WOODEN CAR BODY & FRAME CONSTRUCTION & RESTORATION©

by James Vetrano

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INTRODUCTION

In the early years of automobile manufacture, cars were constructed much like the preceding carriages. First, a wooden body was manufactured. Then that was covered with sheet metal. The assembly was then bolted to the chassis. That worked well until about 1931. The exact year depends on the make and model. At that time all the manufacturers switched to steel-framed bodies and then eventually to unibodies. Steel-framed bodies were cheaper to build, stronger and more rigid.

When cars with wooden bodies were stored indoors for their lifetimes the wood usually survived in quite good condition, (so-called barn finds). If these worn-out cars escaped the scrap-metal drives of WWII, they were often abandoned to junk yards or open fields. This pretty much doomed the car. Rain and snow pouring into the open cars destroyed the upholstery and then went to work on the wood, eventually rotting it all out. The closed cars suffered similarly. Their only protection was a cloth insert top (steel tops did not come about until about 1935). The insert quickly developed leaks, exposing the interior and wood frame to the same fate as the open cars.

Restoring a rotted-out wood-bodied car is a challenge many restorers are unwilling to undertake. Steel-bodied cars can be brought back a lot easier with mechanical updating, body work, upholstery, and paint. But what can you do with a pile of sheet metal and rotted-out wood needing to be put back together before the usual restoration even begins? This dilemma left many such cars still decaying in the open. Some of these abandoned wrecks are rare and valuable cars. They just need a new body. It would be tragic to part them out or scrap them. They can be restored to original condition. The series of articles to follow will take you step by step through wood car body restoration in hopes that it will give you the courage to tackle one of these abandoned wrecks. Introductory articles will cover wood selection, tools, joinery, and such. Subsequent articles take you through the actual restoration of a 1925 Jewett two door sedan. The series will conclude with a quick look at a 1931 Chrysler roadster and a 1931 Buick doctor's coupe to give you a feeling for alternate body styles.

CHOICE OF WOOD

One of the first questions asked in setting out on an antique car body construction project is: "What type of wood shall I use?" The principal qualities to look for in this application are strength, lightness, flexibility, and dimensional stability. In the early days of the automobile industry, the body builders asked themselves this question and decided on ash as the best choice. Current restorers sometimes use oak, but it is not an optimal choice. Oak has an attractive grain, it is hard, and it takes a finish nicely. Use it for the bed flooring of a pick-up, but not as a structural body member. For the body, use ash.

Here are some of the reasons why: Ash is lighter than oak. It has a specific gravity (density compared to water) of 0.6 while red oak is 0.63 and white oak is 0.68.

Ash has a greater flexibility under load than oak. In other words it gives more under impact loads without breaking. That is why it is used almost exclusively in baseball bats, hammer handles, and pick-axe handles.

Finally, ash has better dimensional stability than oak. The physical properties of wood vary

with grain direction. See FIG. 1. In wood, dimensional stability (degree of expansion or contraction with moisture variations) is extremely directional dependent. All woods have a higher tangential expansion then radial or longitudinal. Furniture builders allow for this expansion in building table tops or cabinet doors from edge-joined boards. The assemblies cannot be constrained in the furniture, but must be allowed to float. I have seen an oak conference table top split and warped under seasonal moisture changes when the builder/designer did not allow for tangential expansion. If the difference in the expansion in the three planes is large, a single board can warp. For example, with a large discrepancy between tangential and radial expansion, a board can cup with changes in moisture. See FIG. 2.

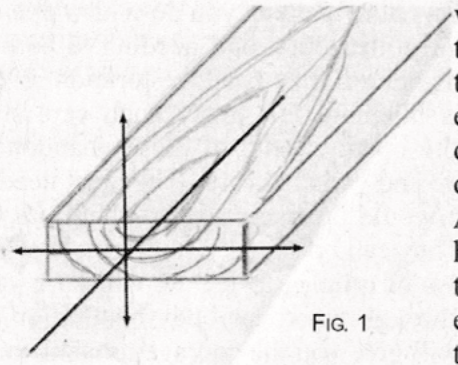


FIG. 1

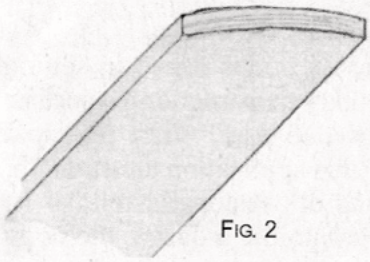


FIG. 2

Table1 compares the expansion of oak and ash. It shows that ash, with a smaller ratio of tangential to radial expansion, is more stable.

Table1. Moisture caused expansion in three planes

	Red Oak	White Oak	Ash
Tangential expansion	8.9%	10.5%	7.8%
Radial expansion	4.2%	5.6%	4.9%
Ratio tangential/ radial expansion	2.12	1.88	1.59

SELECTING YOUR LUMBER

Having decided (hopefully) that you are going to use ash for your project, where can you get it? First of all, do not expect to find what you want in you local home products store. It may carry some ash boards, but in limited thicknesses and only in SFS (surfaced four sides) grade. This is the most expensive grade available, and not even what you want. For auto body building you will need to resurface your boards anyway to get the thicknesses you may want. You need to go to a commercial hardwood supplier. I use Specialty Forest Products in western Washington State. I have to travel 400-mile round trip to pick up a load, but I can be home for supper. Shipping can be expensive.

Sawmills reduce trees to lumber by rough-sawing off slabs of varying thicknesses almost always in multiples of a quarter of an inch, typically 1, 1¼, 2 etc. The length and width depend on the log. Lumber is sold in sizes corresponding to this rough-cut thickness (we all know a 2"x4" is not 2 inches by 4 inches). Sawmills designate thickness by the number of ¼ inch increments, so that a 4/4 board has been rough-sawn to 1 inch, a 5/4 board to 1¼ inch, etc. The sawmill-cut surface is pretty coarse and the edges are not perfectly straight. The mill can then plane a 1-inch rough-cut board smooth to ¾ inch and even up the edges. This is what you buy in the local building supply yard as a 1-inch SFS board.

What you want to buy for your project is one step up in the process from a rough-cut plank. It is called H&M grade. (That stands for hit and miss.) It has had one quick pass through the planer, leaving a surface that has alternating areas of clean and rough spots and is still quite near the rough-cut thickness. The boards are usually pretty flat in this condition since the planing has eliminated any cup condition. Its edges are not perfectly straight and clean.

Now that you have decided to order some H&M grade ash for your project, you need to come to the least exact step in the process - figuring out how much lumber to order and in what thickness. The only advice I can give is to look over the existing (probably rotted) wood in your car and list what you will need by thickness. The sills will probably be about 8/4 and the door pillars 5/4 or 6/4. You just need to measure, taking into account that when you surface-plane these to final dimension, you will probably be taking off about ¼ inch. When you

have the thickness issue sorted out, you need to estimate board feet required of each thickness. Suppliers sell by the board foot. A 1 inch by 1 foot by 1 foot board is one board foot. You need to be pretty generous in your estimates because you cannot be sure of the width or length of the boards you will get (although if you absolutely need an extra-wide board, the supplier can probably accommodate you). After making a generous estimate, I usually double it. You may be able to estimate it more closely but, I do not want to come up short and be faced with a return trip to the supplier. Also, in my case I build a lot of furniture and some left-over boards on one job can be used on another.

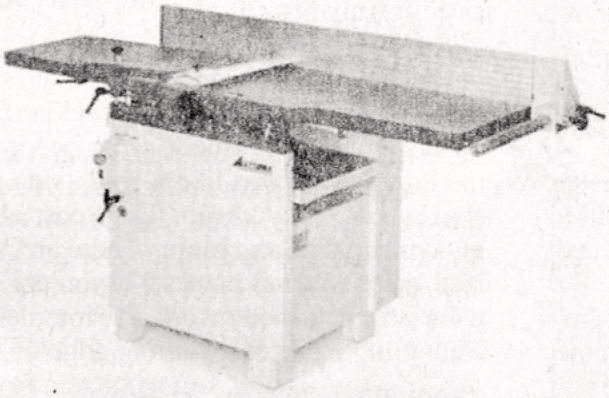
TOOLS

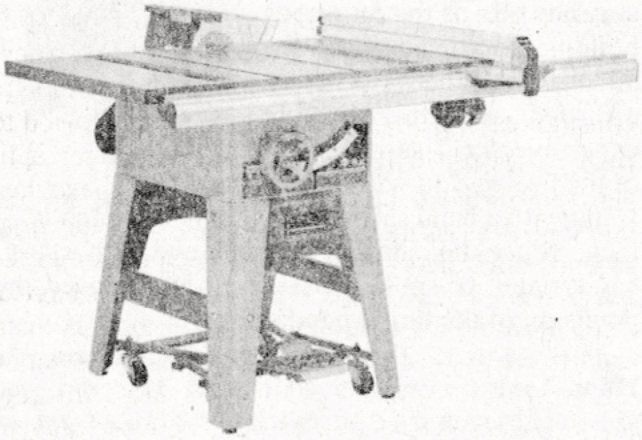
You do not need a complete set of woodworking tools to restore a wooden car body, but there are a few tools that are a must for this job. These tools will be described in the following sections.

Power Tools

There are only three power tools needed for wooden auto body construction, but without all three the job would be very difficult.

The first power tool you will need is a planer to surface your rough boards and bring them to the desired thickness. The widest board you will need to deal with is the sill assembly. This is the base of the structure. It lies on top of the chassis frame and bolts to it. All the rest of the body is built up from this. A 12" to 13" planer will handle this board and all the other boards you will work with. A variety of thickness planers are available that will handle this job. Prices range from a few hundred dollars to a thousand dollars. The lower-priced planers will usually only take a 15-amp draw and work on a standard 120-volt line. The models in the top of the price range usually require a 240-volt supply. The 15-amp models will bog down on a heavy cut in a wide board and probably keep throwing your circuit breakers. In my opinion it is best to pay a bit more and get the planer with the heftier 240 volt-outlet requirement. You will be planning a lot of boards and will appreciate the smooth operation of this larger-motored plane, particularly when planning the wide sill boards. (On the other end of the planer spectrum are the hand-held power planes, which are worthless for this job, and the 15-inch to 20 plus-inch planes, which are overkill.)



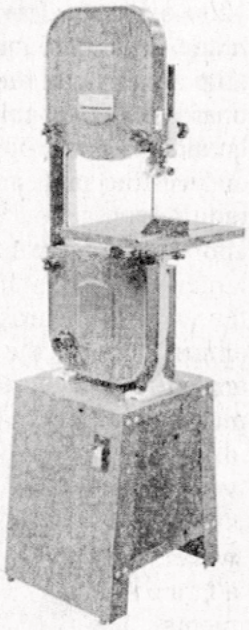


The next power tool you will need is a table saw for ripping and cross cutting the thickness planed-boards. With this tool you can go the economy route. An 8-inch blade will work, but a 10-inch blade will be better. You will need either a combination blade or both a rip and a cross-cut blade. The higher precision obtainable with a cabinet maker's table saw is unnecessary for car-body building. You can get a suitable contractor's table saw for about $500.

Cross-cutting long boards to final length may be difficult with an economy saw because they often lack the lateral support needed and usually come without good out-feed tables. For the few long boards required in auto-body building you can use either a hand saw, a cut-off saw, or a skill saw, if your table saw will not support them.

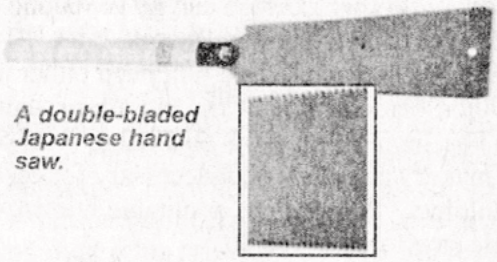
The final essential power tool required is a band saw. Band saws are sold by clearance between the table top and free blade spacing. You can get a good 10-inch band saw for a few hundred dollars. Expect to pay considerably more for a 15-

inch to 20-inch band saw (perhaps a few thousand dollars). The larger saws have more powerful motors and can cut a thicker board because of the increased clearance. These larger saws are usually a more precise tool because their principal use is in resawing. Resawing is cutting thin veneer strips from a wider board set on edge. You really do not need to resaw boards for auto-body building and do not need the added allowance of height afforded by these more expensive band saws. Most of the boards you will be profiling with a band saw will be less than 2-inch to 3-inch. Since the cuts can be smoothed with a rasp, hand plane, or spoke-shave, you do not need the precision of the larger band saws.



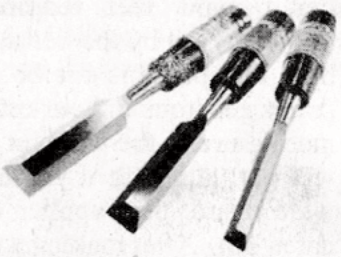
Hand Tools

In my opinion, while it is possible to economize some on power tools, you need to buy the best possible hand tools. They will cut more easily, and because of their better quality steel, take a keener edge and can be resharpened when necessary.



A double-bladed Japanese hand saw.

For auto-body building, you will need some really fine hand saws for cutting accurate joints. Glue will not cure a sloppy joint and make it strong. You need precisely fitting, tight joints and then the glue can do its job. Japanese hand saws are excellent for precision cutting. They cut aggressively and have a very fine kerf (width of cut). They are made in many shapes and sizes. Some are double-bladed with rip teeth on one side and cross-cut teeth on the other; some are stiff backed and some are ultra flexible. They cost about $15 to $50 each. Because of the tooth design, they are not resharpenable, but replacement blades are usually available.



Three-pieces of a six-part wood chisel set.

For removing small amounts of material - for example cleaning up a surface to get a tighter fit in a joint and for cutting certain types of joints - you will need a good set of wood chisels. There are many styles of wood chisels, all designed with a particular application in mind. What you want is a set of bevel-edged bench chisels. A 5- to 8- piece set (1/4" to 1") should do just fine. These chisels are meant for medium-duty cutting and can be driven by a light mallet tap. The bevel will be about 20-25 degrees. Be sure you do not buy paring chisels, as they are thinner bladed and are used for light duty without being mallet driven. Also stay away from framing chisels, which have a very thick blade and are used for rough carpentry work. You will want to spend at least $60 for a good set of beveled bench chisels. You can find cheaper ones that look about the same but will not take or keep as good an edge as a high quality chisel.

Hand planes and spoke-shaves can both be used for cleaning up flat, curved surfaces like the outside contour of a door pillar or for rounding off the edge of a piece like a roof side rail. Spoke-shaves are pretty cheap. They cost about $20. A good plane will cost more. There are many specialized types of hand planes. If you are going to buy planes for auto-body work, I recommend a standard smoothing plane for working edge or surface grain and a small block plane for cross-cutting end grain. I prefer metal shoe planes with adjustable blades that can vary the depth and tilt of the cut.

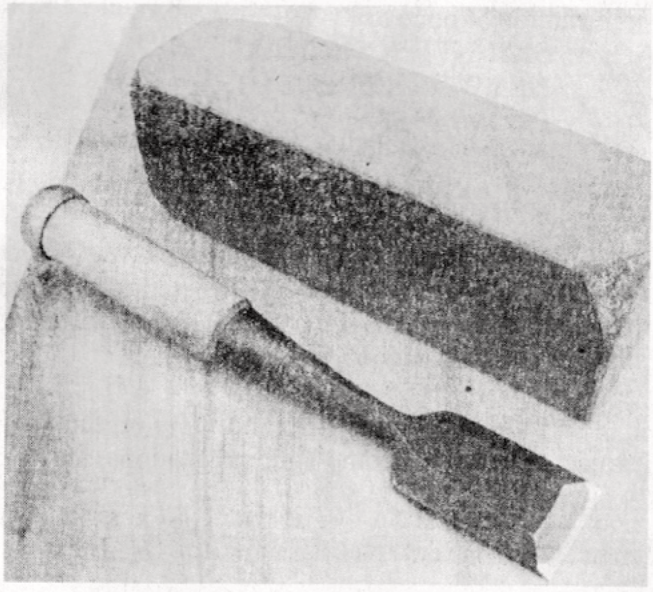
A set of wood rasps will come in handy for your work. Get a set of various coarseness that are rounded on one side and flat on the other. They will

come in handy for smoothing out 'bumps' left by your band saw work and other smoothing operations. Rasps will leave a level but rough surface - this is OK. Unlike in furniture building, you do not need a really smooth finish on the wood.

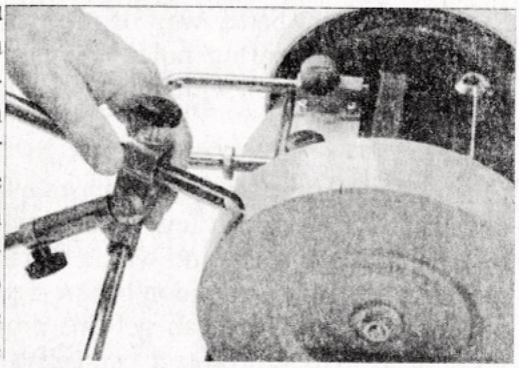
Finally, you will need a large number of clamps of various sizes. These are used to squeeze glue joints together until the glue dries and to hold pieces temporarily in place. Get at least twelve C-clamps with about a 6-inch opening and at least that number of 36-inch to 48-inch bar clamps.

Sharpening

While you can replace the blade on a Japanese hand saw when it becomes dull, you will need to resharpen the chisels and plane blades quite often. Your two major choices in sharpening stones are oil stones or water stones. The water stones can give a keener edge and cut more rapidly than the oil stones so they have become the general choice in recent years. Handheld water stones are effective, but require frequent flattening because of their rapid wear. To get a good edge using a handheld stone, you need to hold the blade being sharpened at just the right angle. This takes a lot of practice and some skill. You can pick up a set of water stones and a flattening stone for about $75.



For better control in sharpening a plane or chisel, you can go to a motor-driven water stone wheel with attachments to hold the tool at the angle you set, resulting in a very precise edge. One such tool is sold by Tormek (see the Internet). Prices start at about $400 for the simplest model and run to over $900 for models with more holding fixtures and accessories.



S.K.

Editor's Note: In reading the above section on tools, some of the prices might be initially shocking. And they can represent a substantial out-lay of money. But before you say, "Nope! Not for me!" please consider the cost of sending the classic car frame out to a shop for rebuilding. It makes the tool expenditure seem like a bargain.

In Future Issues:

Part II
AN OVERVIEW OF THE PROJECT
JOINERY
- Edge-jointed Boards
- Face-jointed Boards
- Lap Joint
- Rabbet Joint
- Mortise Joint
- Bridle Joint
- Glues

JEWETT CONSTRUCTION
- Tear Down
- The Rebuild

CHRYSLER ROADSTER CONSTRUCTION
BUICK DOCTORS COUPE CONSTRUCTION