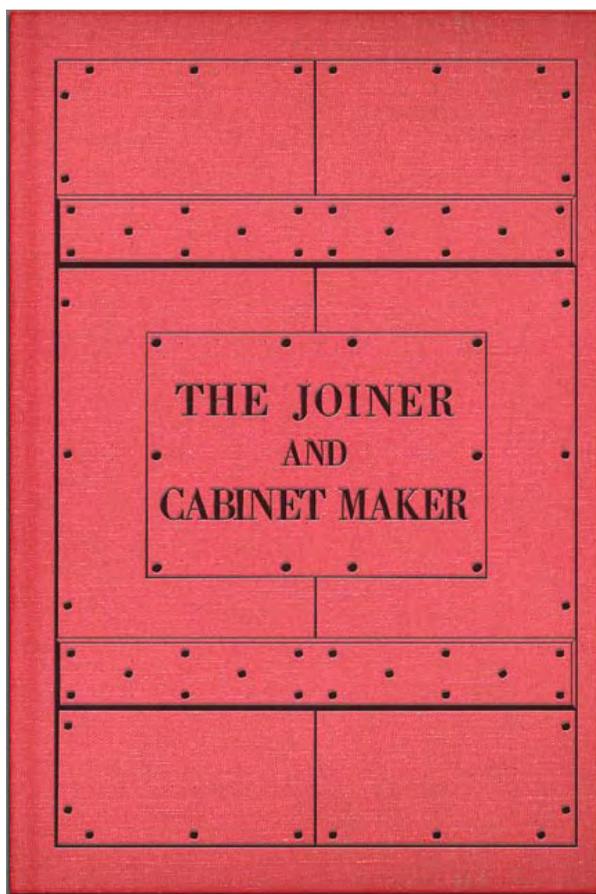
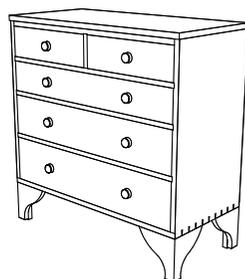
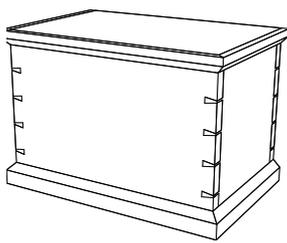
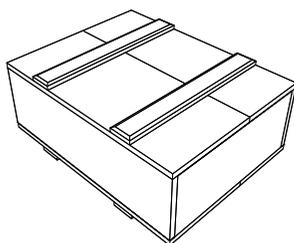
The image shows the front cover of a book. The cover is a deep red color with a fine, woven texture. A black grid pattern is overlaid on the cover, consisting of a central rectangle and four smaller rectangles at the corners. Small black dots are placed at the intersections of the grid lines. In the center of the cover, there is a white rectangular box with a black border. Inside this box, the title "THE JOINER AND CABINET MAKER" is printed in a black, serif, all-caps font. The text is arranged in three lines: "THE JOINER" on the top line, "AND" on the middle line, and "CABINET MAKER" on the bottom line.

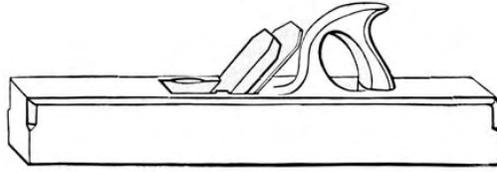
**THE JOINER  
AND  
CABINET MAKER**



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# The Joiner and Cabinet Maker

His Work  
And its Principles

“Whatever thy hand findeth to do, do it with thy might.”  
Ecclesiastes ix. 10.

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ENLARGED EDITION WITH ILLUSTRATIONS

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by Anon,  
Christopher Schwarz &  
Joel Moskowitz

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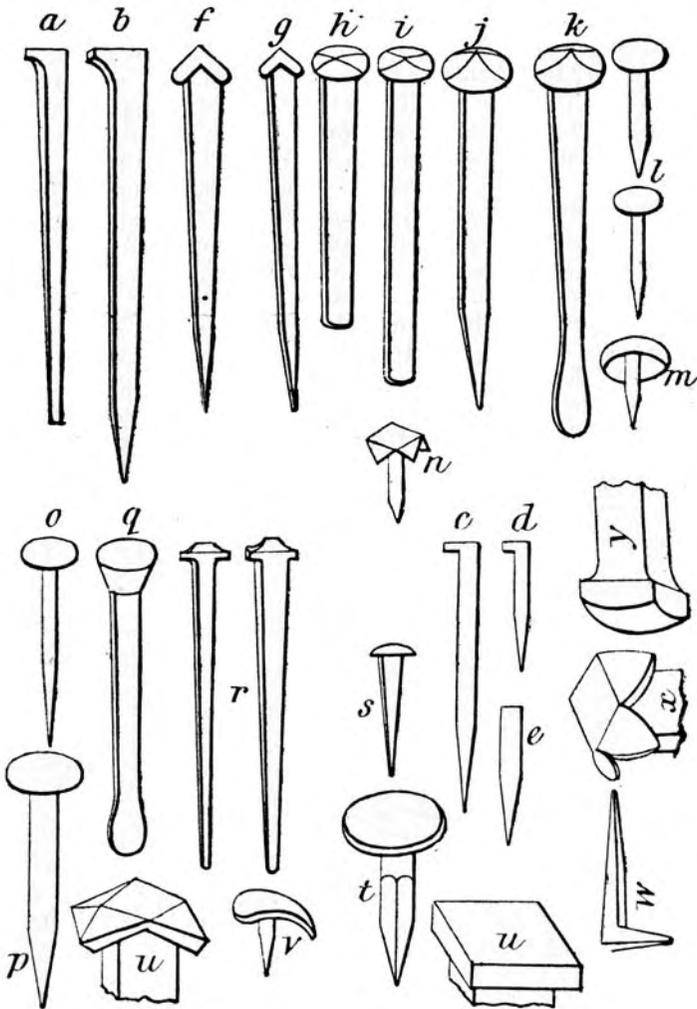
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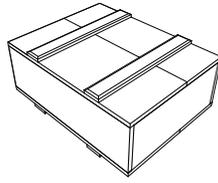
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Some of the many kinds of cut and wire nails available to the 19th-century joiner and cabinet maker in England. Many modern woodworkers are surprised by how many nails were used in the construction of quality antique furniture. This plate is from "Spons' Mechanics Own Book" (1885).



## Part I: History

# Introduction

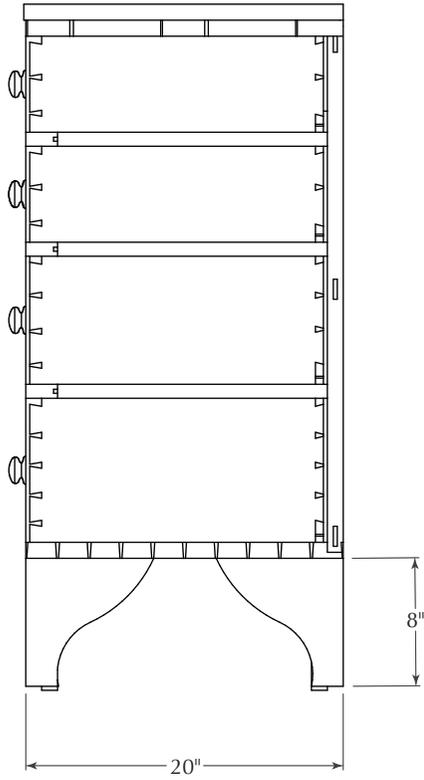
In 1839, an English publisher issued a small book on woodworking that has – until now – escaped detection by scholars, historians and woodworkers.

Titled “The Joiner and Cabinet Maker,” this short book was written by an anonymous tradesman and tells the fictional tale of Thomas, a lad of 13 or 14 who is apprenticed to a rural shop that builds everything from built-ins to more elaborate veneered casework. The book was written to guide young people who might be considering a life in the joinery or cabinet making trades, and every page is filled with surprises.

Unlike other woodworking books at the time, “The Joiner and Cabinet Maker” focuses on how apprentices can obtain the basic skills needed to work in a hand-tool shop. It begins with Thomas tending the fire to keep the hide glue warm, and it details how he learns stock preparation, many forms of joinery and casework construction. It ends with Thomas building a veneered mahogany chest of drawers that is French polished.

Thanks to this book, we can stop guessing at how some operations were performed by hand and read first-hand how joints were cut and casework was assembled in one rural English shop.

Even more delightful is that Thomas builds three projects during the course of his journey in the book, and there is enough detail in the text and illustrations to re-create these three projects just as they were built in 1839.



Profile View (Section)

When we first read this book, we knew we had to republish it. Simply reprinting the book would have been the easy path, however. What we did was much more involved.

We have published “The Joiner and Cabinet Maker” with additional chapters that will help you understand why the book is important, plus details that will make you a better hand-tool woodworker. In this expanded edition, you’ll find:

- A historical snapshot of early 19th-century England. Moskowitz, a book collector and avid history buff, explains what England was like at the time this book was written, including the state of the labor force and woodworking technology. This dip into the historical record will expand your enjoyment of Thomas’s tale in “The Joiner and Cabinet Maker.”

- The complete text of “The Joiner and Cabinet Maker,” unabridged and unaltered. We present every word of the 1839 original (plus a chapter on so-called “modern tools” added in a later edition), with footnotes from Moskowitz that will help you understand the significance of the story.

- Chapters on the construction of the three projects from “The Joiner and Cabinet Maker.” Schwarz built all three projects – a Packing Box, a dovetailed Schoolbox and a Chest of Drawers – using hand tools (confession time: he ripped the drawer stock on a table saw). His chapters in this new edition of “The Joiner and Cabinet Maker” show the operations in the book, explain details on construction and discuss the hand-tool methods that have arisen since this book was published.

- Complete construction drawings and cut lists for the modern woodworker. This will save you the hours we spent decoding the construction information offered in “The Joiner and Cabinet Maker.”

We encourage you to read this entire book and attempt to build the three projects using hand tools. That is a tall order, we know. However, building the Packing Box, the Schoolbox and the Chest of Drawers will unlock the basic skills needed for all hand-tool woodworking, and it will offer insights into how traditional, high-quality casework was really built.

— Christopher Schwarz & Joel Moskowitz

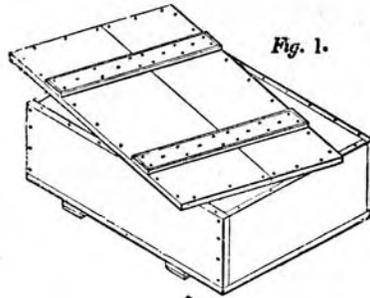


Fig. 1.

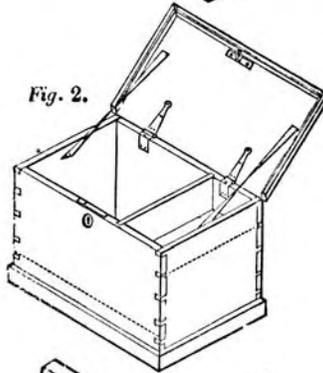


Fig. 2.

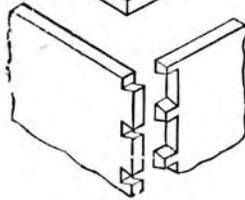
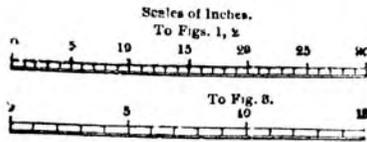


Fig. 3.



*“A joiner’s or cabinet-maker’s apprentice would find some instructive reading in this little work. It contains, in addition to certain rudimentary information, some hints to apprentices of how to turn their leisure hours to permanently useful account. The book is a good shilling’s worth.”*

— The Furniture Gazette, Sept. 29, 1883

Part II: The Original Text

# The Joiner and Cabinet Maker

Boys are generally fond of using tools; and there are few places that they like better to visit than the joiner's shop. The writer has known many boys who would look on for hours together as the joiner was at work, and who have gone on from looking to imitating, and learned to use one tool after another, till by degrees they have become very good workmen themselves. Their own little workshop at home has thus been gradually furnished with a pretty complete set of tools, partly of their own making, partly of their own earning; their parents and friends having paid them for little jobs which they have been able to do. As an amusement for boys, whatever may be their future pursuits in life, few appear more rational and more useful than this: we know many men in various trades and professions who are constantly feeling the advantage of having learned in childhood the use of the joiner's tools. And as for boys who look to their own labour as their means of support, and who have any taste of this kind, the joiner's shop seems just the place where they may be both useful and happy. Supposing, then, a boy of thirteen or fourteen years old, who has been accustomed to amuse himself with the hammer, who has often watched the joiner at his work, and does not know anything he should like better to be than a joiner himself, we will try to shew him what he will have to do as a joiner's apprentice. And, though we cannot pretend in a little book to teach him all that he must learn by long practice during his apprenticeship, we think we may give him some notion of the kind of

tools he will have to use and the way of using them, the kind of things he will learn to make and the best way of making them. We have called him a *joiner's* apprentice, but we shall not on that account think it necessary to abstain from teaching him a little of *cabinet-making* also; for, indeed, the two trades are not always kept distinct; and the same man will call himself a joiner when he is working in deal, or oak, or ash, and making a strong kitchen table, or a door, or a corn-chest, and a cabinet-maker when he is working in mahogany or rosewood, and making a writing-desk or a cabinet. So we will suppose it is a joiner and cabinet-maker of this sort to whom our apprentice is to be bound.

As he is still very young and has a long apprenticeship before him, he will at first be called upon to make himself useful in various ways without at once beginning himself to be a joiner. But if he will only keep his eyes about him, he will see a great deal from which he may be learning his trade; he will see the way in which the workmen use their tools, and put together the various things that they have to make.

He will find most likely that he is expected to keep the workshop in order. Now, a joiner's shop is not expected to be as clean and tidy as a parlour; shavings, and sawdust, and chips, are constantly being made, and without them it would seem as if no work was being done. But they must not be allowed to lie till they are in the way; and the apprentice must regularly remove them to their proper places. In picking up the shavings, he must be careful to take them in handfuls and shake them before he stuffs them into the bag; for it often happens that tools have fallen amongst them from the bench, or pieces of wood that have been prepared for some part of a work in hand, or small bits of hard and valuable wood that are too good to burn. The careful apprentice, who picks up all these things and returns them to their proper owners, will find both master and men ready to thank him and reward him by helping him in many ways in his business. But if he is careless about them, and if Sally, the servant over the way, who bought a bag of shavings<sup>1</sup> to light her master's fire with, brings back a chisel with which she nearly cut her hands, or a piece of mahogany, planed square and dovetailed at the ends, which had been prepared for the side of a box, and the loss of which made it necessary to cut another, every body will say, We never had such a troublesome shopboy, and we must look out for another who will do his business better.

Now, it is only the careful apprentice that can be entrusted to do what is the next part of the apprentice's duty – to light and take care of

the fire. In a joiner's shop, where so much wood and shavings are always lying about, great care must be taken to guard against accidents by fire. We have seen careless boys – aye, and careless men too – strike a light on the bench, and then run with the lighted match in one hand to the fire-place, picking up a handful of shavings as they went. Then they would find they had no chips ready; and while they were looking them up and chopping them, they would have to run with first one handful of shavings and then another – dropping a few each time as they went – to keep the fire alight till the chips were ready; and by the time the fire was really burning, there was thus a train of shavings scattered all along the floor from the fire-place to the benches, as if laid on purpose to tempt a stray spark to set the shop on fire. If this were to happen, and the master to lose his stock of timber and furniture, and the workmen their tools, whom would they have to blame but the careless fire-lighter? Now, the proper way to light the fire seems to be to lay on the hearth (for a joiner's shop seldom has a grate) a sufficient quantity of shavings carefully gathered and cleanly carried, and upon them the chips, chosen from wood before laid aside to burn as fit for nothing else, not from pieces snatched up in the hurry of the moment, and ten to one too good for the purpose; then, when all is ready, the light may be struck as near the fire-place as possible, and applied without danger. The fire will need to be kept up almost constantly even in summer, for the glue may at any time be wanted, and there are various other purposes for which it is required. The fuel used will be sometimes refuse wood, when it is to be had, and always sawdust, which, indeed, will not burn of itself, but which, when thrown over the wood, helps to keep up a dull, smouldering kind of fire, which answers the purpose very well, and at little expense.

The apprentice will probably use tools first in cutting wood for the fire. He will want an axe to split it down; but he had better choose the smallest and lightest he can get, and use it very carefully, as it is rather a

<sup>1</sup>*Sally has to buy the shop's shavings; they are not free. In the early part of the 19th century, there was comparatively little garbage generated. Everything was, to use a modern word, recycled. Men collected dog manure for use in the tanning industry. Mudlarks combed the mud and sludge of the river Thames looking for the odd nail or scrap that could be resold. It was rare for most people to own much clothing, and rarer for them to buy clothing new. Fabric lasted a long time and clothing was constantly remade and re-worn. When a scrap of fabric was really too far gone to be used in clothing, it was sold to the ragmen for making into paper. The list goes on. Making the shavings cost time and labor, so it made sense for the shop master to want to make a few pennies on selling them. What the shop didn't sell they could burn themselves, and fuel cost money.*

dangerous tool. The saw will be wanted also where the wood is long, as it splits best in short lengths; and this practice in sawing will be very useful, for the saw is a most valuable tool, and one that requires a good deal of practice to use it well. It will be well worth while for the apprentice to mark his board across by the edge of a square, and try how exactly he can keep to the line; for thus, when he comes to real work, he will not be in danger of wasting his materials. In the same way he may try sawing the wood lengthways, which to a beginner it is not easy to do straight. Indeed, if he finds time, as he often may, it will be well for him to try his hand in various ways on this refuse wood. He will find one or other of the men kind enough to lend him a plane and various other tools, if only he has shewn himself careful and attentive, and can be trusted to look the wood well over, and see that there is nothing that will injure the tools, as nails or dirt. He may thus be beginning to saw and plane wood square, as it is wanted for the sides of a box, and to nail together the corners, and to do various other things that are very necessary for him to learn. And here we will give him a little piece of advice. If he finds he cannot borrow tools so often as he wishes, let him remember that there is nothing about which a good workman is so particular as to keep his tools in good order – so that it is not surprising that he is not very willing to lend them; and, above all, let him never allow himself to think of using them without leave, which would be mean and wrong, and would, besides, bring him into disgrace and trouble; for it is next to impossible for him to do it without being found out, as a workman can almost always tell one way or another when any one besides himself has been using his tools; and when once an apprentice has been found out in using tools without permission, he will not soon be trusted again. If only he is attentive and obliging to the workmen, he will generally find them ready to help him in this way; but even if he does not, it is better not to have the use of their tools at all than to get the use of them dishonestly.

The apprentice will be expected to take care of the glue-pots<sup>2</sup>, and keep them always ready for use. Every body knows the look of glue as it hangs at the ironmonger's door, and that it is used for joining wood together. It is made of the hoofs of oxen boiled down, just as calves' feet are boiled for jelly, only that, being so much harder, they want more boiling, and make a stronger jelly. It is of very various qualities for different purposes. For the joiner's use, the best is known by its being quite clear, so that you may see through it, and also brittle, so that it will easily break. The smell of this best sort is not offensive, but there

<sup>2</sup>A lot of woodworking was then, as now, about *gluing* things together. These days, glue is something you buy in a store that requires little thought to use. All the adhesives in “The Joiner and Cabinet Maker” were animal-based collagen, with hide glue the most popular for woodworking. Hide glue needs to be mixed with water, soaked then heated before use. Keeping the glue liquid and available throughout the day was a vital job for the welfare of the shop, and one of the most important jobs for the apprentice – which is why it gets covered in detail at the start of the book. Having an apprentice around for glue-up also meant an extra pair of hands and an opportunity for learning. Glue was made by boiling the collagen found in hides and connective tissue. Any animal could be used, with the different glues having different strengths and characteristics. Horses, cows, rabbits and fish all made good glue. The author is incorrect about just the hooves being used. Animal glues were ubiquitous up to World War II, when milk-based adhesives and other glues become more popular. Hide glue, also called “Scotch glue,” was sold in cakes by the local ironmonger (the English term for “hardware store”). Modern hide glues are sold in granules, are of much better purity, of specific gram strengths and are much easier to use. Typical modern gram strengths for hide glue are 251 for general woodworking or 192 for veneering. The lower the gram-strength number, the weaker the glue (although that’s not really an issue with either 192 or 251) and a longer open time (the amount of time you have to set up your wood before the glue gels too much to bond effectively).

As Thomas finds out, breaking up a cake of glue, mixing it and getting it ready for use was a constant chore of the apprentice. Constantly cooling and reheating old glue reduces its strength. Also of note: Modern hide glues are much better refined so they don’t smell nearly as bad.

The glue pot that Thomas would have used is a simple pot with a water jacket that would keep the glue at a steady 140° to 150° Fahrenheit. If it’s hotter, the glue breaks down and loses strength; if colder, it doesn’t flow. The water jacket idea worked, but modern electric glue pots are easier to use and don’t require the constant attention of an apprentice. The main modern appeal of hide glue is that it is easily repairable – just heat it up and the joint falls apart. It’s also mostly transparent to finishes, so glue squeeze-out won’t result in unsightly blotches where the finish and stain didn’t penetrate. While hot hide glue does have a short open time compared to modern yellow and white glues, it allows for “rub” joints where you simply rub two boards together until the glue starts to set, then put the work aside without clamping. Hide glue really needs 24 hours to fully cure. This means that some projects, like Thomas’s first “rush job” crate, needed nails because the glue would not have set in time. Thomas doesn’t need to clamp his joints when doing dovetailing because the glue sets up so fast and the dovetails form a mechanical interlock.

The average shop would have had only one stove, the workshop would have been unheated and there is a pretty good chance the windows would not have been glazed. So in the winter you froze, and the glue didn’t flow. Charles H. Hayward, writing about his apprenticeship in the early 20th century, says that one trick would be to warm parts of furniture in the stove so the glue would flow better and have a longer “open time.” He also mentions that sometimes the parts would char or catch fire.

With all the wood and shavings around, fire was a constant danger for woodshops. In this world insurance was uncommon, and the loss of a shop could mean a debt unpaid, and a trip, literally, to the poor house or debtor’s prison. So any shop master would want the apprentices to be extremely careful around the stove. While I don’t know the cause, Thomas Chippendale’s shop burned in 1755. And while he rebuilt, his business and personal fortune never fully recovered from the disaster.

is sometimes to be found a tough, cloudy sort of glue that smells very disagreeably, and is not fit to come into a decent joiner's shop. The glue-pot consists of two parts, an outer kettle to hold water and an inner one to contain the glue. Some pots are made with a handle to the outside kettle only; there should be one to the inside one also – the want of it is very inconvenient. The apprentice should take care always to keep the water-kettle full, for the glue is to be boiled, not roasted, and without this being attended to the glue is burned, and the bottom of the pot cracked or worn away. When fresh glue is wanted, it should be broken with a hammer into small pieces, and care must be taken to hold it with the fingers of the left hand to prevent it from flying about the shop. The inner kettle should be filled about half full of these pieces, and hot water poured upon them from the outer kettle, so as to cover them over. It takes some hours completely to melt fresh glue, so that it is best to put it in at night, that it may be ready for the morning. By constant use, the sides of the inner kettle become covered over with glue, above the level of the liquid in it; this hardens on, and by degrees gets burnt, and if suffered to accumulate must at last be cleared out and thrown away. By a little care, however, this waste and trouble may be avoided; it is only necessary about twice a week to separate it from the sides of the kettle by a turn-screw or dull chisel, pushing it down to the bottom and putting water over it as if it were fresh glue: thus the glue-pot may be kept constantly clean and fit for use. Serious accidents have sometimes arisen from a very unnecessary want of care in taking the glue-pot off the fire, and placing it at once upon the bench, without looking at it. A hot cinder sticking to the bottom has set the shavings and the shop on fire. A piece of wood should be provided, a few inches larger than the bottom of the kettle, to set it upon. Thus, besides avoiding the risk of fire, the bench and the work upon it will be kept clean. An apprentice will learn also, after having burnt his fingers and dropped the kettle once or twice, that it is as well to use a bit of wood to take it off the fire with.

In a joiner's shop where a good deal of work is done, there are many nails<sup>3</sup> used for one purpose or another, which are thrown on one side as crooked and not fit for use. Now, it is not worth the journeymen's while to leave their work to straighten them, so they are left for the apprentice to set right at his leisure time, for it would be wasteful not to use them again. There is generally to be found in the shop some piece of iron with a flat face, which is used as a kind of anvil; or if not, a large hammer fixed face upwards in the vice, or a large axe-head with the

CARPENTERS' WORK.		7	
<b>Nails and Brads,</b>		<b>Wrought Butts &amp; Screws,</b>	
<i>Per Hundred.</i>		<i>Per Pair.</i>	
	<i>s. d.</i>	<i>s. d.</i>	
Two penny . . . . .	0 2½	Inch and a half . . . . .	0 6
Three penny . . . . .	0 3	Inch and three quarters . . . . .	0 8
Four penny . . . . .	0 4	Two inch . . . . .	0 9
Six penny . . . . .	0 6	Two and a quarter . . . . .	0 10
Eight penny . . . . .	0 8	Two and a half . . . . .	1 0
Ten penny . . . . .	0 10	Two and three quarters . . . . .	1 2
Twenty penny . . . . .	1 8	Three inch . . . . .	1 3
Two shilling ditto . . . . .	2 0	Three and a half . . . . .	1 4
Spikes, per lb. . . . .	0 6	Four inch . . . . .	1 6
Holdfasts and Wallhooks . . . . .	0 6	Three inch rising ditto . . . . .	1 4
Ditto, each . . . . .	0 2	Three and a half ditto . . . . .	2 3
		Four inch ditto . . . . .	2 9
<i>All nails are sold by weight, and seldom exceed nine hundred to the thousand.</i>		<b>Cast Back Flaps,</b>	
<b>Screws,</b>		<i>With Screws, Per Pair.</i>	
<i>Per Dozen.</i>		Inch . . . . .	0 5
Three quarter inch . . . . .	0 2	Inch and a quarter . . . . .	0 6
Inch . . . . .	0 3	Inch and a half . . . . .	0 7
Inch and a quarter . . . . .	0 4	Inch and three quarters . . . . .	0 8
Inch and a half . . . . .	0 4½	Two inch . . . . .	0 9
Inch and three quarters . . . . .	0 5		
Two inch . . . . .	0 6	<b>Wrought Ditto,</b>	
Two and a half . . . . .	0 7	<i>With Screws, Per Pair.</i>	
Three inch . . . . .	0 9	Inch . . . . .	0 7
Three and a half . . . . .	1 0	Inch and a quarter . . . . .	0 8
<i>Screws are extremely various in strength and price, though all bear their names from their length; the above calculations are made from an average description.</i>		Inch and a half . . . . .	0 9
<b>Cast Butts and Screws,</b>		Inch and three quarters . . . . .	0 10
<i>(Per Pair)</i>		Two inch . . . . .	0 11
Inch and a quarter . . . . .	0 5		
Inch and a half . . . . .	0 6	<b>Side or H Hinges,</b>	
Inch and three quarters . . . . .	0 7	<i>With Screws, Per Pair.</i>	
Two inch . . . . .	0 8	Three inch . . . . .	0 6
Two and a quarter . . . . .	0 9	Four inch . . . . .	0 8
Two and a half . . . . .	0 10	Five inch . . . . .	0 10
Two and three quarters . . . . .	0 11	Six inch . . . . .	1 0
Three inch . . . . .	1 0	Seven inch . . . . .	1 2
Three and a half . . . . .	1 2	Eight inch . . . . .	1 4
Four inch . . . . .	1 4	Ten inch . . . . .	1 6
Ditto projecting, ditto . . . . .	2 3		
Ditto flush ditto . . . . .	0 0	<b>Brass Flush Bolts</b>	
		<i>Per Inch.</i>	
		Half inch wide . . . . .	0 2½
		Five-eighth ditto . . . . .	0 3

<sup>3</sup>This section on straightening nails might seem like a lot of make-work today. Even by 1839, commodities such as nails were getting less expensive, but figuring that the author of this book is writing about earlier events, this section really shows how valuable commercial items were. Today we buy most common nails in sizes like “3 penny,” “4 penny,” “6 penny,” etc. These terms actually correspond to the cost of 100 nails in the early 19th century. “Skyring’s” 1833 price guide (above) lists all the nails sizes, and their costs are indeed reflected in their names – although the two-penny nail, which was a tuppence (two pennies) in 1823, had risen to two and a half pence per 100 by 1833.

edge downwards, will answer the purpose well; on this the nails may be straightened with a smaller hammer. This is not so easy to be done as it would seem at first sight, and the apprentice may expect to break a great many nails and to hurt his fingers very often before he becomes expert; but practice will teach him by degrees the best way, till at last his straightened nails will be just as good, though perhaps not so good-looking, as new ones. Where a nail is very crooked, he will soon find that he must straighten it gradually, a hard blow would break it at once, but five or six gentle ones, applied first at one side and then at another, as they are wanted, will set it as straight as ever; but if it does break, or even crack, it must be thrown away; a bad nail is not worth the time it would lose to the workman, and the work that it might chance to spoil. The apprentice that has learned to straighten nails, will also be led to consider the best way of drawing them out of wood with the pincers when there is occasion; in being drawn out they are very often bent by carelessness so much that it is impossible to straighten them again. It may seem strange to say it, but as much skill may be shewn in drawing a nail as in drawing a tooth; the bungling joiner breaks the nail and leaves an ugly battered hole in the wood, just as the unskilful dentist breaks the tooth and mangles the gum. As the nails are straightened they must be carefully sorted, and put each in its proper place in the nail-box. There are a great many different kinds of nails, distinguished by different names. Nails have all heads, but of very different kinds. Some are flat; others rose-headed, that is, with the head rising in the middle; others, again, clasp-headed, which are like the rose-headed ones with the head cut off at the two sides of the nail; and there are many other sorts, which may be learned easily when they are to be seen. Sprigs or brads have no head, only just a very small projection on one side at the top; they are used for neater work, where there is not so much need of strength, and are driven down by a punch a little below the surface of the wood, so that the hole over them may be filled up with putty. Both nails and brads are made of various sizes; the smallest are called twopenny, from their price being two-pence a hundred; they rise upwards, threepenny, fourpenny, &c., to sixpenny; beyond which are eightpenny and tenpenny. The larger nails beyond this are described by their length, three-inch nails, &c. The smallest nails of all are called tacks, and cost a penny a hundred. The size of the different nails was fixed long ago, and improvements have since taken place in the manufacture of them, which have reduced their price. The names are,

however, still kept for convenience; the twopenny nail, for instance, is the same size as ever, but, as the price is reduced, the buyer receives at some shops about twenty-five more than the hundred. So also in the others, but fewer are given in as the nails increase in size, and the larger ones are sold by weight. In some places, however, the retail price of nails is not thus reduced, but only the wholesale. The best kind of nails are wrought, made of thin bar iron, pointed by hand, cut off to the proper length, and then headed by stamping. They are of very different makes, some thick and clumsy, and others nicely pointed and well finished. The careful workman well knows from the look of a nail whether it will suit his purpose, and shews great experience and care in buying his nails.

Besides the wrought nails, there are what are called cut ones. These are made by a most ingenious machine, which it is well worth any man's while who uses nails to go and see, if ever he has a day to spend in Birmingham. Suppose nails are wanted two inches long, a strip of plate iron two inches wide and of a proper thickness is held by a man, who pushes it end foremost against the machine, which is worked by the steam-engine. It cuts off a piece in the shape of a nail, narrow towards the point and broader towards the head; it also holds the piece thus cut off while a blow is struck by another part of the machine to form the head, and the nail then falls into a box to receive it. The man turns the plate over as each nail is cut off, in order to keep it straight, and thus the thicker and the thinner end balance each other, each pair of nails requiring a straight piece. The machine will make about 700 tenpenny nails in an hour, of the smaller kinds many more, of tacks sometimes 2,000. The cut nails are more brittle than the wrought ones, and seldom so well shaped; they are, however, much cheaper, and answer well for many purposes. It is easy to tell them, at first sight, from their different workmanship.

*4People have been sharpening things on grindstones and flat stones for millennia. It's such a common operation in every trade that there is almost no mention of the practice of it anywhere. It was too obvious to waste space on in professional books. Joseph Moxon, who was writing for the amateur, does give a sort of description of grinding and honing in "Mechanick Exercises," but in "The Joiner and Cabinet Maker" we have the first detailed look at early 19th-century English grinding practice.*

*Grinding stones of the period were made using fairly soft sandstone. In a professional cutler's or toolmaker's grinding shop, big, dangerous, 4'-diameter wheels were used. In a rural shop, the wheels were much smaller, turned more slowly and cut slowly. My guess is that they were also not commonly dressed, and cut even more slowly as a result. The text suggests 15 minutes to grind a chisel in one case. Contrast*

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