The Making of a Gibson USA Guitar

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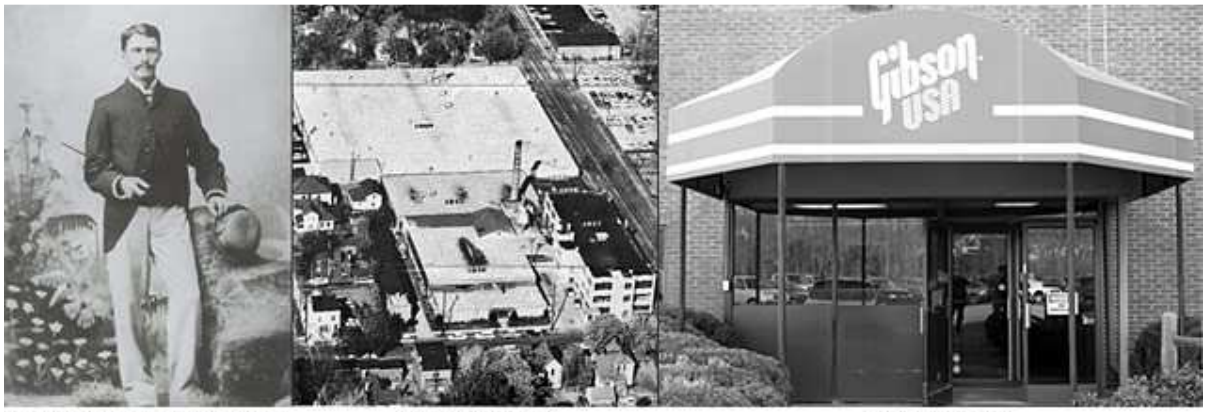
Gibson USA sounds like the name of a city. And that's fitting, because much like an urban center, Gibson's main operation has its own rich history and its own distinct bustle. Giant, computer-controlled body cutters and hand-operated band saws, sanders, buffing wheels, beeping fork lifts, hissing spray guns and whirring pick-up winders make the air hum like a gentler version of Manhattan's rush hour.

But Gibsons are, of course, made in Nashville, TN, and nearly all of the work involved in building the approximately 2, 500 Les Pauls, Flying Vs, Explorers, SGs, Firebirds and other models made each week is done by hand. Even the automated processes — like cutting wood blocks into the shape of guitar bodies — are part of an epic ballet of scheduling that involves nearly 500 workers dedicated to keeping the guitar-making process flowing smoothly.

Gibson USA is on a slow curve at the back of Massman Drive in Nashville. It's a sprawling complex compared to the little shop that Orville Gibson first ran in Kalamazoo, Mich., in 1894, or even the full-fledged factory there that came later.



Company founder Orville Gibson Kalamazoo factory USA factory today

The USA operation takes up two buildings — the rough mill and the factory/warehouse. There's also a big outdoor shed for wood storage. Next door is the distribution center for Epiphone instruments.

WHERE GUITARS BEGIN

Gibsons start at the rough mill, where lengths of maple and mahogany are cut down into body-sized billets. Before they're stacked they are tested for moisture. Too much and they'll go into the slow-drying kilns on site. Too little and they'll also go into the kilns, where they absorb the moisture released by wetter wood.

Here and in the factory an overhead irrigation system spritzes water into the air periodically to keep the building's interior at 45-percent humidity — perfect for preserving the qualities of the wood that makes Gibsons so remarkably resonant.

"The wood's also checked for any impurities or problems like knots or divots," explains supervisor Joe McGee, a 13-year veteran of Gibson USA. "We also grade the maple from plain to AAAA flame to quilt before it gets stacked in the correct pile."

McGee is like a lot of the people who work at Gibson: a friendly long -timer with a love for guitars — he owns a Firebird and Les Paul — who takes pride in his role creating many of the world's best -loved instruments.

As we speak, a fork-lift operator hustles palettes of graded wood to a giant computer numerically controlled (CNC) saw called a body line carver, where billets are being cut into a dozen SGs at a time.

Flame top maple makes a more roundabout trip. Those billets are cut down the center and book matched to provide the classic center seam look of the Les Paul Standard. A large vintage machine called a glue wheel, which looks a bit like an industrial version of a Ferris wheel, clasps the fresh -glued maple tops in its 30 tiers of three arms and gives them an airing. When the book -matched tops are dry, they'll be glued to mahogany backs and put in a large press to make sure both sections adhere.

No machinery, other than a band saw, helps with neck cutting — another important job in the rough mill. Steady hands and watchful eyes are the most crucial tools in this job, which transforms long blocks of wood called neck blanks into the eventual home of fingerboards and wire. A thin trough is cut down the back of these raw necks and a truss rod gets installed in each one.

Fingerboards are also created here: trimmed to shape from Indian rosewood, ebony, or preciosa. Some arrive cut nearly to shape; others as raw blanks.

INSIDE THE FACTORY

After the fingerboards move to the factory, inlays of mother -of-pearl, abalone or acrylic will be glued into their faces and sides. Appropriate holes are routed out of the fingerboards according to each guitar's design — distinctive trapezoids for Les Pauls and SGs, dots for standard Explorers, and so on.

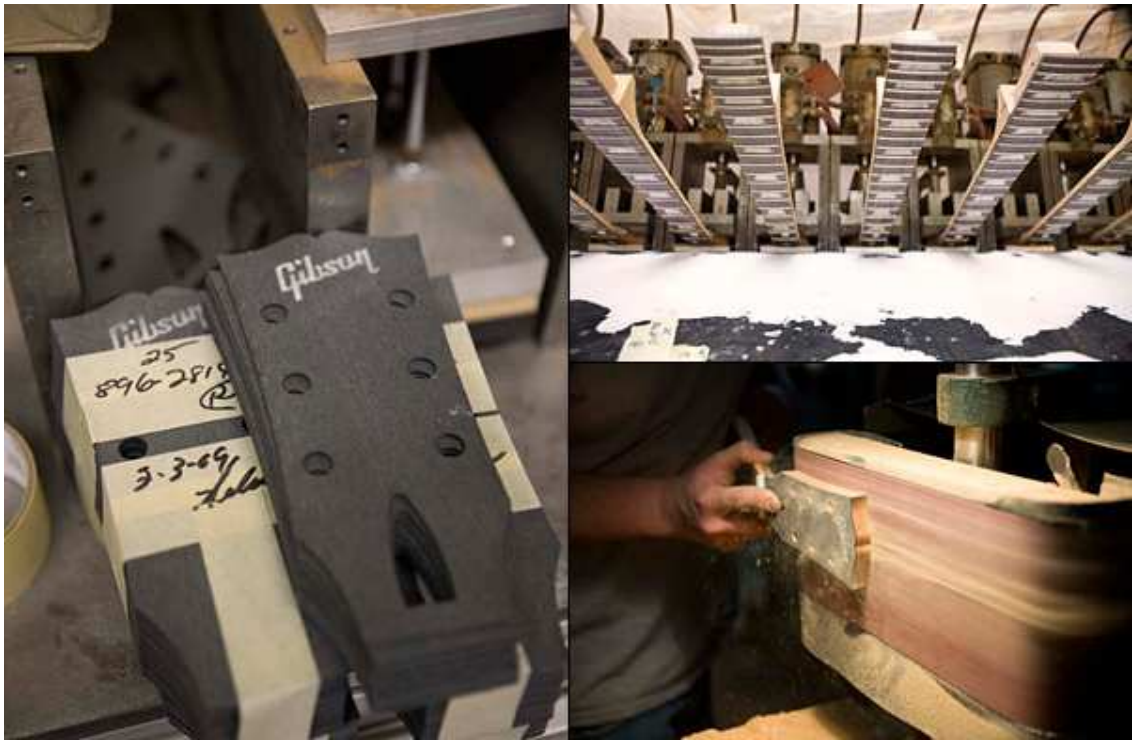
The frets themselves — like the inlays — are installed by hand. Working from spools of fret wire, fitters lay the wire into the grooves cut in the fingerboards and snip them in place. Then the boards are put into a machine that presses the wire evenly in place and trims down the rough edges of the frets.

Neck binding that is placed by hand along the side of fing erboards also requires gluing and then drying on a wheel.

At Gibson the fingerboard binding lays over the ends of the frets, which requires that any excess binding material be carved away by hand, like it was in Orville's day.

QUALITY & CRAFTSMANSHIP

After the frets, inlays and binding are installed and the fingerboards dry, sanded and ready to be united with guitar necks, they get a thorough inspection. Each manufacturing department at Gibson USA — from binding to painting to final assembly — has its own quality control staff to ensure that every step of the guitar - building process is done exactly right. At this stage, the fingerboards are checked for high frets, uneven inlays and gaps in the binding and corrected as needed.



As the fingerboards are being prepared, a nearby department works on headstocks. The veneer faces of Gibson USA's headstocks are cut from bakelite, typically, or holly and get a pearl inlaid or silk-screened logo. Some models get special touches, like a Greek classical-period-inspired urn for decoration or a badge commemorating a special edition guitar.

Then these faces are glued to the headstocks, rolled by hand on a sander to a smooth finish and placed in a press while drying. After a quality inspection, the finished necks move on to be united with guitars.

That happens at the neck fit station. But before the bodies are sent there to be joined with necks, they go through a slew of processes in other areas of the plant — which stays buzzing for three shifts a day.

MORE HIGH-CRAFT WOODWORK

"The bulk of the guitar building is done during the first shift, which starts at 6:30 a.m.," says McGee, "but to keep all the processes that go into making these guitars running smoothly and on time we need to have people in here around the clock."

Staffers wearing goggles and wielding special rabbet saws route a channel along the edge of each guitar that is destined to get binding. And those channels, called rabbets, get their vinyl stripping inlaid by hand. Then the guitars are trussed up with cloth strips that hold the binding in place. They rest in two -tiered drying trees while the glue hardens and adheres overnight.

The next day it's time to sand the ridges and cut marks out of the guitars. Bodies that come out of the rough mill still have small r idges from the carving blades. This smoothing process is a delicate operation done on a large belt sander. It's all about eye-hand coordination and knowing exactly how a Les Paul, SG, Firebird or other Gibson USA six-string is supposed to look and feel as the sander operators ride the belts gently up and down over bodies, applying pressure with cloths or cloth - surrounded blocks held in gloved hands.

Once that's completed there's another sanding step. The sides are smoothed down without the help of anything more than a strip of light-grained sandpaper, to eliminate excess glue and be sure that any binding is flush. Finally, quality control eyeballs and handles each body before it moves on to be united with a neck, looking for rough spots, uneven surfaces, excess glue or weak binding.

"Really, in this age of mass production, it's hard for customers to understand just how labor intensive building every guitar is," says McGee. "It's really a people process. That's the bottom line."

GETTING IN THE GROOVE

Neck fitting is not an easy job, but it's extremely important. A guitar's neck tenon must fit firmly into the receptacle groove that's cut into its body in order to achieve the proper qualities of resonation and sustain. Securing that perfect fit requires examining the body cavity where the neck will be set to get a fix on whether any unnecessary wood must be removed. The preferred tools are a hand chisel and sandpaper, used very judiciously.

"If too much wood is accidentally removed or the wrong cuts have been made, the body has to be rejected," says McGee. "There's no going backwards from here."

So the neck-fitters snug and sand, snug and chisel, or just rub the wood until the neck fit is tight and seamless. But before each neck — which by now have their fingerboards in place — and body are glued together, the neck pitch or angle is checked with a dial indicator gauge.

Near the neck-fitting department stand the twin stamping machines that emboss serial numbers in the headstocks of all the guitars that com e out of Gibson USA. Until recently the hand presses used at the company's original Kalamazoo factory were still on the line, but today they're been replaced by more practical pneumatic machines.

Once the neck and body have been glued together the guitars spend at least a half-hour hanging around in yet another drying tree. Once dry, they are plucked from the trees like wooden fruit and carried to the routers.

THE ROAD TO PERFECTION

Routing the guitar's body for tailpiece holes, the bridge, pickups and othe r electronics was a painstaking process in Gibson's early years of solid body guitar making. But today a computer-controlled router using different software for different

models of guitars does that work, ensuring a higher degree of consistency than Orville could have dreamed.

And what happens next would blow the founder's mind. Fret filing, once a pain-staking process that required exacting craftsmanship and plenty of time, is now a whole new high-tech ball game. Although some fret filing is still done by hand, many guitars produced by Gibson USA are fine-tuned by one of the two Plek machines on the shop floor.

"Right now we advertise that we Plek the Les Paul Standard and the Les Paul Traditional, but we're Pleking a lot of other guitars and just not mentioning it," says supervisor McGee. "With two more machines coming, by year-end we'll be running everything through the Plek machines."

Computer-controlled Pleking is a far more accurate way of insuring the best playability of a guitar's neck than the traditional method of using a file to pl ane down frets and a flat edge to be sure they're uniform. The Plek machines look like a pair of tall, thin glass boxes with armatures and other mechanisms to run cutting tools and measuring devices over guitars. They are accurate within a thousandth of an inch. Each guitar model has its own software template the Plek machine follows. And it takes about 10 minutes for an instrument to complete the process: cutting the nut and filing the frets while simulating string tension to mock playing conditions.

Pleking at Gibson began at the Custom Shop, where every guitar gets the treatment. It's an added value for Gibson customers. A trip to a luthier with a Plek machine typically costs $300 or more.

Still more handiwork happens before the bo
receive the coats of paint and lacquer that w
them shine like six-stringed gems. The guita
rubdown with 280 grit sandpaper, making su
are no imperfections that can make the finis
blemished or hard to coat. Mahogany bodie
layer of pore filler, hand painted on with a b
since the wood is porous and needs to have
evened for the paint room. Then any excess
wiped clean. And every guitar gets another
check before heading to gets its burst, desig
solid-color finish.

COLOR THEM BEAUTIFUL

In the paint shop, guitars with various coatings of lacquer and pigment travel along a conveyor attached to the ceiling, like the system a dry cleaner uses to jugg le clothes, but way sexier given the instruments' sleek curves and alluring colors. And at the end of the line literally hundreds of guitars hang, each one drying overnight next to an electrostatic rod that induces lacquer to better adhere.

"This isn't an easy job," says Stan Speight, who's been painting Gibson guitars for decades. "You have to work patiently and carefully, covering each guitar just right so the paint goes on smooth and even. The key is, through every step of applying the two coats of paint and six coats of lacquer on every guitar, you've got to take pride in what you're doing. I don't play guitar, but I know how to make them look like a million bucks."

Although most of what Speight and his peers do requires a steady hand and a watchful eye, they do get some help from technology. The guitar spray booth gives the instruments a positive electrostatic charge and the paint has a negative charge, which makes it adhere to every part of the instrument. Nonetheless, the air brushes are hand controlled by Speight and his peers, giving the finish of each Gibson guitar distinctive qualities.

Before the guitars are painted all the parts that won't get a coating, like fingerboards, are taped over to preserve their integrity.

If a guitar that comes through the paint shop has a problem, it's up to the department's quality control team, Michael Baker and Jack Browning, to find it and correct it. And they're looking at more than paint.

"When an instrument comes out of here it needs to be ready to go through the rest of the plant and to the customer," says Browning. "So it's my job to look for anything that's off — whether it's a ding or nick in the finish that has to be retouched."

Painter Tom Morgan adds that fixing paint flaws is tricky, since every finish — even one color ebony — has distinctive patterns of airbrush strokes. More elaborate color schemes like sunbursts — which take two or three colors — are more challenging, since the primary shades used to paint the guitars alter to different degrees when they blend.

During lacquering the guitars make multiple trips through an oven set to 110 - degrees to promote drying between the applications of layers. Depending on humidity and other atmospheric conditions it typically takes eight or nine hours to get all six coats of dry lacquer on a guitar.

MORE PURE CRAFTSMANSHIP

An important part of the visual charm of Les Pauls and many other Gibsons is the binding, which is sprayed over with paint and lacquer and then restored to its original look by an eagle-eyed crew of scrapers. The scrapers take the guitars in hand and employ sharp blades they make themselves. Those blades are wielded with the dexterity of sculptors as the scrapers peel the layers of paint off the bindings and the nuts.

"Peeling" makes the process sound less artful than it really is. Most of the time a scraper can remove the paint from a guitar's body and neck binding with a few long, deft, flowing slides of the blade. It's truly impressive to witness the steadiness and confidence on display in this exacting process.

Another post-lacquering step is scuff sanding. That's essentially a rubdown by hand for each guitar that takes place in a small space near the entrance to the paint shop, where Brad Brown and other scuff sanders man their stations with sandpaper and hand tools.

"After the guitar dries, there are little paint and lacquer build -ups and pockets all over the surface," the 20-year company veteran explains. "That's called ‘orange peel.' My job is to even all of that orange peel out until the paint surface is perfectly smooth."

Brown, who's a bass player, has done many other jobs in the plant. "The only one I haven't done is neck fitting, although I've done quality control in neck fitting," he says.

"I enjoy this," he adds, grabbing another piece of 320 grit and rubbing near the edge of one of the guitar's horns, "because it requires real touch and precision. Use too much force and you peel off the finish, which means the guitar goes back to the paint shop, but get it just right and it's rea lly ready to take a great shine."

ADDING GLOSS TO CLASS

After a final coat of lacquer the guitars dry for four or five days. Then they're ready for the last few processes that will make them player-ready. Lacquer, paint or wood filler that may have gotten onto the frets or fingerboard is removed by delicate sanding. The frets are polished and the fingerboard oiled. And then it's time for buffing, where Gibsons get their distinctive, deep shine.

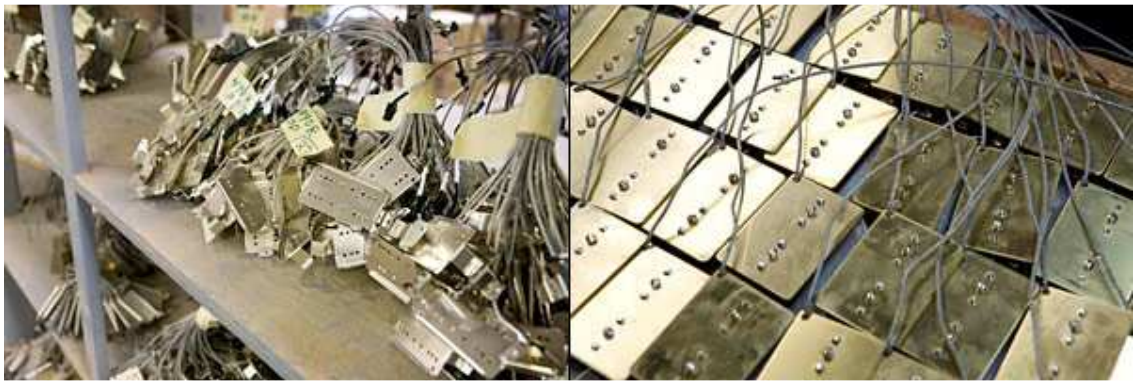
Steve McQuery doesn't play guitar, but he is a master of the buffer's wheel, bobbing and weaving as he stands over his machinery and brings the surface of Les Pauls, Flying Vs, Firebirds and other models in contact with the special wheel surfaces that work polish to a mirror-like gloss.

"Each guitar gets three different coats of polish," he explains. "There's a red compound that smoothes the surface, a yellow compound that brings out a little bit of a shine, and a white polish that really brings out the finish's luster. And the only way to do that is develop an eye for it. You need to buff out any fingerprint smudges, and just work that surface to the consistency of glass.

"I've been doing this since 1980," he explains. "I came to Gibson looking for a job at a time when they were scarce, and found something I really enjoy. By the time I'm done these guitars are beautiful."

WHAT'S INSIDE COUNTS

Now the instruments are ready to get their guts — the electronic innards that help Gibsons achieve their world-class sound.



Some components come from outside suppliers, but not the most crucial, like the pickups. The same machines that wound wire around magnetic poles and pickup forms in the original Gibson plant at Kalamazoo, Mich., moved to Nashville with the company in 1985 and are still hard at work. Their speedy armatures pu ll yards and yards of wire off stationary spools in seconds, producing multiple pickups, which are then carried to the next station and dipped in hot wax for 10 minutes before being allowed to dry.

As we walk though the plant the humming machines are pro ducing the company's classic humbuckers, arguably the most versatile pickup on the planet. And they're being made not just for the guitars traveling the assembly line, but for the aftermarket.

Just a few yards from the pickup-making operation is electronics building, where toggle switch assemblies are soldered together and control panel assemblies are made. These configurations of potentiometers and switches are typically placed in bags as self-contained kits that also include the hardware for certain mod els of guitar. For example, a Les Paul kit would contain the electronics, bridge, mounting rings and tuning peg assembly for a Les Paul. Some models require a bit more assembly at this stage. As we pass by the station there's a stack of Flying V pickguards with all the right electronics already attached — ready to be dropped into the guitars' space age bodies.

At the final assembly station, which is a newly redesigned department at Gibson USA, guitar bodies and their electronics are united. Like electronics building, this process is also entirely done by hand.

A guitar arrives at the beginning of the department's roller belt assembly line, and by the time it reaches the end it has gone past a clutch of technicians who've reamed out the tuning peg holes and inserted and attached the tuning assembly,

done all the soldering inside the body cavity that's required to connect the electronics, placed the pickguards, strung and set up the guitar, and attached the back plate and truss rod cover.

"QUALITY" HAS THE FINAL WORD

Then quality control takes the spotlight once more. The guitars go from the final assembly line to the benches at the finishing station, where highly skilled employees, called finishers, who are both players *and* experts on guitar building get their hands on every ax.

Like all the other adjusters, Jay Thompson tunes and plays the guitars, checking their feel and the performance of their electronics. So while this department doesn't have the industrial grind of saws and sanders in their air, there is the constant sound of electric riffing, with everything from metal to country to jazz licks rippling out of the Epiphone amps perched above most finishers' workbenches.

"This is a really cool job," the 13-year veteran explains. "I get to see every finish and every model that comes through the Gibson plant — and I get to play it. And when I'm sure a guitar's ready to go, I know it could travel anywhere in the world."

As we travel toward the warehouse and shipping department of Gibson USA, there's one more important stop: final quality control. There's roughly a half-dozen people in the department, and as we approach R.P. Elliott in particular stands out because he's ripping up and down the neck of an SG, tossing off squealing, precise bends as he blazes through scales.

"My first guitar was a Gibson Les Paul I got when I was 11 years old," he says with a grin. "I've done a lot of jobs for Gibson since I came here 16 years ago — in engineering, as a maintenance technician, in the machine pattern shop — but at this bench I get to see 175 guitars go by each day. I play and check each one, examining every aspect of playability and finish.

"I know," he says, "that if I pass a guitar whoever buys it is getting a quality instrument they're gonna enjoy."

OUT THE DOOR

But the last people in the factory who'll handle the guitars before they make their way to customers are the warehouse and shipping crew. Louie Blades has been a fixture in those operations for 15 years.

Guitars roll from final quality control into the warehouse in either bags or hardshell cases — that differs by model — and are scanned and logged in to the warehouse inventory system by the serial numbers in their embedded transponders. They are next placed in cardboard boxes and put on shelves ready to ship.

"Sometimes guitars come right in from the factory and go right onto the back of a truck," Blades explains.

"The amount of guitars being produced is pretty much equal to the orders we're fulfilling on any given day, and the orders we get speci fy which individual guitars are going by serial number, so it's all very efficient and guitars never sit in the warehouse for weeks at a time."

ENGINEERING KEEPS THE FLAME

Gibson's precision and efficiency, as well as its innovation and devotion to historic accuracy, is the province of the only department that's not actually on the factory floor. That's engineering, which has its own second -story office inside the factory.

Gibson's engineering department looks a little like a mad scientist's lab. A b lack Les Paul stands upright in a clear Plexiglas case with wires running from its pickups into a smattering of boxes. Bodies of various shapes rest atop desks and chairs and in corners in various states of disassembly.

"Some of the things we do in here I can't even talk about, like the specifics of the 2009 Limited Edition Series program, or the refinements we're working on for certain models we're developing," says technician Justin Morris.

But the seven employees in engineering have been on the front lines of the development of the innovative self -tuning Robot Guitar and have translated the vision of designers and luthiers into striking models like the just released Holy Explorer.