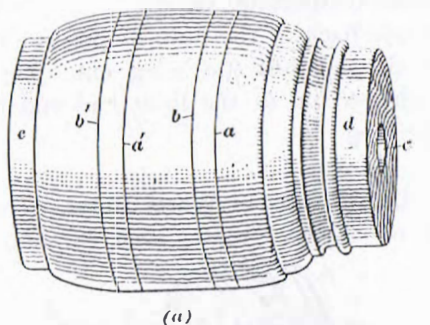


FIG. 2

The number of spokes in each wheel varies from 10 to 16, by even numbers, according to the size of the wheel; the mortises are marked off in the following manner. The centres of all the mortises are first set out on the front gauge line, marked *a* in Fig. 2 (*a*), and the sides of the tenons are marked on each side of the centre lines. The hub is next clamped down, as shown in Fig. 3, on a plate *a* having a level surface, and the mortises then marked off with a set-square *b*. Light stock hoops should now be fitted temporarily on the front and back of the hub, to prevent the latter from splitting while the mortises are being cut. The hole in the centre is also plugged up at the front end and the centre then marked on the plug.

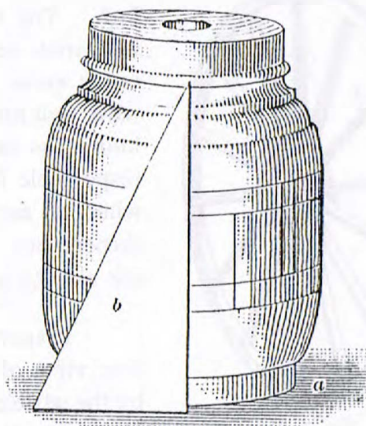


FIG. 3

Construction of Wheel Horse.—The hub is next clamped down on a wheel horse, such as shown in Fig. 4. This is a

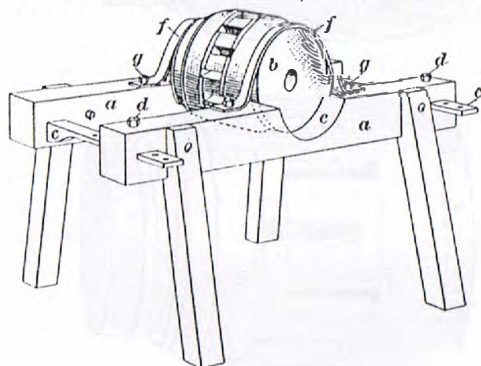


FIG. 4

trestle in which the distance between the sides *a* can be adjusted to suit the length of the hub *b*. The ends *c* are fixed into one of the sides and pass through mortises in the other side, where they are secured by the bolts *d*. The ends of the hub rest in hollows cut in the sides as at *e*, and the hub is held down by iron straps *f*, which fit over the temporary stock hoops

and are secured by bolts *g*. This device holds the hub firmly while the mortises are being cut.

Dished Wheels.—It is customary to fit the spokes of an English-pattern wheel in such a way that their outer ends incline toward the front of the hub, thus forming what is termed a dished wheel. The amount of dish, or inclination, usually given is about $\frac{1}{2}$ inch for the front spokes; the back spokes are inclined still more, so as to bring the outer ends of all the spokes in line with each other. In some cases the front spokes are fixed at right angles to the centre line of the hub, and only the back spokes are dished. Whichever method is adopted, the mortises in the hub must be cut so as to give the spokes the required inclination.

Design of Spokes.—The best spokes are made from cleft

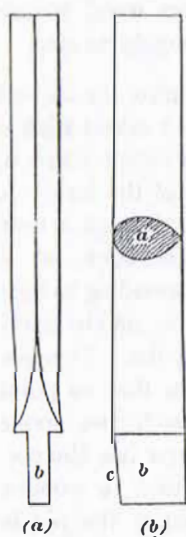


FIG. 6

wood; that is, they are split from selected straight-grained logs and are roughly dressed to shape with an axe. Sawed spokes generally have a certain amount of cross-grain in them, and pieces are liable to break off when the spokes are driven into the hub. The spokes are first squared up and the shoulders and tenons marked and cut, after which the spokes are dressed off to shape, as shown in Fig. 5, in which (*a*) is a front view and (*b*) a side view; the shape of the spoke in section is shown at *a*. The tenon *b* must fit tightly in the mortise from front to back, and to ensure this the tenon is made $\frac{1}{8}$ inch narrower at the bottom than at the shoulder; the taper is formed on the back only, at *c*, the mortise in the hub being made the same size as the bottom of the tenon. The tenon must not fit too tightly sidewise, or it will have a tendency to split the hub.

8. **Wheeler's Jarvis.**—For shaping spokes of a special design, or for use where machine-made spokes are not available, a tool similar to that shown in Fig. 6 is employed. This tool is used

in the same way as a spokeshave, the cutter *a* being fitted as in a plane and secured with a wedge *b*. The face *c* is hollowed out at right angles to the handles, the cutter being ground to the same curvature. To prevent unequal or excessive wear the face is covered with iron or gunmetal. The tool is generally known in the trade as a wheeler's jarvis.

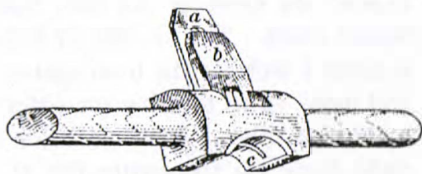


FIG. 6

Mortising the Hub.

In mortising the hub, as much wood as possible should be removed by boring out with a bit that is only slightly smaller than the thickness of the tenon. The front mortises *a*, Fig. 7, should be bored first, and then those at the back, *b*; the boring brace should be inclined so that the holes run toward each other at the bottom, as shown dotted at *c*. The surplus wood is now cut away with a chisel, and the mortises pared roughly to size.

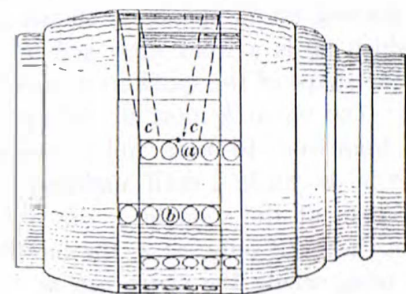


FIG. 7

Use of Wheel Stick.—The method of obtaining the correct inclination of the spokes is illustrated in Fig. 8. A wheel stick *a* is secured to the face of the hub by means of a coach screw *b*, which itself is screwed into a plug in the centre of the hub. A pin *c*, of square steel, pointed at the end, passes through a hole in the wheel stick, at a height corresponding to that of the shoulder on the outer end of the spoke. This pin is adjusted so that its point will just touch the spoke when the latter has the correct inclination; a wooden wedge *d* secures the pin in this position. The front ends of the mortises for the front

spokes are now pared down, and are then tested for accuracy by means of a straightedge *e*; this is held tightly against the end of the mortise by a chisel or some other sharp tool, as shown in the illustration. When the face of the straightedge just touches

the point of the pin, the hub is turned round so as to bring another front mortise on top, and this is treated in the same manner, the wheel stick being again brought into a vertical position for the purpose. After the front mortises have been dealt with, the back mortises are pared in the same way, the same straightedge being again used ;

but in this case there will be more inclination, as shown by the dotted outline *f*. The end of the straightedge that is put into the mortise is tapered, as shown.

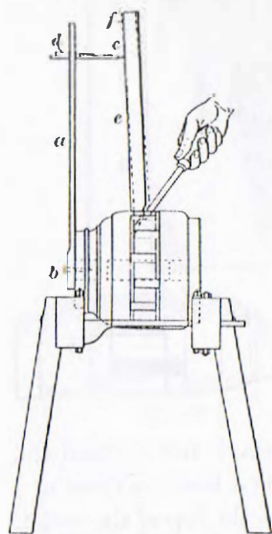


FIG. 8

The next operation consists in paring down the sides of the front mortises and driving in the front spokes, the back spokes being then fitted in the same manner. If the mortises have been pared out correctly, the face of each spoke will touch the point of the pin *c*, Fig. 8. The latter can now be driven a little farther through, so that it will act as a scribe and mark the position of the shoulder on each spoke.

Marking Off the Shoulders.—The shoulders at the outer ends of the spokes are marked off at right angles to the face of the wheel stick, and for this purpose a special wooden template, similar to that shown in Fig. 9, is required. The faces *a* and *b* are at right angles to *c*, and a recess, or groove, *d* is gouged out of one side to fit over the spoke. The template is held with the

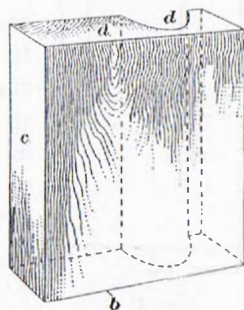


FIG. 9

face *c* against the wheel stick and with the groove *d* against one side of the spoke, the face *a* being level with the shoulder mark previously made on the front of the spoke. The shoulder is scribed on one side of the spoke from front to back; the template is then turned over with the face *b* uppermost, so that the shoulder can be scribed on the other side of the spoke.

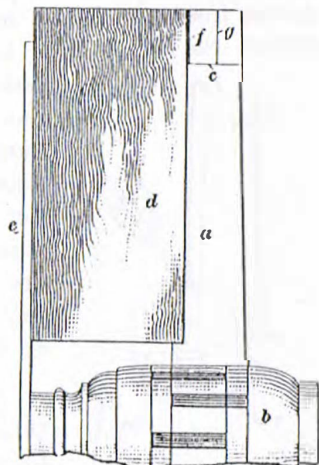
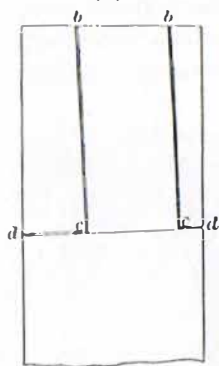


FIG. 10

Marking Off the Tangs.—The method of marking off the tangs is illustrated in Fig. 10, which shows a spoke *a* driven into the hub *b*. First, the approximate position of the tang is marked on the shoulder line *c*; then a piece of board *d* of the required width and having parallel edges, is held against the



(a)



(b)

FIG. 11

face of the stick *e*, while a line is scribed at *f* from the shoulder line to the top of the spoke. Another line *g*, representing the back of the tang, is scribed in the same manner; when all the spokes have been thus marked, the work of cutting and rounding the tangs can be proceeded with.

Cutting the Tangs.—The wheel stick can now be removed, and the spokes cut to the required length with a tenon saw; the ends of the tangs are then marked on each spoke with a pair of compasses, as illustrated in Fig. 11 (*a*), which shows the end of the spoke with the outline of the tang *a* marked on it. The centre of the tang is not coincident with the centre of the spoke, the front of the tang usually being from $\frac{1}{4}$ to $\frac{3}{8}$ inch from the front of the spoke, according to the size of the wheel. The wood round the tang is removed by sawing