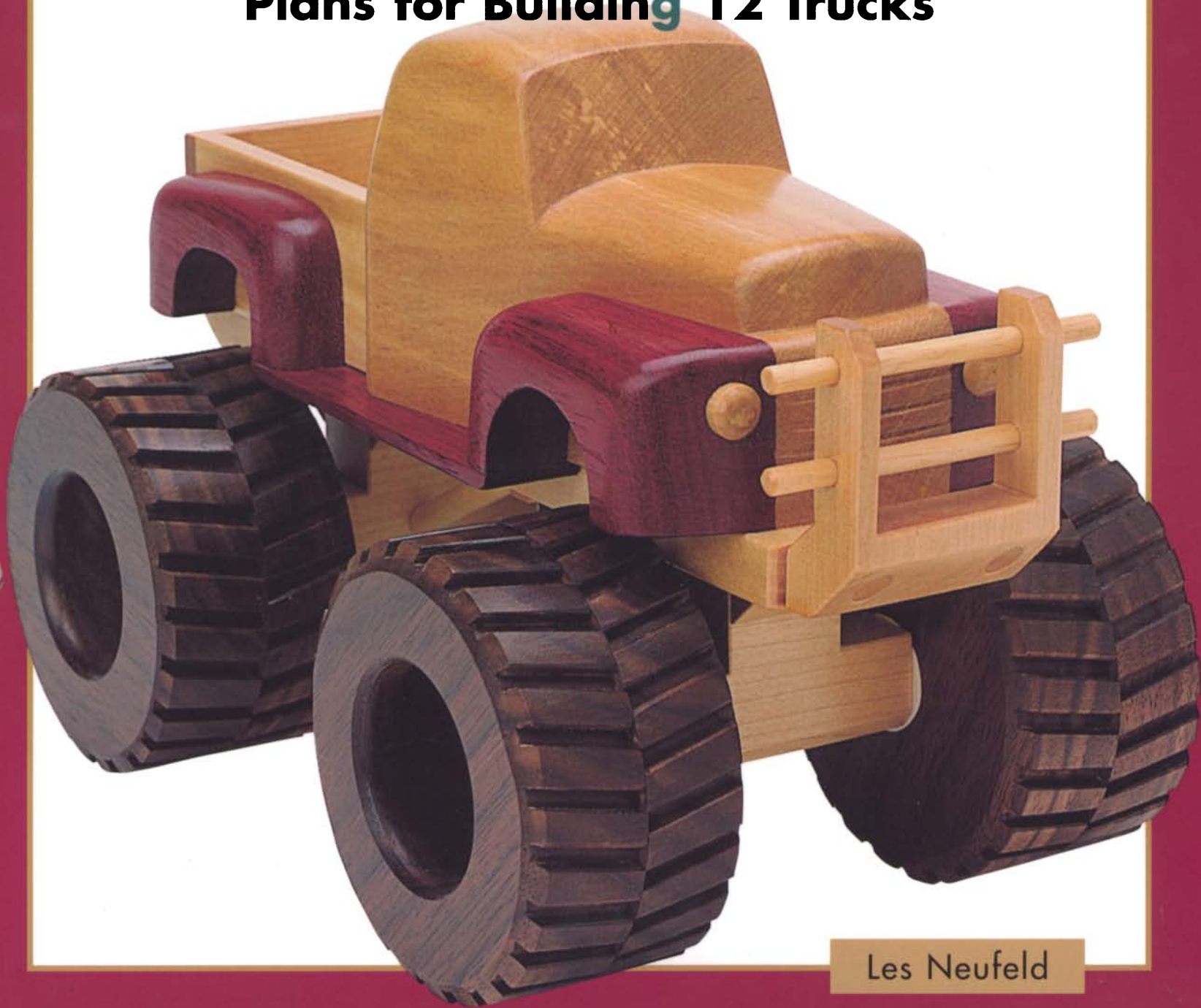


TREMENDOUS TOY TRUCKS

**With Step-by-Step Instructions and
Plans for Building 12 Trucks**



Les Neufeld

Tremendous Toy Trucks



Les Neufeld



The Taunton Press

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About Your Safety:

Working with wood is inherently dangerous. Using hand or power tools improperly or ignoring safety practices can lead to permanent injury or even death. Don't try to perform operations you learn about here (or elsewhere) unless you're certain they are safe for you. If something about an operation doesn't feel right, don't do it. Look for another way. We want you to enjoy the craft, so please keep safety foremost in your mind whenever you're in the shop.

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*To my wonderful children: Eric, Kevin, and Lisa.
Without you, it would never have occurred to me
to make these toys or write this book.*



Acknowledgments

Many people have worked on this book, in one way or another.

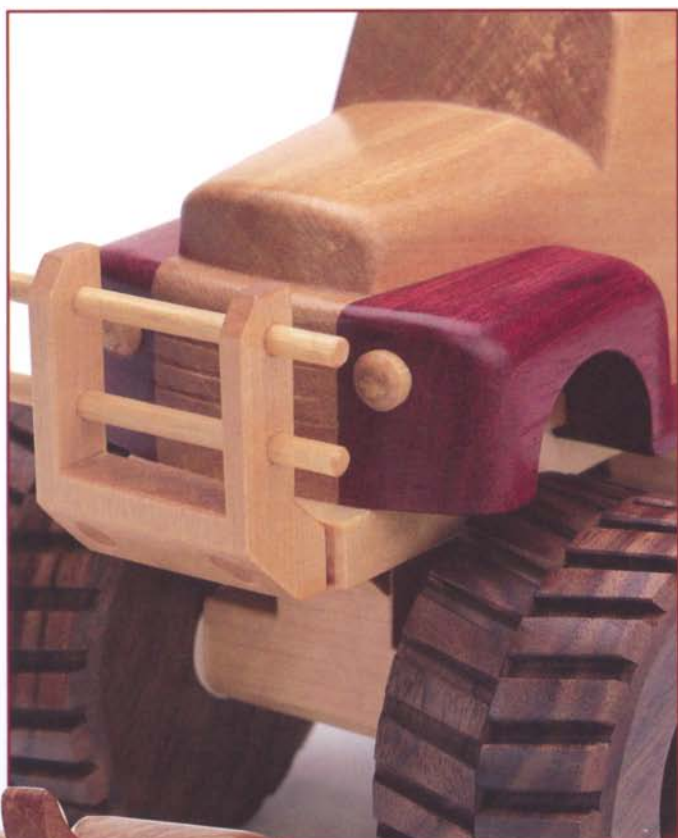
My wife, Corrinne, helped in a variety of ways. She took photos, worked on the projects while I took photos, and provided me with advice on writing and toy design. During the writing process, she took over extra household duties to allow me extra time to write and build, maintained her own day job, continued her college education, and published her own book. It occurs to me that this is fairly impressive. As with most things, Corrinne, I couldn't have done it without you.

Corrinne and I have three children, all of whom had an active part in this book. Eric, Kevin, and Lisa each snapped the shutter a few times and provided a sounding board for each toy design. Kevin brought a stream of friends over, and together they played with the toys for many hours. This gave each design a good workout and resulted in many suggestions and improvements.

My father is a craftsman who has always believed that if a job is worth doing, it is worth doing right: "It may take a little longer, but it will be better." He spent many frustrating moments attempting to pass on this philosophy to his children. To the extent that these toys and this book turned out well, he attained some success and should receive credit.

Strother Purdy was the editor at Taunton who first went to bat for this book and for me. Although he has left Taunton to pursue his own fine woodworking endeavors, he was instrumental in getting this book off the ground. Thank you, Strother.

Tom Clark inherited *Tremendous Toy Trucks* from Strother and had the job of putting the book together and coordinating the myriad details. I have found that capable and understanding editors are vital to the process of writing a book. My thanks to Tom, Suzanne, and the rest of the team at Taunton.



Making Toy Trucks—and More

Although I have built projects from kitchen

cabinets to Queen Anne reproductions, few have been as enjoyable and rewarding as these wooden toys. Part of this has been the pleasure that comes from seeing children's eyes light up as they receive and play with the toys and part of it is the enjoyment of the toy-making process itself.

It is reassuring to find out that in a world of battery-powered, remote-controlled toys, attractive, handmade wooden toys still hold great kid appeal. Not only are the toys popular, they are inexpensive and reasonably easy to make—a sort of “no pressure” project. There are no hand-cut dovetails and no mortise-and-tenon joints. Because the parts are small, if one is cut undersize a new one can be made quickly and inexpensively. Furthermore, the undersize part may very well work anyway—does it really matter if the exhaust stack is $\frac{1}{16}$ in. or $\frac{1}{8}$ in. short? Not likely.

The projects in this book are toys, not models. Models are wonderful things to build—and where possible these toys look like models—but the first goal of this book was always to make durable toys that kids love to use. Our two younger children, Kevin and Lisa, along with their friends, played with the prototypes and supplied many comments and suggestions along the way. Kevin was and is an active, energetic lad, to put it mildly, so each of these toys has gone through repeated design cycles until it is “Kevin proof.” Short of repeatedly hurling the toys across the room (which Kevin never tried), they should last many years and even a generation or two.

The second goal is to make it possible for a toy maker of limited experience to have success in making quality toys, using a limited amount of equipment. To that end, the steps are detailed clearly, using photographs to illustrate all but the simplest steps. Some expert woodworkers will find more photographs than they really need, but no one should find fewer than he or she needs.

You will not likely read this type of book as you would a novel. You may start with the skidder in chapter 7, then build the dump truck in chapter 3. For this reason, there is some repetition from chapter to chapter. I have dealt with each chapter assuming it was the first one you decided to tackle. However, the toys are grouped together when it is natural for them to be used together: For example, the log truck, skidder, and log loader are in consecutive chapters.

There is no doubt that accomplished woodworkers will have other ways of doing certain things. Similarly, you may find design additions or changes you would like to make as you go along. If the toys are intended for very young children, you may want to omit some of the smaller parts or shorten the exhaust stacks to cab height, for example.

Machine setup

Although expensive machines are not required, the good setup of each machine is required. This is especially important in the absence of a jointer or planer. Take time to set the disk-sander table exactly square to the disk and to set the bandsaw table exactly square to the blade. In this way the parts can be squared up as accurately as needed for any of the toys. (For that matter, a jointer is not much use either, unless the table and fence are set accurately.)

Gluing and clamping

The toys in this book were assembled using common white carpenter's glue (PVA). This glue does not need extreme clamping pressure—in fact, excessive pressure produces a weaker joint than moderate pressure. If the parts fit together nicely without clamping, then I generally do not clamp them. Rubbing the parts with a small side-to-side motion will squeeze the glue thin enough that you can suddenly feel it start to grab. At this point, the part can be left alone, and the resulting joint will be very strong—generally stronger than the wood itself.

This being the case, much of the assembly of these toys is greatly simplified because some parts are odd shaped and cannot be clamped easily.

When the glue surface is large, such as in a laminating operation, clamps are needed to eliminate gaps in the joint. In these cases clamping is required, but use only enough pressure to bring the parts together. Where the parts join snugly without gaps, clamping is generally not necessary.

If in doubt, glue a few small scrap pieces together without clamping, then try to break them. You will likely be impressed with the strength of the joint.

Template use

Some toy parts have curves or many hole locations that can be marked out much easier if a template is used. At the end of each chapter, you will find templates if required, although the measurements are given in the drawings if you would rather measure. If you decide to use the templates, there are a few options regarding their use.

Some of the templates are full size and some have been reduced. Ideally you can photocopy the reduced templates on a machine that can adjust the size to the needed dimensions. This can be a trial-and-error procedure until the drawing comes out with the required overall dimension.

The template can be traced using carbon paper or can be cut out and traced around, or you could rub the underside with pencil lead, which transforms the template into carbon paper. If using a carbon-paper option, a ballpoint pen seems to work better for tracing than a pencil. Sometimes it is easiest to mark the hole centers and outlines using an awl to press through the template, making small indentations in the wood. These marks are then joined using a straightedge and a pencil.

The best method probably depends on the type of part being made, although it is hard to go wrong.

Choice of wood

These toys are made of hardwood and those types of hardwood that are actually hard. The woods that seems to stand up best are maple, birch, walnut, and equivalent-strength woods. I made a few toys using oak, but somehow the dramatic grain took away from the appearance of the toy machine. So in the end, the best woods were the ones that were hard but had less visible grain.

To get the dramatic color differences for the fenders of the trucks and other miscellaneous parts, I bought or begged a few small pieces of bloodwood and purpleheart. I happened to see these in a joinery shop and chose them because they were a nice color and were available. Small

pieces of exotic woods can be purchased from a variety of companies such as Lee Valley. The toys look much sharper with a few accents.

Wood supply

Ideally these toys are made from quality hardwoods. This will reduce the wear and tear that forms in the way of small dents and chips as children play. Also, assuming you may be making these toys without the use of a thickness planer or jointer, you will want some wood that is already sized.

There are several ways to obtain this wood.

Many cabinet shops and even high-school shops have small scraps of hardwood. Since many parts are only a few inches long or wide, small scraps are useful. Often lumber building-supply stores will stock small boards of planed hardwood. As mentioned before, some hobby stores and wood-worker supply stores, such as Lee Valley, sell small blocks of exotic hardwoods, perfect for small parts. As you will notice here and there in the book, Baltic plywood is sometimes an option, and this can be purchased at most hobby stores. It is made of many thin veneers and, while expensive for full sheets, is reasonable in the small amounts needed here.

Most of the toy parts do not require planed wood. Generally the parts are rough-sawn on the bandsaw and then planed or sanded.

Wheels and axle pins

Most of these toys use standard wheels, readily available from hobby stores and mail-order companies. They are 2 in. dia., with the exception of the pickup and travel trailer of chapter 2, which uses 1 1/2-in. wheels. Axle pins are available wherever the wheels are sold. While these wheels can be made, it is a time-consuming process if you want them to look as good as the factory-made wheels do. The handmade wheels used on the loaders and the monster truck still use the standard axle pins to attach them.

Last words

It defeats the purpose of a hobby if the process becomes a chore. There certainly will be moments of frustration, but these can be reduced to a minimum if each detail is not taken too seriously. The toys in the photos are not perfect. Here and there, if you could inspect closely, you would see gaps, misaligned parts, and machine marks not sanded out. There were times when I cut the part too short, but if it still looked fine I left it alone and just changed the drawing a little. Even so, I still figure they turned out to be great-looking toys, almost as good as yours will be.

Chapter 1 **Monster Truck**



This truck is a '48 Ford and a real favorite.

The '48 has the distinctive fenders and running boards of the era, and this toy comes quite close to being a scale model. Fortunately it is a toy as well.

Monster trucks have a definite if somewhat strange appeal. If truck appeal is based on the size of the wheels and amount of ground clearance, this one is a winner. For children, the wheels and front bumper are the biggest attraction; for adults, it's the classic lines of the truck itself.

The rounded fenders and cab make for a little more handwork in filing the corners, but since the truck is a toy and not a scale model and the exact amount of rounding is not critical, it all ends up being quite easy to do. Even the wheels are easy to make—although cutting all the treads takes an hour or more on the bandsaw (shorter if you are using a table saw).

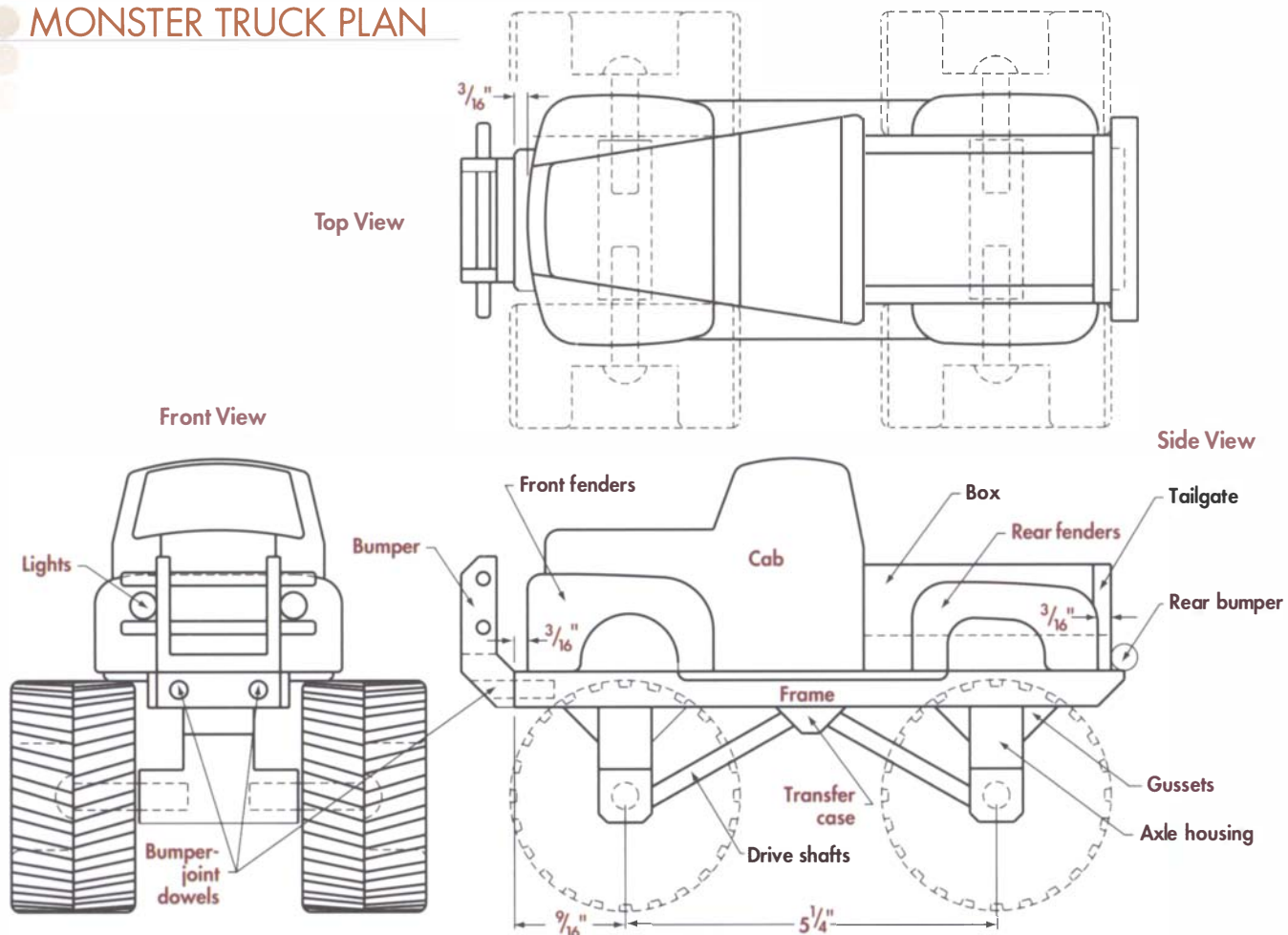
Colors are fairly important in the appearance of this truck, more so than with most of the wooden toys in this book. Using contrasting wood for the fenders and the running boards is almost a necessity for the overall appearance (and is true to the original paint schemes of old Ford trucks). I used birch for the cab and box and purpleheart for the fenders and running boards. I used black walnut for the wheels, but a light wood would be fine as well.

The truck consists of a shaped block (the cab) and a rectangular block (the box), glued to a flat frame, with the large wheels attached underneath.

MONSTER TRUCK

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Cab	4 ³ / ₄ x 3 x 3	1	
Box	3 ¹ / ₈ x 2 ³ / ₈ x 1 ³ / ₈	1	
Tailgate	2 ³ / ₈ x 1 ³ / ₈ x 1/4	1	Cut about 2 ¹ / ₂ in. x 1 ¹ / ₂ in. x 1/4 in.; trim later
Front fenders	2 ⁵ / ₈ x 1 ³ / ₈ x 1	2	Mirror images
Rear fenders	2 ⁵ / ₈ x 1 ¹ / ₄ x 9/16	2	Mirror images
Frame	8 ⁵ / ₈ x 2 x 1/2	1	
Running boards	3 ³ / ₄ x 3/4 x 1/8	2	Check truck for exact cutting size
Front bumper	2 ¹ / ₈ x 1 ³ / ₄ x 3/4	1	Drill before cutting to shape; note grain direction
Front-bumper dowels	3/16 dowel x 2 ³ / ₄ long	2	
Bumper-joint dowel	1/4 dowel x 1 ¹ / ₄ long	2	
Headlights	3/8 dowel x 3/8 long	2	Round end before cutting to length
Rear bumper	3/8 dowel x 2 ⁷ / ₈ long	1	
Axle housings	2 ¹ / ₄ x 1 ⁵ / ₈ x 3/4	2	Note grain direction
Axle-housing gussets	1 x 1/2 x 1/2	4	Cut extra for transfer case
Transfer case	1 x 3/4 x 3/8	1	Make from gusset material
Drive shafts	1/4 dowel x 2 ⁵ / ₁₆ long	2	Cut to fit truck
Axle pins	1 ¹ / ₃₂ dia.	4	
Wheels	3 ¹ / ₄ dia. x 1 ³ / ₄ thick	4	Cut eight halves, 3 ¹ / ₄ in. dia. x 7/8 (or 3/4) in. thick

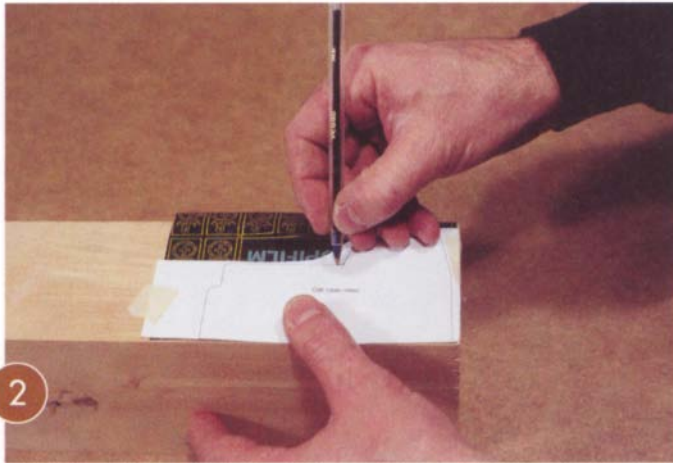
MONSTER TRUCK PLAN



Cab

The cab is made separately from the box, which allows the box to be “hollowed out.” Make the cab, the box, and the frame, then glue the cab and box to the frame. The fenders are glued to the sides of the cab and box after this.

1. Laminate the wood, if you need to. I used a block of local birch hardwood, which I can get in stock thick enough so that I don’t have to laminate.



2. Trace out the side profile using the template on p. 23. Photocopying these templates is a good idea, but make sure the image comes out full size, enlarging as needed. I tend to use carbon paper to trace onto the wood, but you could cut out the template and mark around it with a sharp pencil.

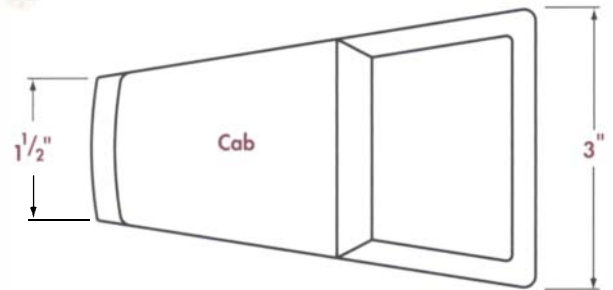
3. Lay out the top profile (1½ in. wide at the front, 3 in. at the back).



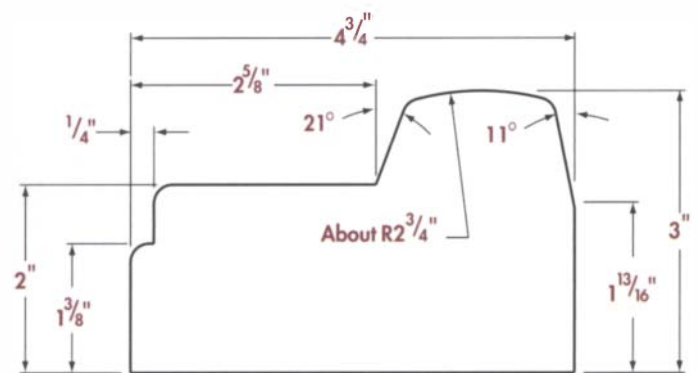
4. Cut the top profile, but leave about ½ in. uncut so that you can still see the side profile.
5. Cut the side profile.

CAB

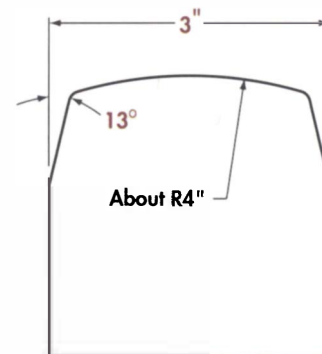
Top View



Side View



End View





6. Finish cutting to remove the sides.

7. Sand the sides and ends using a disk sander or belt sander. Fine grit is best, although a coarser, well-used belt or disk will also work. The back of the cab should be flat to allow a good fit with the box.

8. Round the roof, the hood, and the hood front using a file and then sandpaper.

The grill area can be rounded using a disk sander, but be careful not to round it too much. It is better to leave it a little too flat if anything, and then round it more when the fenders are glued on.

If you are brave, the roof can be rounded freehand using the disk sander, but do it lightly and carefully. Take your time here; be an artist at work. It is much better to take a little longer and get nice, even rounded edges than to end up with nicks and bumps. The roof rounds both ways, front to back and side to side. The hood just rounds from side to side, a little more in the front than at the windshield.

The sizes in the drawing (13-degree angles and the 4-in. radius) are just to give you a general idea. Look at the drawing to see how it should look, and then shape the side windows and the roof by eye.

9. File rounded edges on all corners until you like how it looks. Rounds of between $\frac{1}{8}$ -in. to $\frac{1}{4}$ -in. radius seem best.

Box

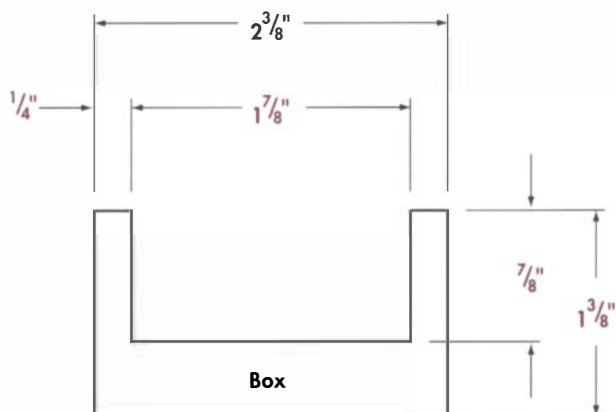
The box is pretty straightforward. You don't have to cut out the inside if you don't want to; just pretend the box has a cover. It looks fine that way, too, if it suits you. The tailgate is attached to one end of the box, and the cab is attached to the other end, with the whole assembly glued to the frame.

1. Saw the rectangular block to shape. Use a table saw or miter box if you have it, but it works if you draw a fine line with a pencil and square, then carefully disk-sand to it (that's what I've done).

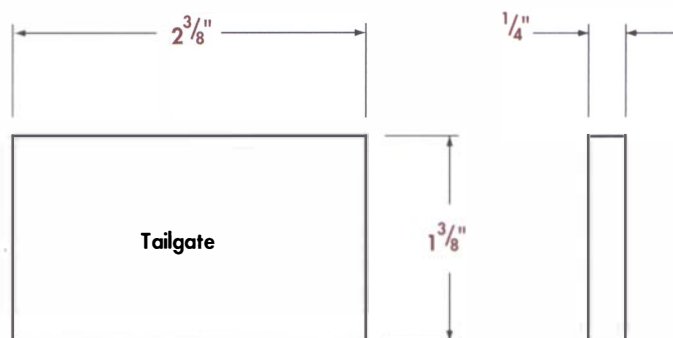
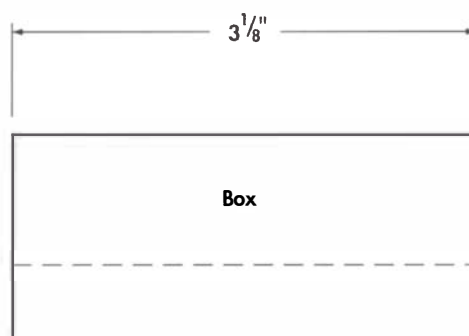
2. Bandsaw out the box interior. For safety and accuracy reasons, it is often a good idea to use a handscrew clamp or C-clamp to hold small parts when bandsawing (see the top photo on p. 8).

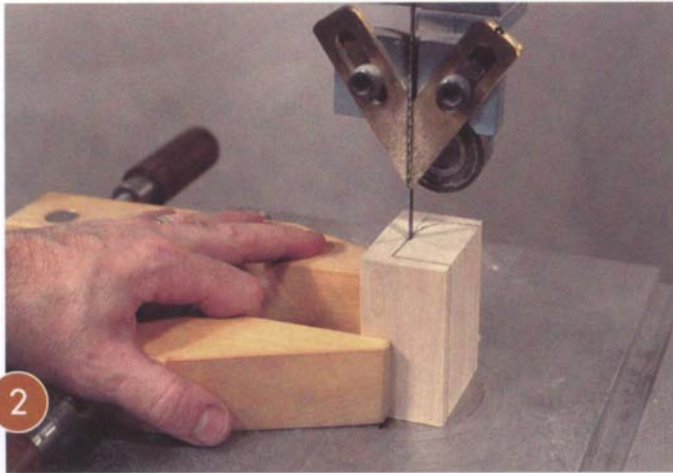
BOX

End View



Side View



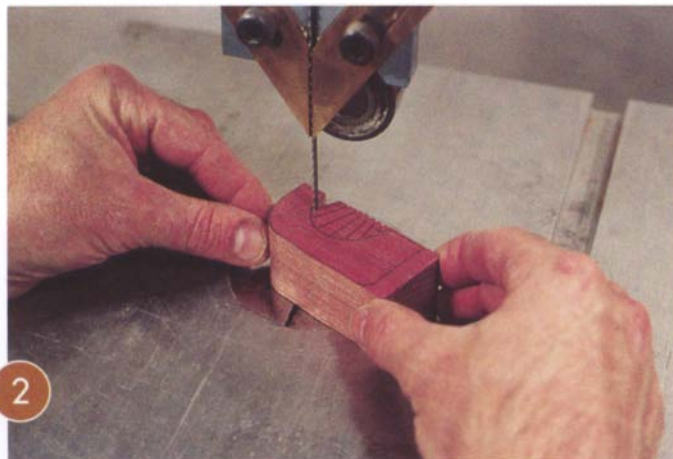


3. File and sand the interior until smooth.
4. Cut out the tailgate to match the box. Leave it a little oversize in length and width, and sand it down after it is glued in place.
5. Bevel all the corners slightly, just so they are not sharp.

Fenders

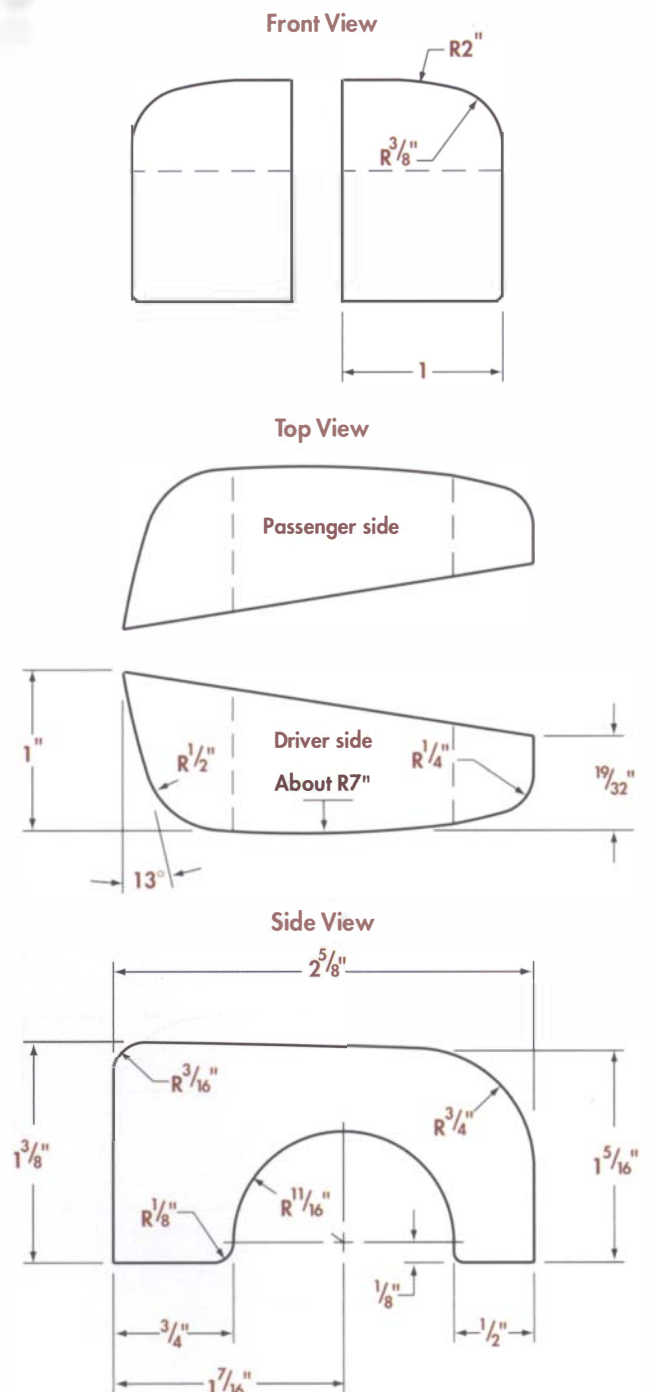
The fenders are glued to the sides of the cab and the box. Most of the visible surfaces are quite rounded, but don't be intimidated. The rounds are dimensioned accurately on the drawings, but you really just need to cut out the fenders using the templates and then round all the existing corners until they look satisfactory, even if they are not exactly as shown on the drawings.

The wood needs to be 1 in. thick for the front fenders but only $\frac{5}{16}$ in. for the rear fenders. You'll probably cut them both out of 1-in. wood, then saw and sand the rear fenders thinner.



1. Choose a wood that contrasts with the cab and box. I had a small piece of purpleheart, so that's what I used. Trace out the shapes using the templates provided on p. 23.
2. Bandsaw the outlines, including the wheel wells. Cut carefully; this will save a fair bit of filing and sanding later.

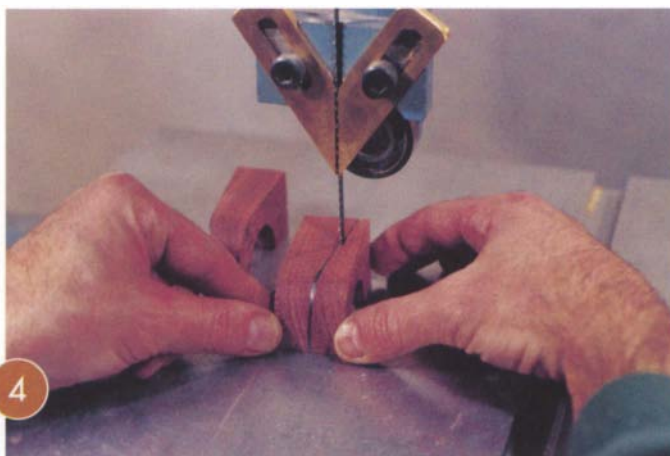
FRONT FENDERS



3. Use a small sanding drum on the drill press to smooth out the wheel wells. These drums are inexpensive and are a great help for the toys in this book. If you don't have one, a round file and sandpaper will do the same job; it will just take a little longer. If you are filing, file toward the inside surface, so that any breakout does not show after assembly.



4. Cut the long-angled surface of the front fenders. This angle matches the angle on the side of the cab. Sand it exactly flat and straight, so it will have good contact with the straight sides of the cab. Don't forget there is a right side and a left side, which are mirror images.



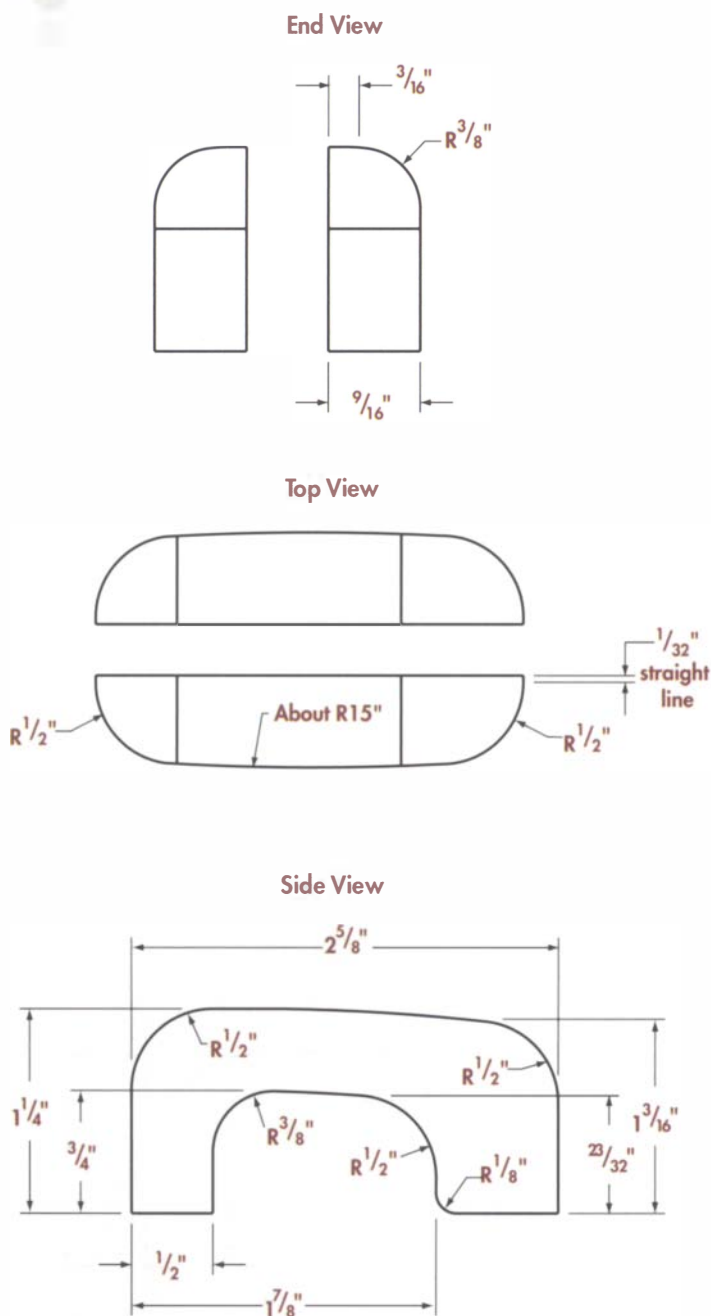
5. Cut the angle at the front of the front fenders. Lay it out using the top view of the template.

6. Use the disk sander or belt sander to shape the top profile of each fender. Trace it out from the template if that helps, but doing it by eye will work fine, too. It does not have to be identical to the template.

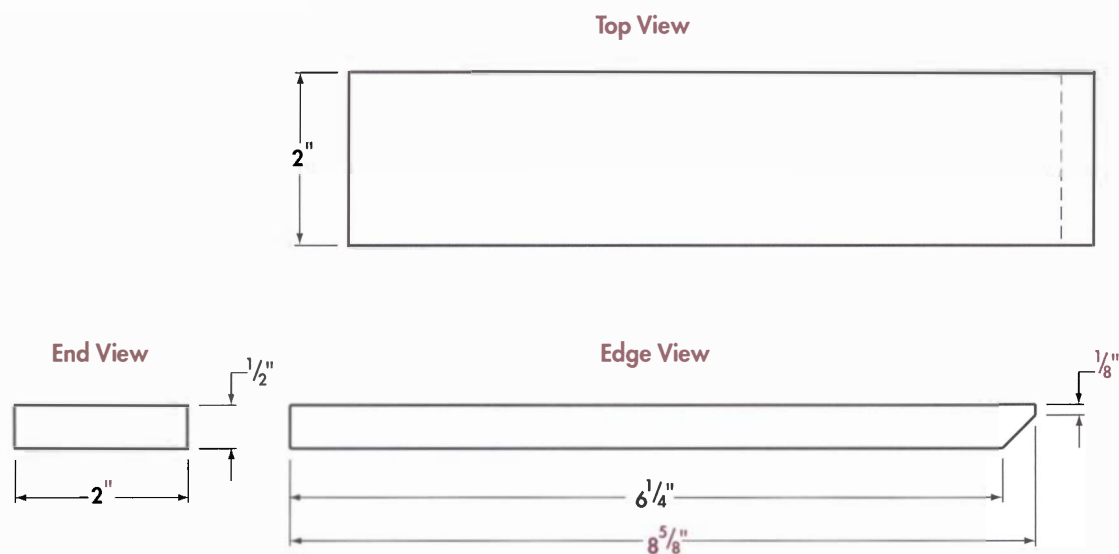
7. File and sand the rounded edges using the end-view drawing and template to help you get the approximate shape needed. Shaping the fenders freehand on the disk sander works well if you are careful not to overdo it.

8. Blend all the corners and curves by hand, using sandpaper.

REAR FENDERS



FRAME



Frame

The cab and the box sit on this frame, and like a real truck, the frame holds the parts together. The frame itself is just a small board.

1. Cut the frame to size.
2. Cut or sand the small angle at one end.
3. Sand as needed.

Assembly

Here the front fenders are glued to the cab, then the cab and box are glued to the frame. The rear fenders are glued in place last.

1. Spread a little glue on the front fenders, and press them into place. Rub them very lightly side to side to smear the thin layer of glue evenly, then let the glue harden once the fender is in place.

See the plan drawing on p. 5 to get a good idea of the location of the fenders. Later you will sand the front of the truck to smooth out the front curve and to ensure the fenders and the grill are flush.

2. When the glue is hard, sand to smooth out the curve at the front. Blend the curves of the cab front and the front of the fenders into one smooth arc. I do this on the disk sander, but it also will work if you do it by hand with a small smooth file and sandpaper.

3. Sand the bottom flat. I touch the bottom to a fine belt on the belt sander.

4. Glue the cab to the frame. The frame should protrude about 3/16 in. in front of the cab (see the plan drawing on p. 5).

5. Clamp the cab to the frame if needed, but if it sits flat on the frame, just press it in place. If the glue is spread thin, this large gluing surface will produce very strong adhesion without clamping.

6. Fit the box assembly to the cab. Make sure that when it is assembled and centered on the frame, the gap between the box and the cab is minimal and equal side to side. Slightly rounding the corners of the box will camouflage the gap if you can't get rid of it.



7. Spread glue on the bottom of the box, and press it into place against the frame and the cab. Clamp if you need to get rid of a stubborn crack.

8. Glue the rear fenders in place. The back of the fender will overlap onto the tailgate by about $\frac{1}{16}$ in.

Running Boards

I fit small running boards to the truck, using $\frac{1}{8}$ -in.-thick wood. This can be solid wood or $\frac{1}{8}$ -in. Baltic plywood.

1. Cut the running boards to length, checking against your truck to see if they should be a little longer or shorter. Cut the running boards $\frac{7}{8}$ in. wide to start, then reduce this to fit the truck. They should touch, or almost touch, the frame under the truck and extend out as far as the fenders do.

2. Sand as needed.

3. Put some glue on the bottom of the truck where the running boards will fit, and press them into place.

4. When the glue is hard, round the ends a little to blend them into the wheel wells. File or sand the outside edges

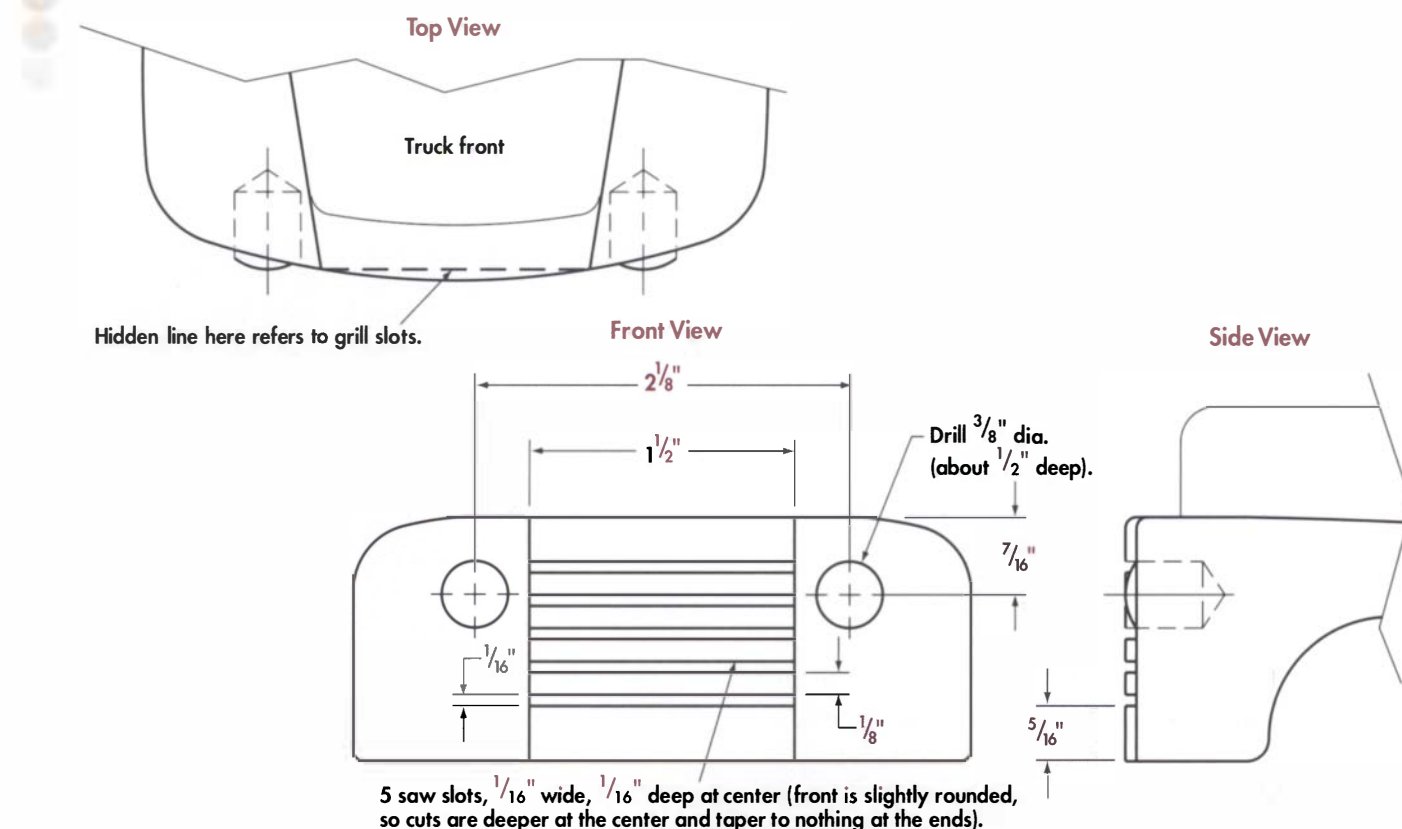


of the fenders (near the running boards) to align with the running boards as needed.

Grill/Lights

These two things are optional and do very little to change the appearance of the truck because they are mostly obscured by the oversize front bumper. Most children could not care less if you do this or not. But if you can't resist some fancy touches that children will appreciate 20 years from now, this is for you.

GRILL AND LIGHT DETAILS





1. Lay out the grill lines, then carefully saw them by hand using a small backsaw or some other small saw. Try to have the lines evenly spaced and parallel to one another. Saw until the ends of each slot just meet the fenders.

2. Lay out the location of the lights. Use an awl (or a knife) to make a locating “dent” in the center of the layout.

3. Drill the holes about $\frac{1}{2}$ in. deep with a handheld drill. Exact accuracy is not needed, but the drill needs to be held very steady so that the hole is not bell-mouthed.

4. Make the headlights by taking a piece of $\frac{3}{8}$ -in. dowel and rounding each end on the disk sander. Hand-sand a little to ensure a smooth profile on these ends.

Cut off each headlight, making each about $\frac{3}{8}$ in. long. If it is too long, it will bottom out in the hole before you want it to. Use a small file to bevel the cut end slightly so it starts more easily in the hole.

5. Use a toothpick or nail to put a little glue in the hole. Don't put any on the headlight or the surplus glue will need to be wiped off, creating a bit of a mess on the headlight.

6. Tap the light into place using a mallet. Be careful to get the light started straight; this can be a little tricky on the curved surface of the fender, so apply a gentle, patient touch here. If for some reason the holes are a little too big (this has happened to me) put in a little extra glue and slide the light into place slowly and carefully. If worst comes to worst, drill it out to $\frac{5}{16}$ in. and use a larger dowel.

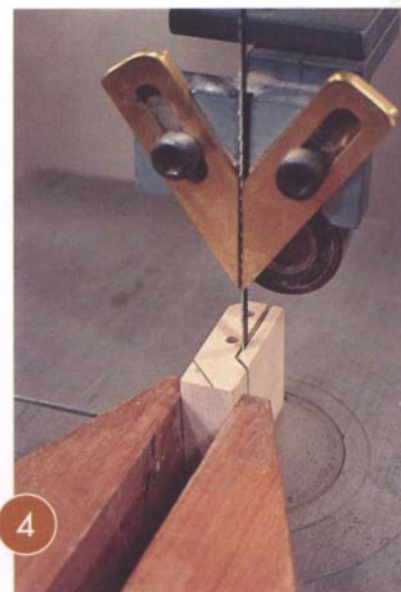
Bumpers

The front bumper is attached to the front end of the frame. Because the bumper is glued to the end grain of the frame, two dowels are added to strengthen this joint. The rear bumper is just a length of $\frac{3}{8}$ -in. dowel.

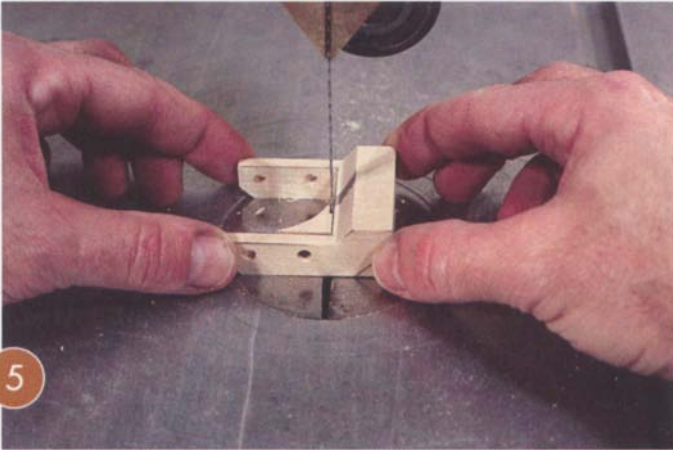
1. Cut the front-bumper block to its overall dimensions (see the cut list on p. 5). It's a good idea to have the grain running vertically, or else the two vertical arms tend to break off.

2. Lay out the side profile including hole centers by measurement or by tracing the template provided on p. 23. Don't cut out this profile yet; it is much easier to drill the holes when the block is a basic rectangle.

3. Drill the two holes. You want the dowel to be a sliding fit, so you may want to try a test hole on a scrap piece of wood. Dowels tend to vary slightly in size: Sometimes a $\frac{3}{16}$ -in. dowel slides into a $\frac{3}{16}$ -in. hole; sometimes you will need to drill it slightly oversize. I sometimes end up using number drills (#7 to #12), all of which are a little oversize.



FRONT BUMPERS



4. Cut the side profile on the bandsaw, but *not* the bottom bevel. Leave it square so that you can easily drill for the dowels that will strengthen the joint to the frame. Bevel it after the dowels are glued into the bumper/frame joint.

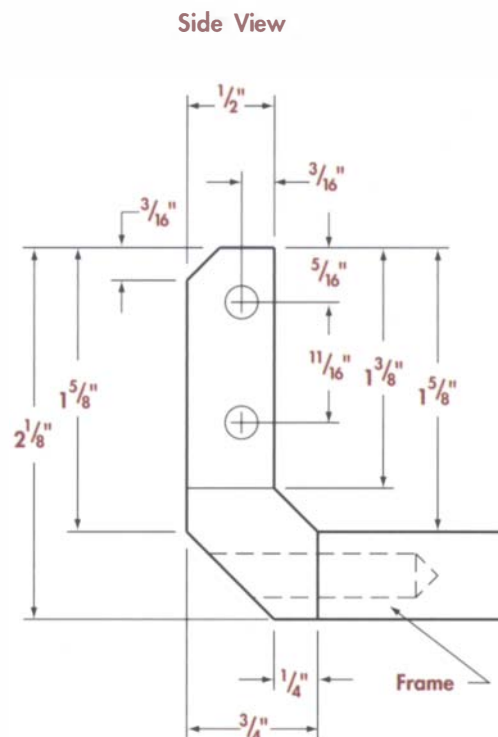
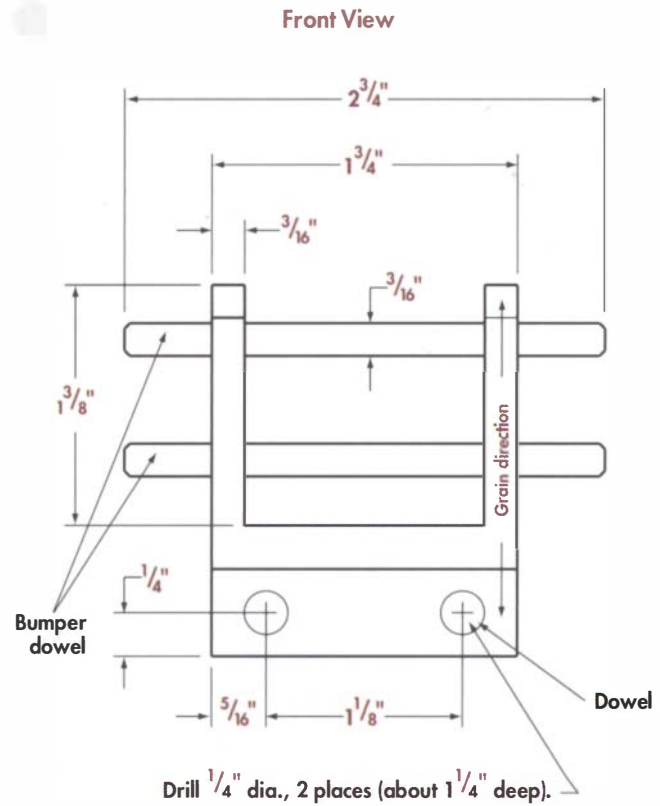
5. Cut the U shape that can be seen from the front of the truck. Lay out on the side that will face the truck grill, as this will leave the flat surface down when sawing.

6. File and sand as needed. Bevel all the corners slightly.

7. Cut and install the front-bumper dowels (2 $\frac{3}{4}$ -in.-long pieces of $\frac{3}{16}$ -in. dowel). When you do this, tap or slide the dowel into the hole until it only has to slide in another $\frac{1}{4}$ in. Then dab a tiny bit of glue on the dowel right beside the bumper. Slide the dowel in the last $\frac{1}{4}$ in. so the glued sections are now in the joint. When the glue is hard, sand the dowel ends to length if needed.

8. Glue the bumper to the front of the frame. If you can clamp this conveniently with the clamps you have, do so. If not, just press it into place and hold it for a minute.

Try to have the bumper square to the frame and have the bumper protruding down a little below the frame, if anything. Let the glue harden before drilling the dowel holes (see the top left photo on p. 14).





8. Lay out and drill the holes for the dowel. A portable drill works pretty well here, as the truck is awkward to clamp in a drill press.

10. Put glue in the holes, and tap in two short dowels.

11. Saw or sand the bevel on the bottom of the bumper, and then sand or file the bottom of the bumper flush with the frame.

12. Cut the dowel for the rear bumper, and sand the ends. Glue to the back of the truck.

Wheels

These wheels are used for the monster truck, the skidder, and the log loader (see pp. 4, 88, and 104, respectively). They take a bit of time, but they look great and are not all that hard to do.

Make the four wheels in eight halves, cut the treads, then glue the halves together. You need to make sure that two wheels are made for the driver's side and two are mirror images made for the passenger's side because these are "directional" wheels. If they are all identical, you will end up with two wheels having treads that face forward and two with treads facing backward.

There are two ways to cut the treads. One option is to use the bandsaw and shape the treads a little. The other option is to use the table saw. The wheels still come out pretty nice and it is much faster, but the bandsaw is a friendlier, safer machine. I will describe both methods.

Preparing the disks

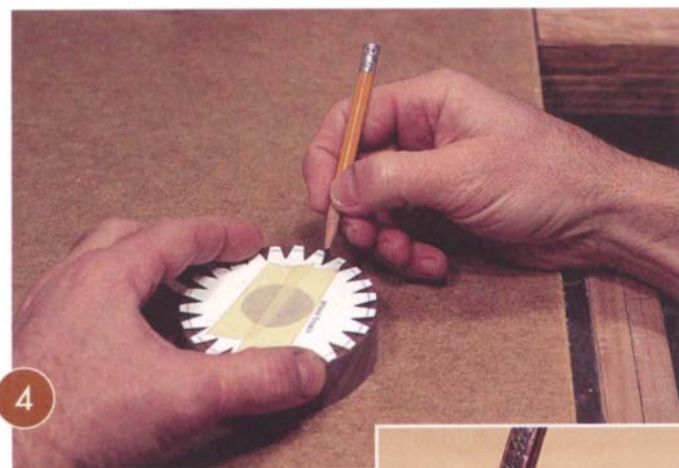
1. Lay out eight disks. Keep an eye on the center mark from your compass, as you will use it a few times yet. Use wood that is between $\frac{3}{4}$ in. and 1 in. thick, depending on what you have on hand and how wide you want the



wheels to be in the end. The skidder and the log loader will have the same wheels but a little narrower.

2. Lay out a circle that is $\frac{1}{4}$ in. smaller in diameter than the outside diameter. This line will be for the tread bottoms.

3. Bandsaw the disks just a tiny bit oversize ($\frac{1}{32}$ in.), then disk-sand them exactly to the line. Do this carefully, as you want the wheels both round and concentric to the center compass mark.

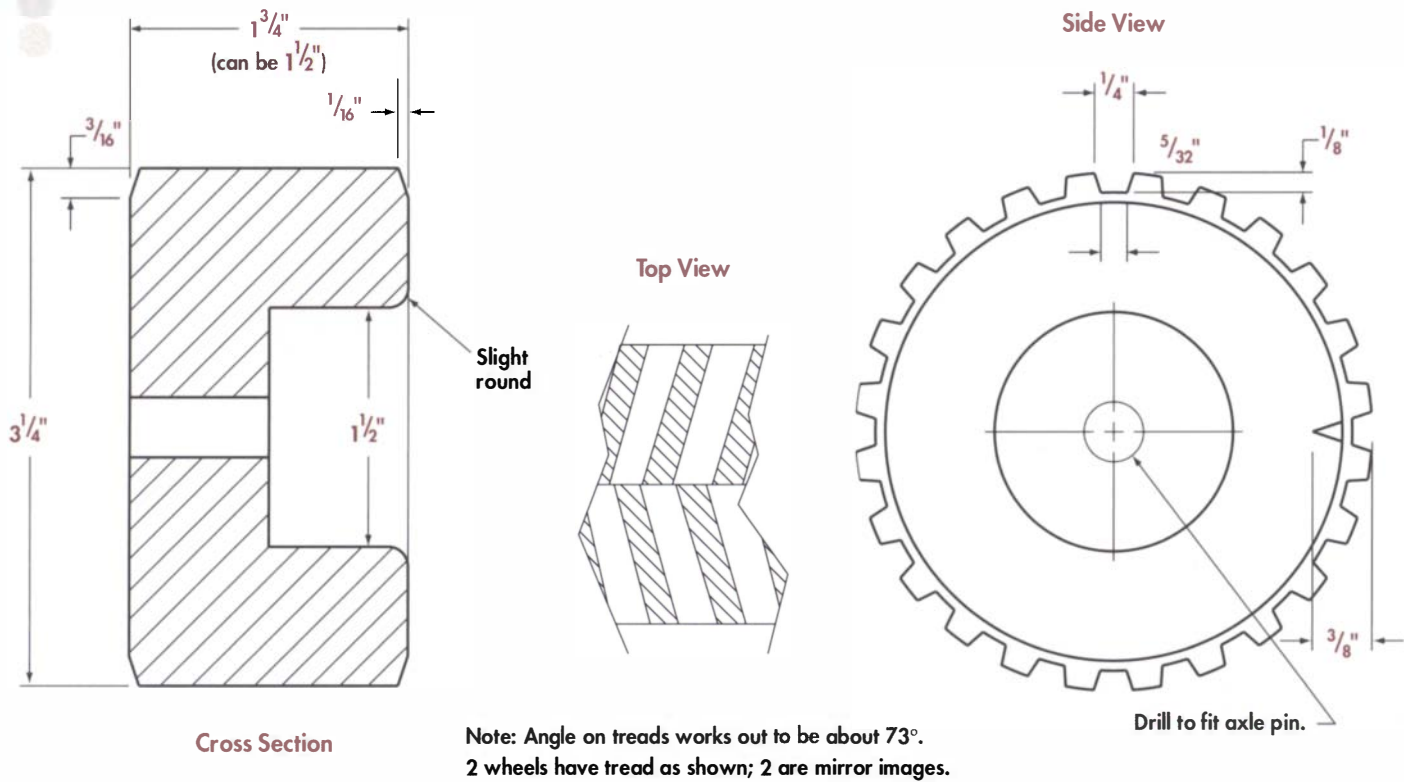


4. Lay out for the 24 treads, using the template on p. 23. It seems to be easiest in this case to cut out a photocopy of the template (use cardboard stock as heavy as the copier will take).

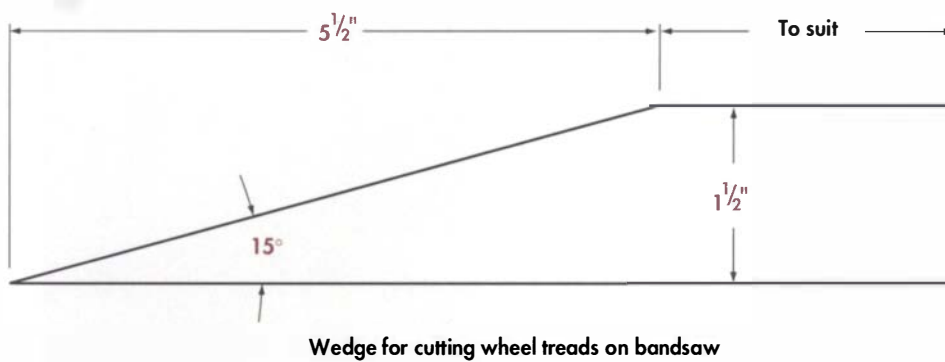
For the bandsaw method of tread cutting, cut each tread to a V shape on the



WHEELS



WHEEL JIG





template. This makes cutting out the template much easier, makes the tracing simpler, and gives a little nicer shape to the treads. The circle drawn earlier provides the layout for the bottom of the treads.

For the table-saw method, cut out the slots in the template, and mark out 24 lines on the disks. A rectangular carpenter's pencil works a little better than a regular pencil does.

5. Drill a 1½-in. hole in the center of four of the disks. Use a hole saw or a Forstner bit. A Forstner-type bit leaves a better finish.

6. Round the edges of the 1½-in. hole. Do this now if you are doing it by hand; it's too hard to do by hand after the wheel halves are glued together. File a little with a round or half-round file, then sand. Only a small radius is needed; you can decide what looks good to you (probably about a ⅛-in. radius is good enough).

If you have a router mounted on a table, with a ⅛-in. or ¼-in. roundover bit, then use it after the wheel halves are glued together. It is easier to hold the wheel at that time, making things a little safer.

Cutting the treads

Bandsaw method: You need to be able to cut an angle of about 15 degrees to the right and to the left. Since some bandsaw tables do not swivel both ways this far, the simplest solution is to cut a wedge from a 2x4, a 2x6, or an equivalent-size block of wood. The flat section on the end is to make clamping easier.

1. Clamp the wedge to the table, and saw the teeth in four disks (two that are solid and two that have the 1½-in. hole in the center).



It is a good idea to cut one practice disk of cheap wood in order to try a few teeth. Try the wheel a little higher on the wedge, as well as a little lower, until you get a sawcut that is the same depth on the top and bottom edge of the disk. The curve of the disk combined with the angle does some strange things here but nothing that a few trial tread cuts won't solve.

2. Don't rotate the wheel as you cut a given tread; instead, use the bandsaw blade as a sort of motorized file, carving out the treads. Pull up a stool; this will take a while until all treads in all disks are cut. After four disks are cut,

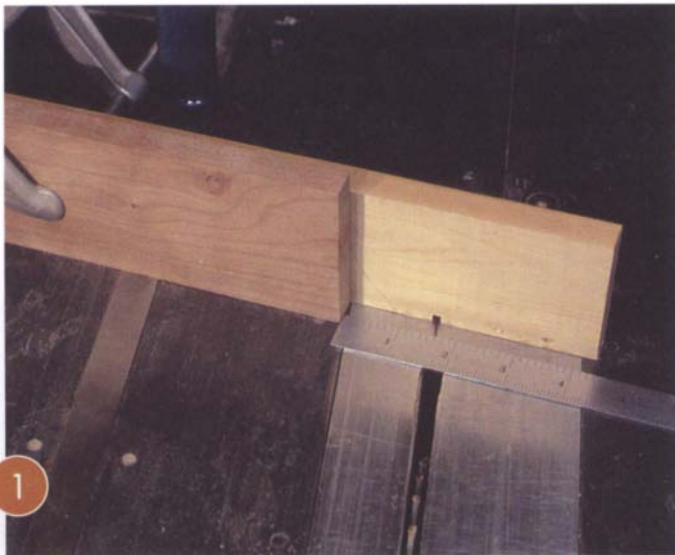


clamp the wedge on the other side of the blade, and cut the remaining four disks.

File with a small file, and sand as needed to clean up the treads.

Table-saw method: Attach a long face board to the miter gauge, and angle the miter gauge 15 degrees.

1. Clamp a stop in place to locate the wheel so the table-saw blade cuts on center to the wheel. Since the wooden wheel is being held at 15 degrees, the blade will actually enter on one side of center and exit on the other side of center. Measure so that, in the middle of the wheel, the blade will be on center.



2. Set the blade to cut $\frac{1}{8}$ in. deep.

3. Mark a line somewhere on the table, in line with blade center. I used a red marker.

4. You may want to clamp a scrap (left over from cutting the disks) to the miter gauge on the other side of the wheel. If so, have it a little loose so the wheel can still be turned freely.

5. Cut on each line. Saw the teeth in four of the disks (two that are solid and two that have the $1\frac{1}{2}$ -in. hole in the center). Don't worry if there is a little chipout at the end of the cut. Put these bad edges to the outside, where the corners are beveled later anyway.

6. Swivel the miter gauge to 15 degrees the other way, and reset the stop so the blade cuts on center.

7. Cut the other four wheels.

8. File a small bevel on each tread.

Completing the wheels

1. Glue the halves together, one drilled disk to one solid disk. Use glue sparingly, as it is hard to remove if it squeezes out into the treads or the center hole. Put the best edges of the treads together and the worst ones to the outsides. The outsides get beveled anyway, so a few chipped edges just disappear. Align the outside edges as closely as possible.



2. Drill out the $\frac{3}{8}$ -in. axle holes. It is very important to center these holes as accurately as possible. To do this, draw a $\frac{3}{8}$ -in.-dia. circle around the compass center that was made during the original layout, then enlarge the compass center mark with an awl. Now, if the drill starts cutting off center, you will be able to spot it right away and move the wheel a tiny bit to compensate.

Line up this mark using a small drill ($\frac{1}{8}$ in. or smaller). Using a small drill to line up the mark makes it easier to see the alignment with the center mark. The drill will flex a little when it is touched to the center mark, if it is off center. Align it until there is no flex when the drill is gently touched to the center mark, then change bits and drill the large one—without moving the wheel.

I hold the wheel in a handscrew clamp, although a large vise or even two small C-clamps would work. I fasten the clamp to the table with a C-clamp. Later, if you try the wheels on the truck and find that one wheel doesn't quite touch the ground, you may have to enlarge this hole to $\frac{25}{64}$ in., but let's start with $\frac{3}{8}$ in.

3. Bevel the outside corners. I do this using the disk sander, and rotate the wheel carefully by hand. The bevel does not have to be accurate, but it does look better if it is consistent all the way around. Do the inside edges first for practice, as they are not easily seen. I've clamped a small guide onto the disk-sander table to help keep the bevels consistent.



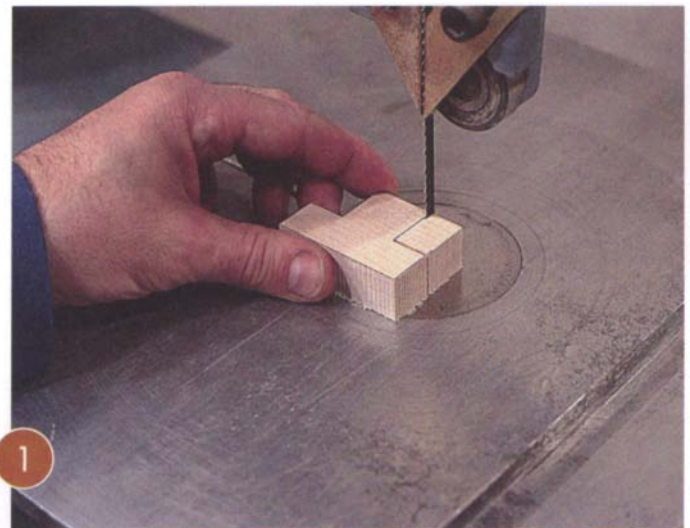
4. Run the wheels over the sander—disk or belt—to smooth the faces if there is a noticeable step where the two halves are joined.

5. Finish as desired. It is a little easier to finish the wheels separately, especially if you are using a spray finish. Before applying the finish, put some paste wax in the axle holes, using a Q-tip. This will keep the finish from adhering and will help the wheels spin more freely later.

Axle Housings

These are the T-shaped parts to which the wheels mount. Make the housings, glue them to the frame, put gussets on each one, then drill them for the axle pins.

1. Bandsaw the $\frac{3}{4}$ -in. stock to size and shape, making sure that the width of the housing is slightly wider than the frame (so the wheels will not rub on the frame). Sand as needed.



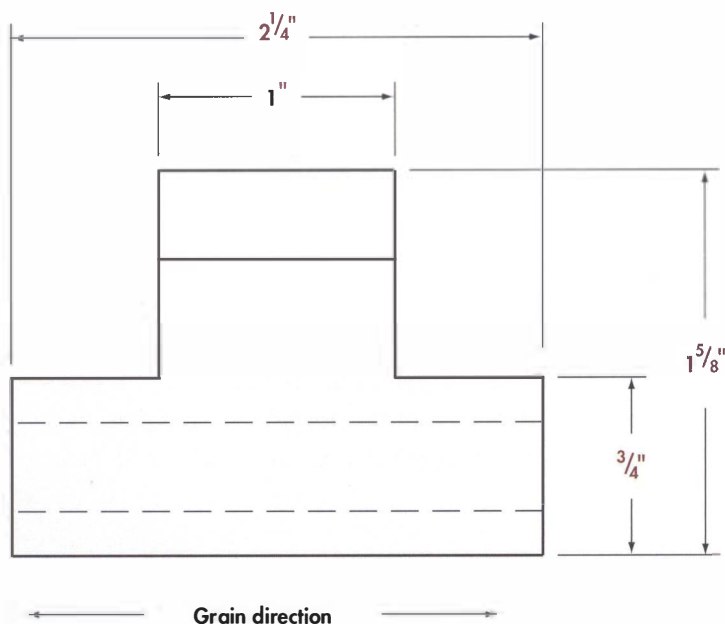
2. Glue the housings to the frame. See the plan drawing on p. 5 for location ($\frac{1}{32}$ in. out won't matter, maybe not even $\frac{1}{16}$ in.). Clamping is optional.

3. Make the triangular gusset material. Cut a strip of wood $\frac{1}{2}$ in. by $\frac{1}{2}$ in. square ($\frac{9}{16}$ in. square if you want the finished product to be exactly $\frac{1}{2}$ in. by $\frac{1}{2}$ in.) and about 6 in. long.

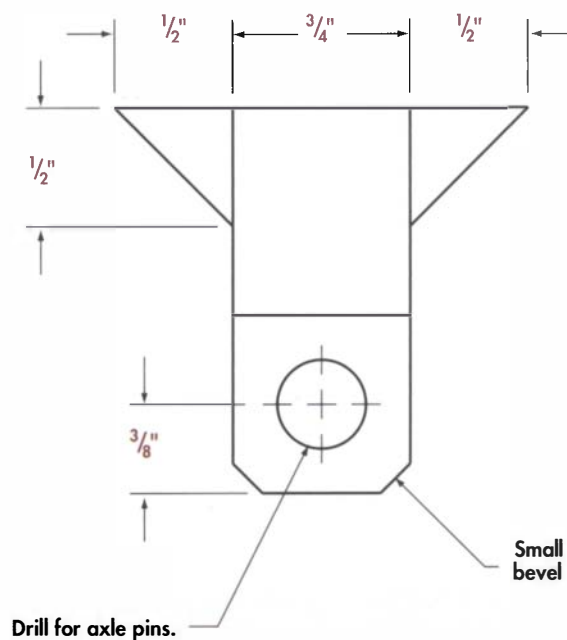
Rip-cut this on the diagonal using the bandsaw, but leave the last inch or two uncut so you can keep your fingers away from the blade. The clamp helps hold the wood on the diagonal.

AXLE HOUSINGS

Front View

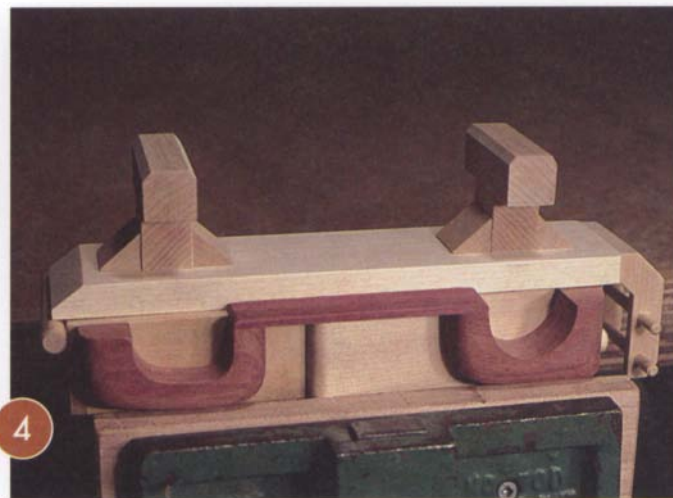


Side View



Crosscut the triangular parts off, and you should have about 8 in. of gusset material (two pieces, each approximately 4 in. long)—perhaps slightly under $\frac{1}{2}$ in. by $\frac{1}{2}$ in., but just fine for your needs.

Sand by hand as needed.



4. Cut to 1-in. lengths, sand the ends to smooth them, and glue in place. No clamping is needed here; just press them into location and leave the glue to harden.

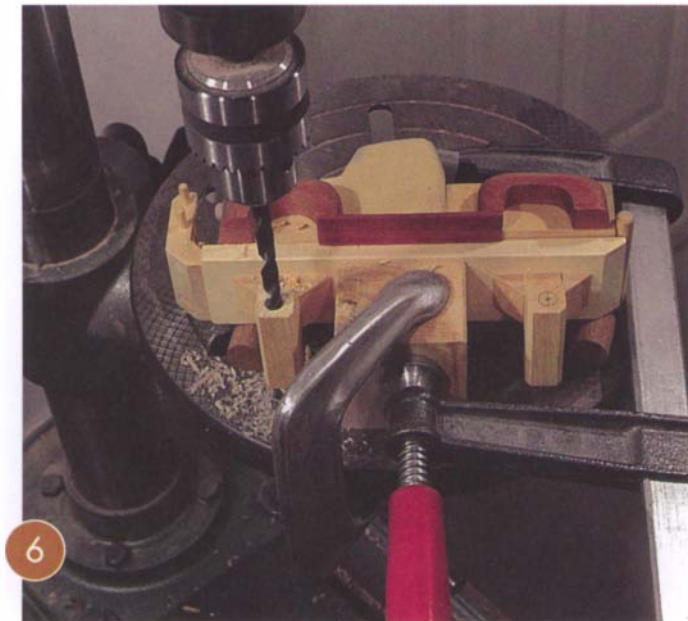
5. For the axle-pin holes, lay out four holes—one on either side of each axle housing—making sure that they are the same distance up from the bottom. I find that drilling four holes is more accurate than drilling two through holes. When I tried drilling right through from one side, I had trouble with the drill wandering just a little and coming out a bit higher or lower on the other side, probably due to grain differences (especially in oak).

It is best to put the truck upright on a flat surface and measure up from that flat surface. Exact distance is not as important as it is to make sure that all four holes are in line (or else one wheel may be sitting up off the ground later).

Before drilling, hold a wheel in place to check that it will fit under the truck body without rubbing.

6. Set the truck in the drill press to drill the axle holes. Most pins use an $\frac{11}{32}$ -in. drill. Make sure that the truck is level side to side and end to end.

Drill only halfway through from each side, which is more accurate than drilling all at one go.



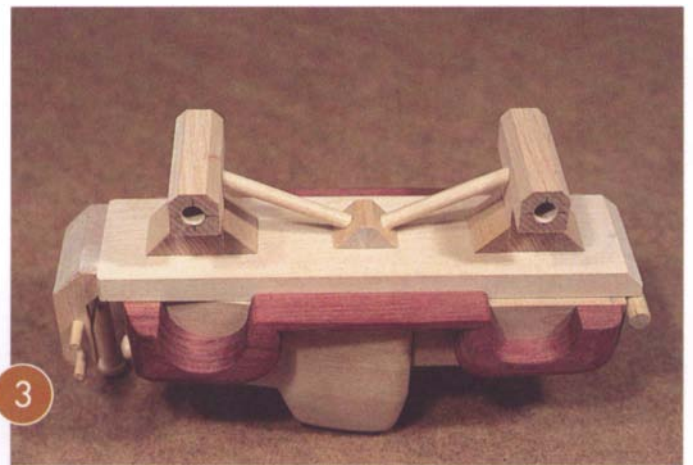
Drive Shafts and Transfer Case

While not exactly mechanically correct, these parts do improve the appearance a little, and my son Kevin, at 10 years old, thought they were important. Gluing two short leftover pieces of gusset material makes the transfer case. Fit the drive shafts last.

1. Cut two pieces of gusset material to $\frac{3}{4}$ in. long. Glue them together to make up the transfer case.

Sand or file a little flat on the bottom, until the thickness is about $\frac{3}{8}$ in., as shown on the drawing.

2. Glue the transfer case to the underside of the truck, midway between the two axles.

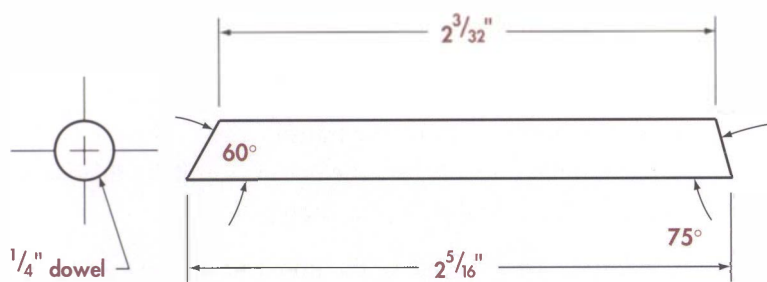


3. Cut two drive shafts, about $\frac{1}{8}$ in. longer than you think they will need to be. This will leave some material for custom fitting. It is a good idea to check that the length shown on the drawing will fit your truck because your truck might vary slightly from the drawings.

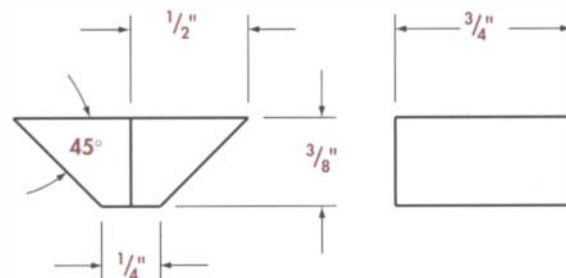
Sand or file the ends to the approximate angles, then check by holding them in place. Trim the ends as needed until you have a good fit on each end. The fit is more important than the exact location of the drive shaft.

Put a dab of glue on each end of the drive shaft, and carefully locate it. Let the glue harden.

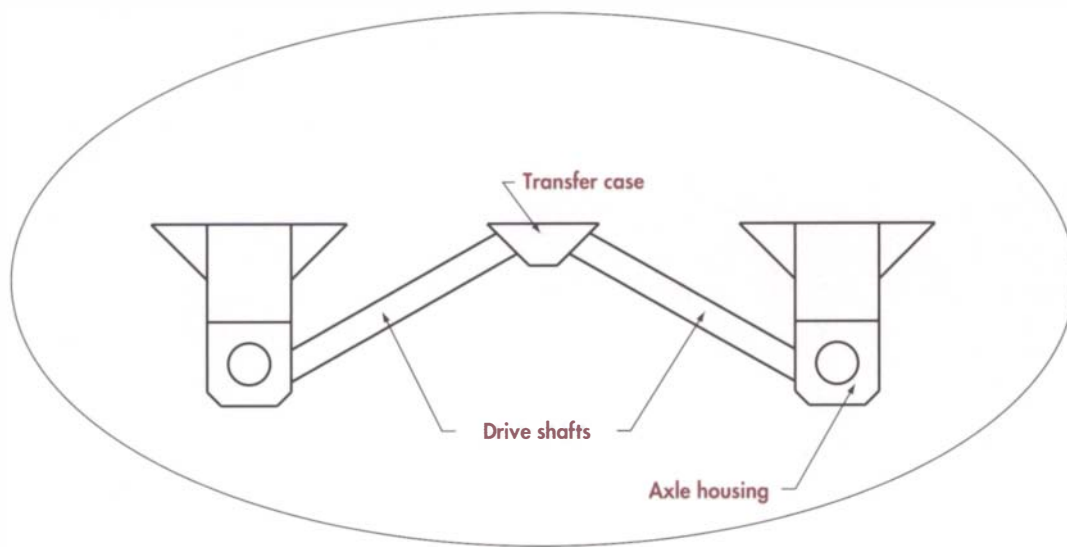
DRIVE SHAFTS AND TRANSFER CASE



Drive shafts
(make 2)



Transfer case
(make 1)



Finish

Sand and bevel all sharp corners, and apply your finish to the truck. If you are doing this now, before the wheels are on, don't forget to stuff some paper or cloth in the axle holes to keep out the finish.

You may want to read the appendix on finishing on p. 172.

Wheel Installation

1. To install the wheels, first cut the axle pins to length, if needed, to ensure they don't hit in the middle of the axle housing.

Rub some paraffin wax on the part of the axle pins on which the wheel spins, or wax the hole centers with paste wax and a Q-tip.

2. Before gluing, assemble the wheels to the truck by starting each axle pin in place. Slide the wheels up against the axle housings, and see if all four wheels turn when the truck is moved on a flat surface. If one does not spin, it is a good idea to open up the holes in all the wheels. Drill them out to $2\frac{5}{64}$ in. and try again.

3. I often make washers for these large wheels. Without them the wheels wear against the axle housings if the toy is played with endlessly. Use slippery plastic, such as the lid from a margarine container. Cut the plastic about $\frac{7}{8}$ in. dia., and cut or punch a $\frac{3}{8}$ -in. hole in the center.



4. Place glue in the holes with a Q-tip or sliver of wood.

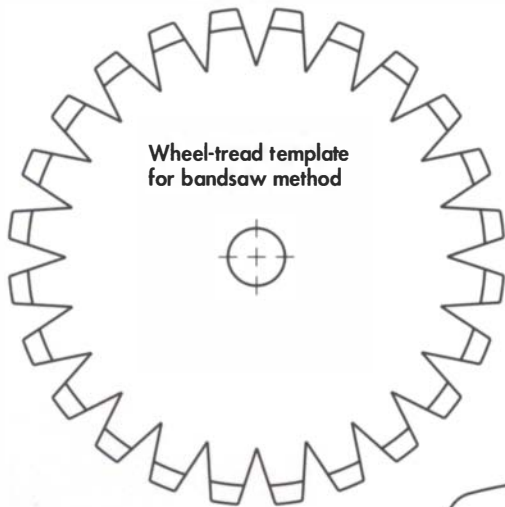
Tap the axle pins in place using a short length of dowel or other small piece of wood. Don't get these pins too tight, as it is very hard to back them out again (drilling them out may be needed if the wheel is pinned in so tightly that it cannot spin).

Ideally, you want the wheels to have almost no in-and-out movement yet still spin freely. However, too loose is better than too tight.

TEMPLATES

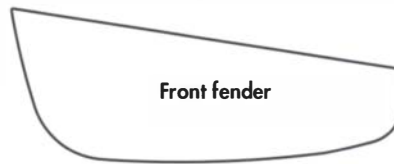
Use wheel templates for
monster truck, skidder,
and log loader

Wheel-tread template
for bandsaw method

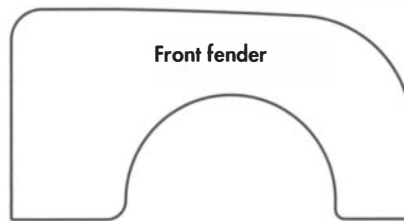


Top View

Front fender



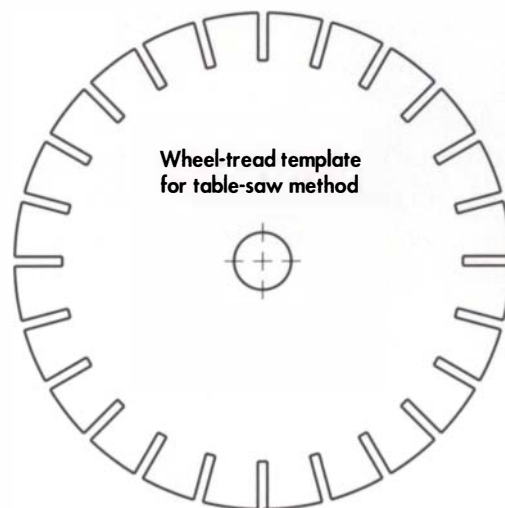
Front fender



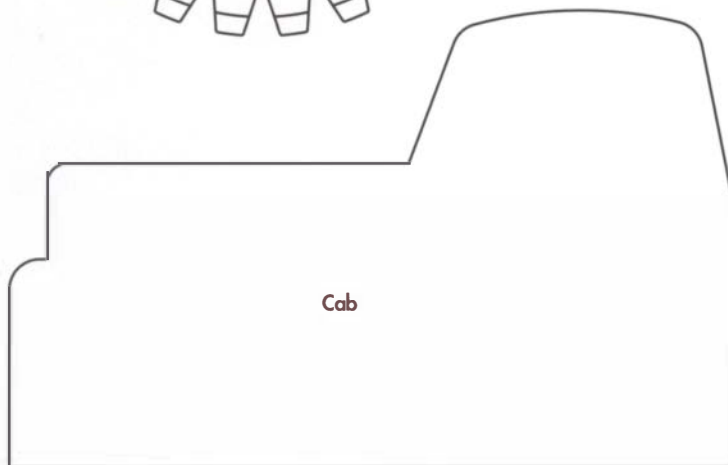
Side View

Use wheel templates for monster
truck, skidder, and log loader

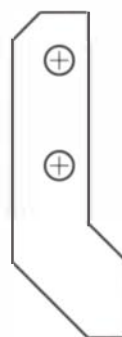
Wheel-tread template
for table-saw method



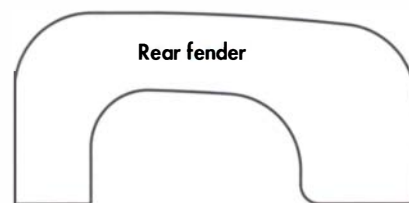
Cab



Bumper



Rear fender



For full-size templates, enlarge by 126%.

Chapter 2

Pickup *with* Fifth-Wheel Travel Trailer



After building a fleet of semis, tankers, and

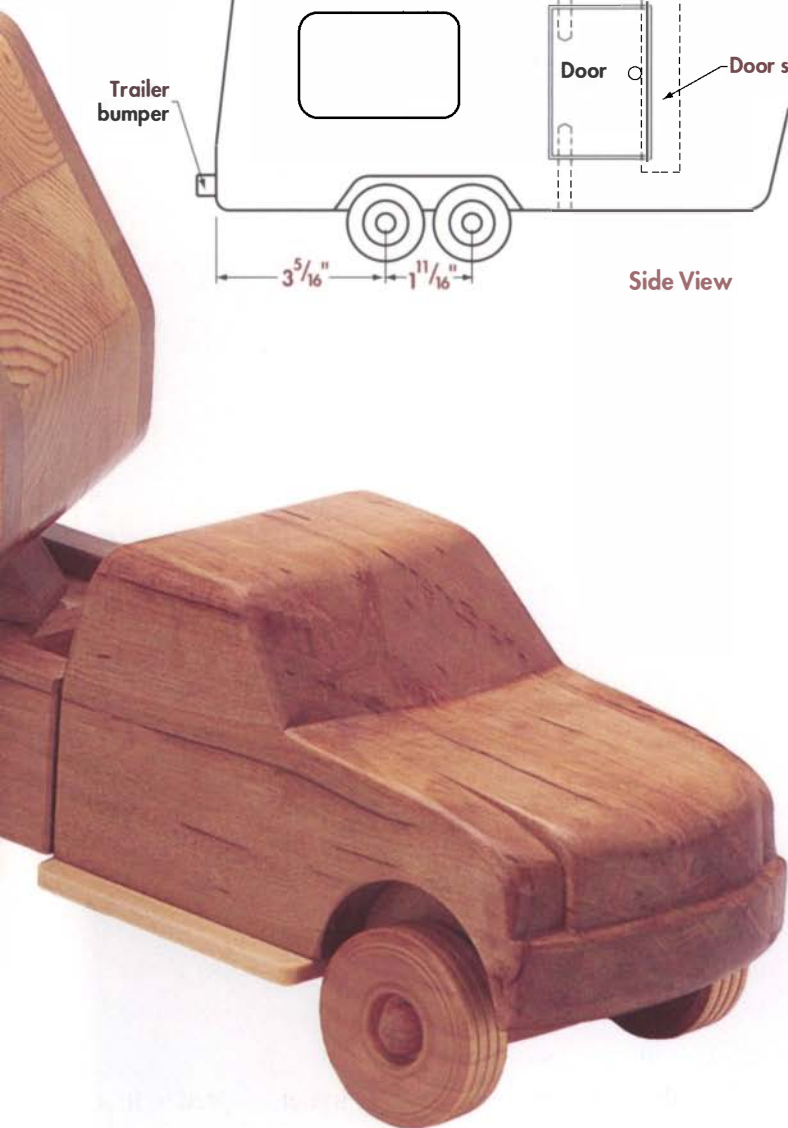
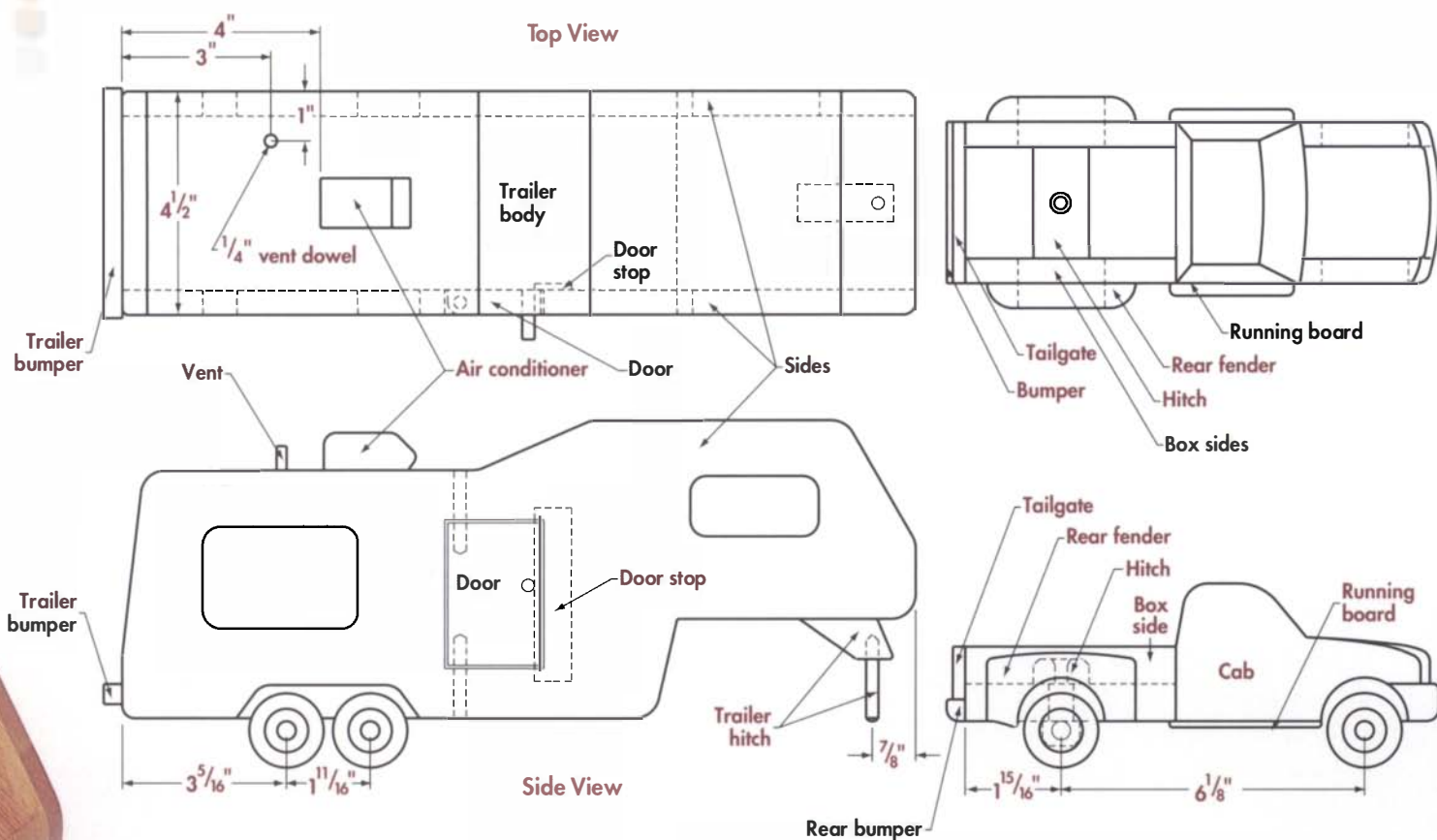
other highway trucks, I noticed my children often using them as holiday trailers and campers. Pretty soon I realized that a pickup with travel trailer would be very popular, and it was. My daughter, Lisa, was especially taken with it and had a variety of suggestions to improve it, including a workable door (which I made) and a removable roof (which I didn't make but you may want to).

Pickup trucks are a little more difficult to make than highway trucks because they seem to need more shaping

and rounding in order to look right. This truck can be simplified by making the hood quite flat and eliminating the protruding bumper in the front. I'll illustrate and comment on these options as I go through the process.

It is also a possibility to have the trailer adapted to fit a highway truck, such as the ones in chapters 5, 9, or 12. A doctor used my shop to make a highway truck/travel trailer combination for his children, and it looked pretty

PICKUP AND TRAILER PLAN



good. He used a single axle on the back of the truck to shorten it up a little.

This truck body may also be used on the monster-truck frame from chapter 1. But before the options get too confusing, I'll go through the process of building it to the stock design.

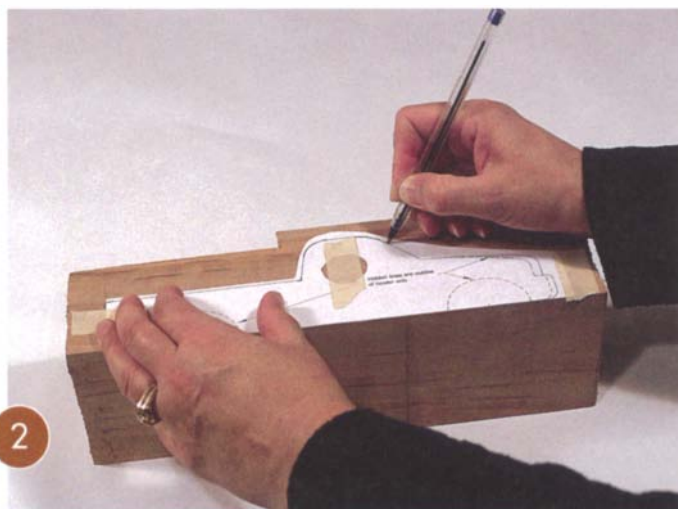
Basically, the truck is a block of wood with sides added on the back to form the box. The trailer is hollow, with a door and windows cut out in the sides.

PICKUP WITH FIFTH-WHEEL TRAVEL TRAILER

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Truck body	9 ⁹ / ₁₆ x 3 ¹ / ₄ x 2 ³ / ₄	1	
Tailgate	3 ¹ / ₄ x 1 ¹ / ₁₆ x 1/4	1	
Truck hitch	2 ¹ / ₄ x 1 ¹ / ₈ x 1/2	1	Adjust length to fit truck box
Truck rear bumper	3 ³ / ₈ x 3/8 x 7/16	1	Adjust length to fit truck
Truck fender extensions	3 x 1 ³ / ₈ x 1/2	2	Mirror images
Truck axle housings	2 ³ / ₈ x 3/4 x 1/2	2	Make trailer axle housings at the same time
Running boards	3 x 3/4 x 1/8	2	Cut oversize; trim to fit truck
Trailer body	16 x 3 ¹ / ₂ x 6	1	Cut blank to 16 ¹ / ₄ in.
Trailer sides	16 x 6 x 1/2	2	Mirror images
Trailer door	2 ⁷ / ₈ x 1 ⁷ / ₈ x 1/2	1	Adjust size to fit trailer side opening
Trailer doorstop	3 ¹ / ₄ x 3/4 x 1/8	1	
Trailer door hinges	1/4 dowel x 1 ⁵ / ₈	2	Cut about 2 in. long; trim after installing
Trailer door handle	1/4 dowel x 1 long	1	Cut about 1 ¹ / ₁₆ in.; trim after installing
Trailer axle housings	3 ¹ / ₈ x 3/4 x 1/2	2	Make truck axle housings at the same time
Trailer bumper	4 ⁵ / ₈ x 3/8 x 3/8	1	
Trailer hitch	1 ⁷ / ₈ x 3/4 x 1 ³ / ₁₆	1	Adjust 1 ³ / ₁₆ -in. dimension to fit truck and trailer
Trailer-hitch dowel	1/4 dowel x 1 ⁵ / ₈ long	1	
Trailer air conditioner	1 ⁷ / ₈ x 1 x 3/4	1	
Trailer vent pipe	1/4 dowel x 1 long	1	May want two vent pipes
Trailer air vents	5/8 x 5/8 x 1/4	2	Optional
Axle pins	Factory made	8	Buy size needed to fit wheels
Wheels	1 1/2 dia. (factory made)	4	Two dual wheels and two singles, or six singles

Pickup Body

Make the cab and the box out of one piece of wood. Cut 1/2-in. slices from the sides, saw out the wheel wells and front fender tops, then glue the sides back on. This step can be eliminated if you want a simpler truck.

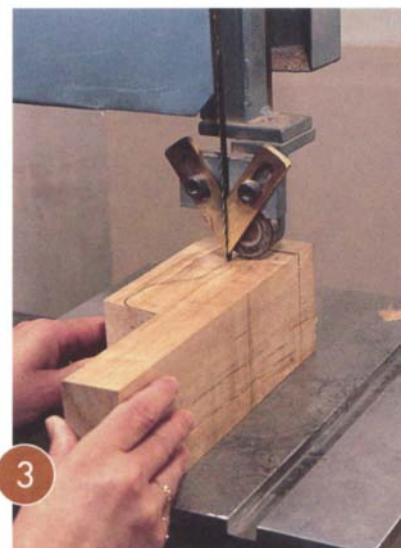


1. If needed, laminate material for the body. Trim the product to the rough dimensions shown on the cut list.

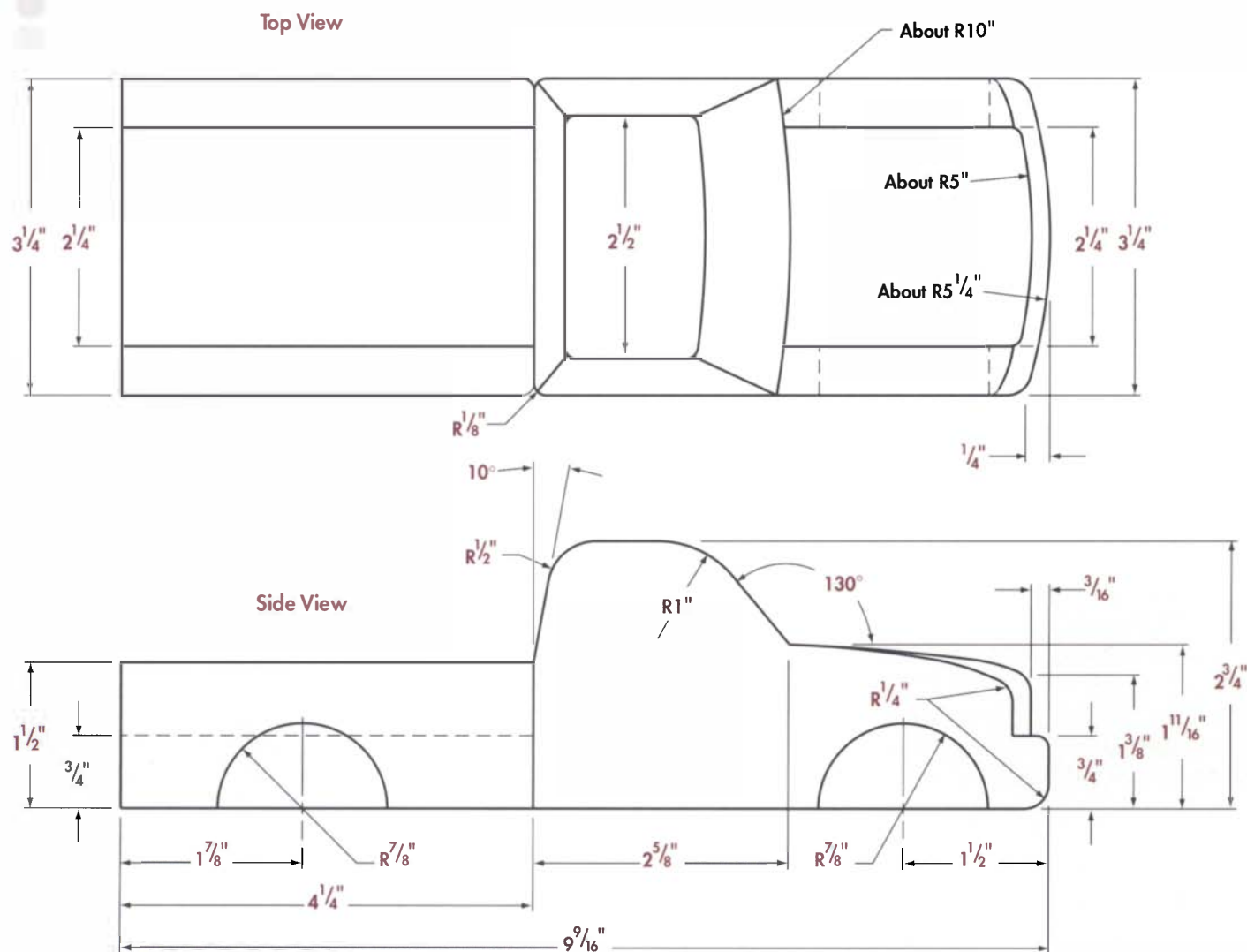
2. Lay out the side contour from the template on p. 39. (If you have not already done so, see the notes on template use on p. 3.) I photocopied the template and rubbed soft pencil on the back around the contour, then I traced it with a pen.

3. Use the bandsaw to cut to shape.

4. Rough out the grill (unless you are making the simplified pickup, in which case skip to step 18). While this will end up rounded in front like the bumper, rough it out to an angular shape using a



PICKUP BODY

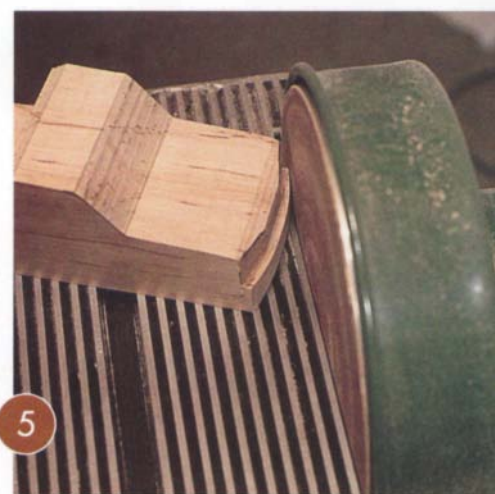


backsaw or other small handsaw. To get the approximate angle, measure back $\frac{1}{4}$ in. on the sides and in about 1 in. on the front.

5. Sand the curve on the front of the truck. Just get it close; you will touch it up after sawing off and reattaching the front fenders. It's better to sand too little than too much at this point.

6. Sand or file the slight round on the bottom of the front bumper.

7. File the grill front to its rounded shape. This can be done quite easily with a coarse flat file. You will do the



final filing and sanding later after the wheel wells are completed and the truck sides are glued back on.

8. Lay out to cut $\frac{1}{2}$ -in. slices from each side of the truck. The slices will be glued back on after you cut out the wheel wells and shape the fenders.

9. Saw the strips from the truck using a bandsaw.

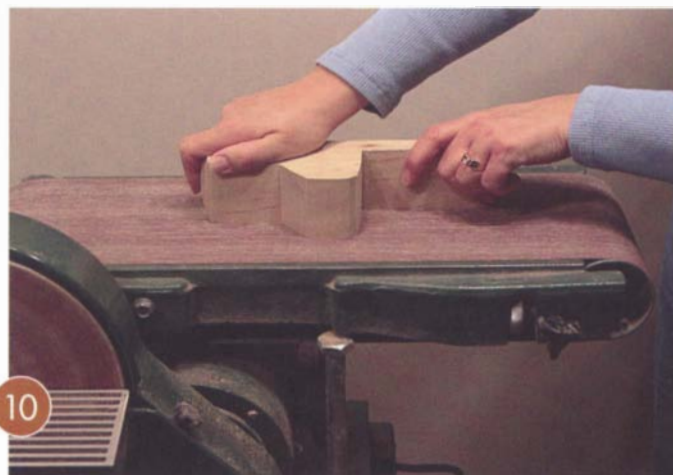


10. Sand, plane, or joint (depending on your preference and the equipment available) each cut surface smooth and flat. It is very important to make the surface flat to produce an invisible glue line upon reassembly.

11. Use the dashed lines on the template to lay out and cut the fender top and the fender front. Cut the template along the dashed lines and place it facedown

for one side of the truck and faceup for the other side.

If you are bandsawing the wheel wells (instead of drilling, as shown in the next step), you can saw them at this time, using several relief cuts and a $\frac{1}{4}$ -in. bandsaw



blade. Sand the wheel wells with a small drum sander (unless you really want to file and sand for a while).

12. If you are cutting the wheel wells with a $1\frac{3}{4}$ -in. Forstner bit, butt the two side slices together, bottom to bottom, and drill both wheel wells at once. Put some scrap wood under the slices, and clamp both parts down.



13. File and sand the angle at the front of the fender (where the headlights would be), instead of trying to saw it. Lay out this angle by eye, using the top view of the drawing as a guide.

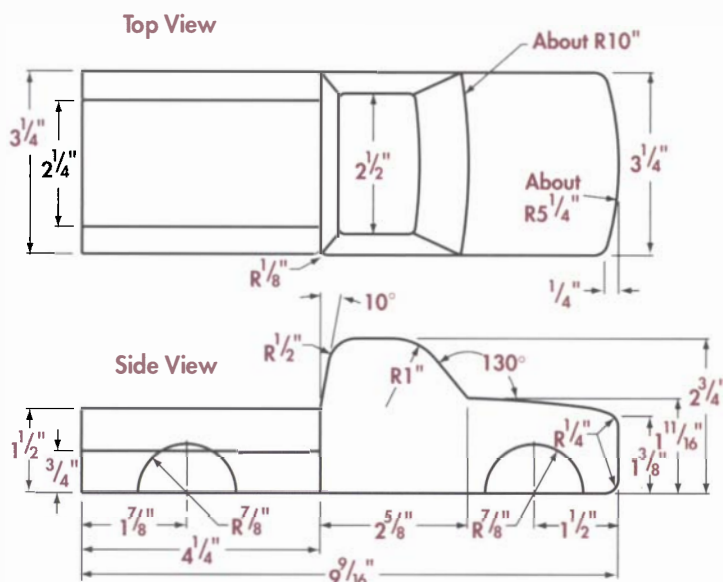
14. Do the finish-sanding now, at least on the headlight area and the top of the fender. It is much harder to get in there after reassembly.

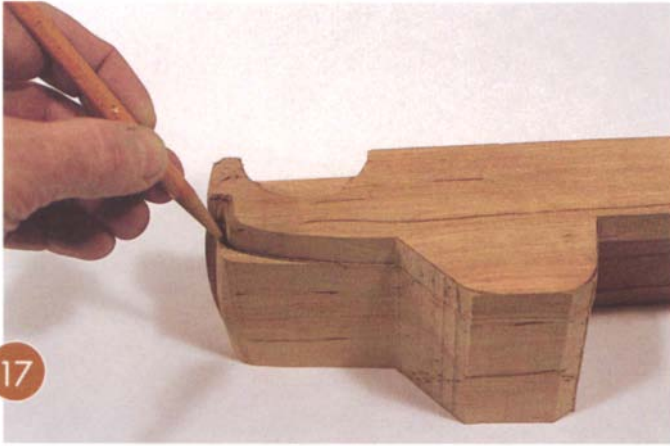
15. Saw the box bottom on the center section of the truck. Lay out a line $\frac{3}{4}$ in. up from the bottom.

16. File and sand as needed. Sand the back of the cab now, as it is hard to get at when the box sides are glued back on.



SIMPLIFIED PICKUP BODY





17. Before putting the sides back on, it is a good idea to round the sides of the hood a little. Place the sides against the truck, and trace the outline. File and sand a radius that just meets this line.

18. Glue the side slices back onto the truck. If you have sanded or jointed all surfaces flat, this will be pretty easy to do: just glue, locate, and clamp. If a slice is not quite flat, place your clamps carefully to close small gaps. If you have large gaps, sand it again lightly and evenly on the belt sander and arrange for as many clamps as you need. C-clamps are good for clamping small offending areas.

19. Sand the curves on the front of the truck to make sure the fenders align with the center section. Sand the windshield until it is rounded (see the top view of the drawing), as well as the roof and any other places that need alignment after the assembly.

If you are making the simplified version of the truck, continue on to the next step; otherwise, skip to step 21.

20. If you are making the simplified truck, lay out the wheel wells and drill them using a Forstner bit. This bit will drill even with almost half of the bit overhanging into open air, if the part is clamped down securely. You may have to move up the center of the hole so that the center point of the drill sits completely on the wood. Moving up the wheel well $\frac{1}{16}$ in. will not hurt the appearance of the truck.

21. Sand the curves on the sides of the truck to round the side-window areas. Get an idea of the amount of rounding from the drawings, and then do the final curve by eye. When it looks pretty good, it's fine. Don't over-analyze this—it's a toy, not a model.

22. Round all corners slightly with file and sandpaper. I do this to about a $\frac{1}{16}$ -in. radius. Don't round the corners of the rear wheel well or tailgate areas. The fender and tailgate parts that are attached here later look much better if these corners are left sharp.

23. Saw a line between the cab and the box to give the two sections a visual distinction. This slot is about $\frac{1}{16}$ in. to $\frac{1}{8}$ in. deep. Round the corners of the cut.

Tailgate

1. Cut out the tailgate, slightly oversize. Sand the inside surface of the tailgate now while it is easily accessible, but sand the top and sides of the tailgate after gluing it in place to make these surfaces flush with the sides of the truck box.

2. Glue the tailgate in place. It should be $\frac{7}{16}$ in. up from the bottom of the truck to form a notch for the bumper.

3. Sand as needed.

Fifth-Wheel Hitch

In addition to serving its main function, this hitch covers the exposed wheel wells, which otherwise can be seen from the inside of the truck box. Make the hitch, glue it in, then drill it about $\frac{1}{32}$ in. larger than the trailer-hitch dowel size, to allow the trailer to move up or down as it goes over bumps.

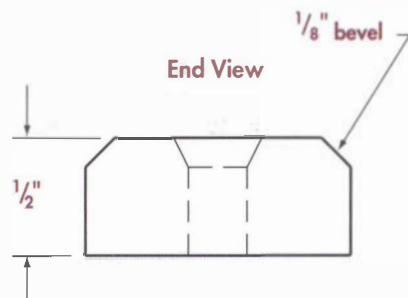
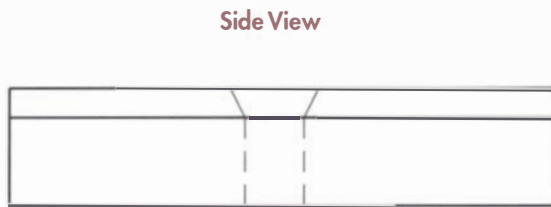
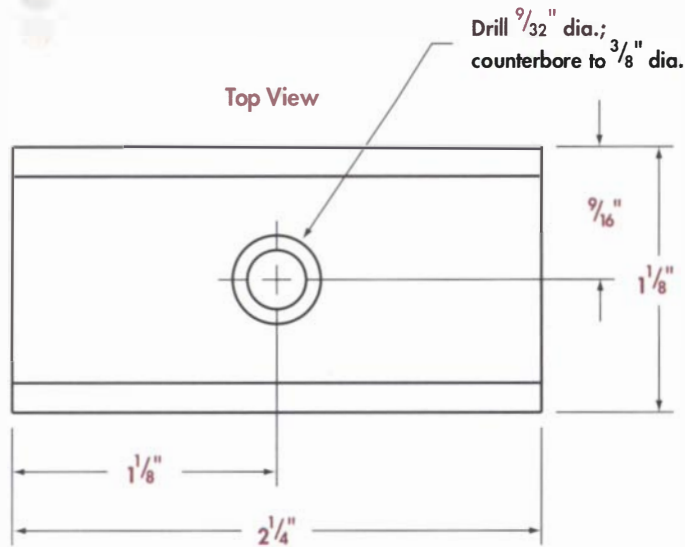
1. Cut out the hitch blank and bevel the corners. Cut the length to fit exactly within the truck box.

2. Lay out the hole in the center of the hitch.

3. Glue the hitch in place in the pickup box.

4. Drill the $\frac{3}{32}$ -in. hole, and countersink about $\frac{1}{8}$ in. deep (see the photo on p. 30).

FIFTH-WHEEL HITCH



5. Drill an oversize hole, about $\frac{5}{16}$ in. or even $\frac{3}{8}$ in. dia. and $\frac{7}{8}$ in. deep, up from the bottom of the pickup box. Don't drill deeper than $\frac{7}{8}$ in. because you need to leave a certain amount of the original $\frac{9}{32}$ -in. hole. This allows the trailer-hitch dowel to pivot a little in the hole. Later, the axle housing will cover the bottom of this hole.

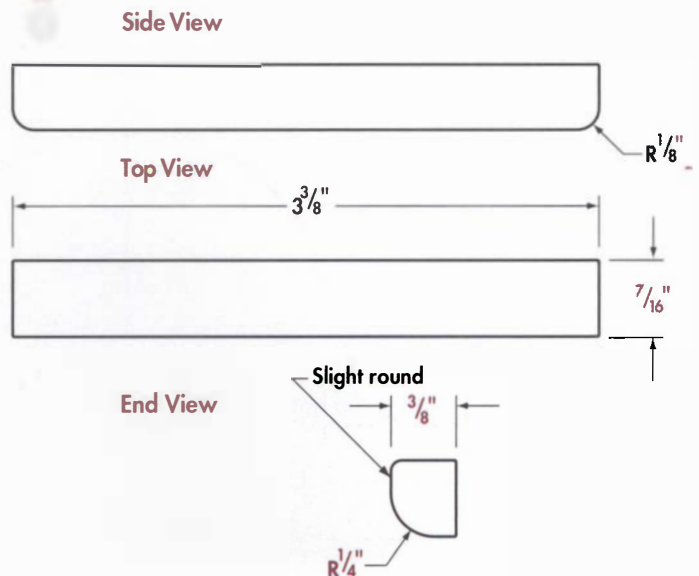


Truck Rear Bumper

This is a decorative piece; the only sizes that matter are the ones that will make the bumper fit in the notch of the back of the truck. Adjust the length, width, or height as needed, but the dimensions on the drawing will probably be just fine.

1. Cut a strip of wood to size.
2. Round the bottom edge, and round the ends as desired. The curves indicated on the drawing are suggestions only and are done by eye.
3. Glue the bumper in place after sanding.

TRUCK REAR BUMPER



Rear Fender Extensions

A 1-ton pickup with dual rear wheels has fender extensions to cover the outside tires. Make the fender extensions, then glue them on so that the wheel wells line up. Again, the curves around the edges of the fenders are suggestions only. Don't measure the exact radii as you make them—just round a little to get the idea across.

1. Lay out the blocks of $\frac{1}{2}$ -in. wood. Lay these out back to back, and drill the wheel wells before cutting them apart. Use a $1\frac{3}{4}$ -in. Forstner bit or hole saw, as you did with the pickup body in step 12 on p. 28).

2. Saw into two fenders.

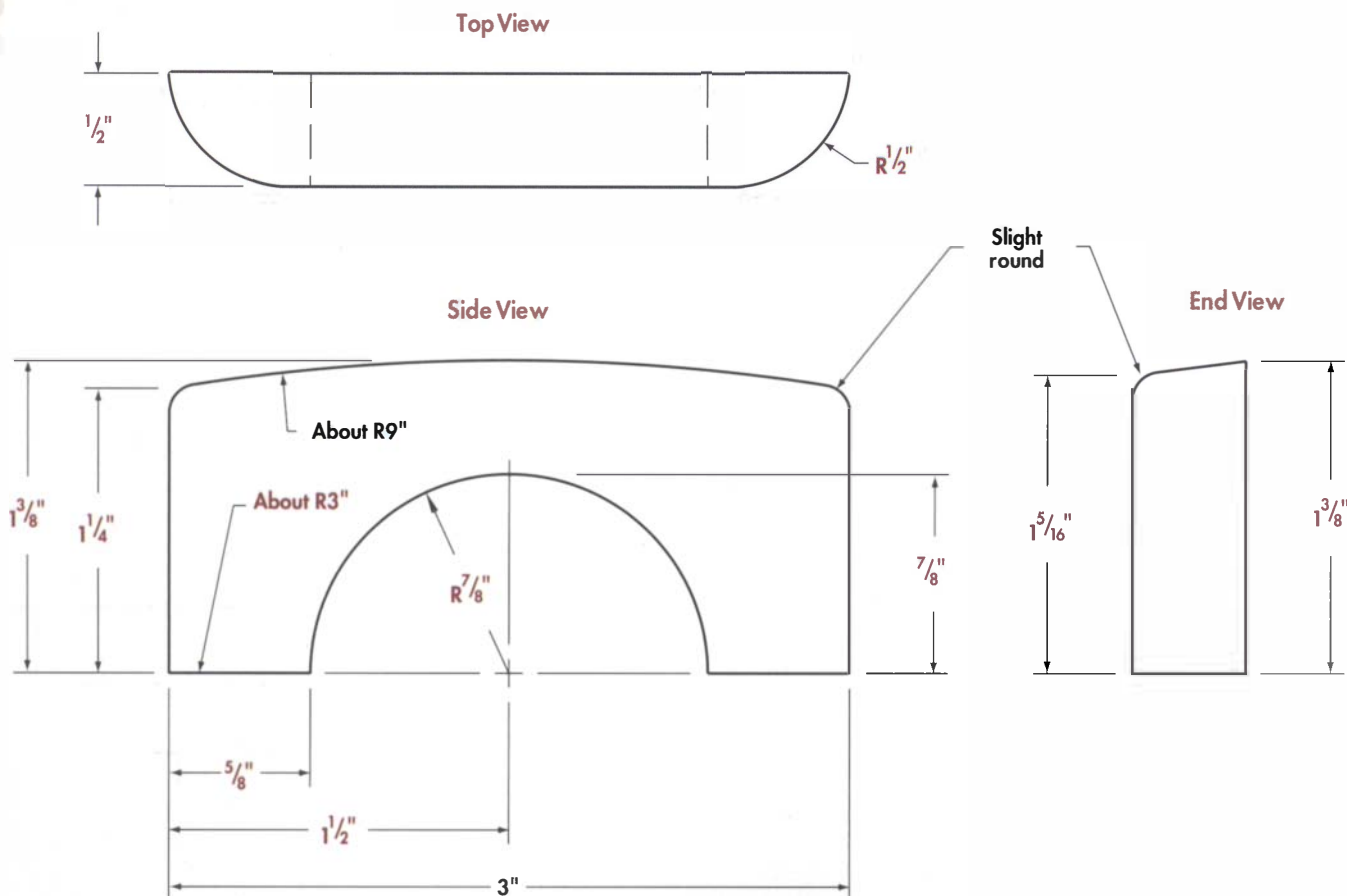


3. Sand and file the rounded edges on the different surfaces. Use the drawings and templates to give you an idea of the curves, but don't worry if yours is a bit different. Each one I make is a little different from the last. I call this "improvement" or "creativity."

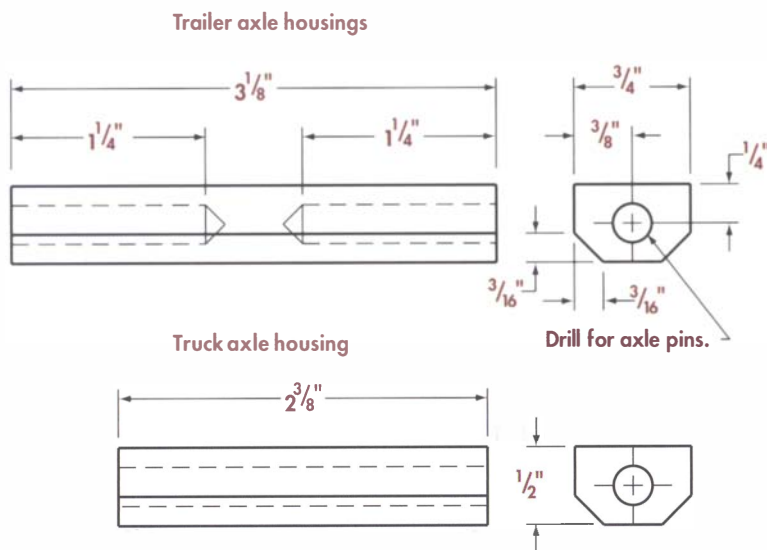
4. Glue the fender extensions to the sides of the truck, clamping if needed. Line up the bottom edges with the wheel wells.



REAR FENDERS



AXLE HOUSINGS



Truck Axle Housings

These housings are glued to the undersides of the truck and the trailer, and holes are drilled in them for the wheel axle pins. Make a single length of housing material for both the truck and the trailer, in this case about 12 in., then cut the pieces according to the lengths indicated on the drawings. Two pieces are used for the truck and two for the trailer (see pp. 36–37).

1. Cut a strip of hardwood to size, about 12 in. long. Bevel the corners with a plane or a belt sander.
2. Cut to the lengths needed for the truck.
3. Glue the axle housings in place so that the center of each axle housing is in line with the center of the wheel well.
4. Lay out the $\frac{7}{32}$ -in. axle holes (for standard axle pins). Have the wheel in place to locate the holes and then check the location. It is fine to have the wheel located in the center of the wheel well but off center to the axle housing. When you have it right, use an awl or center punch to dimple the drill location.

Draw a circle ($\frac{1}{4}$ in. to $\frac{3}{8}$ in. dia.) around the center so you can check if the drill wanders a bit once you start drilling.

5. Drill the holes from each side, making sure the truck is square to the drill-press table both sideways and length-wise. Check the location a couple of times just as the drill is starting. If the dimple the drill makes is not on center, a gentle side pressure while drilling can move it over a little.



Wheel Installation

The wheels used here are standard $1\frac{1}{2}$ -in. wood wheels available at hobby shops and through catalogs. These wheels are available as duals (for the rear), but putting two single wheels together will also work just fine.

1. Check that all four wheels sit flat by testing the fit of the axle pins in the axle holes. Don't tap the pins in very far or they will refuse to come out if they are at all snug. Run the truck on a flat hard surface, with the wheels pushed in against the truck sides. See if all the wheels turn.

I often drill the axle holes $\frac{1}{64}$ in. oversize to make sure all the wheels will turn, but if this is not necessary, don't bother.

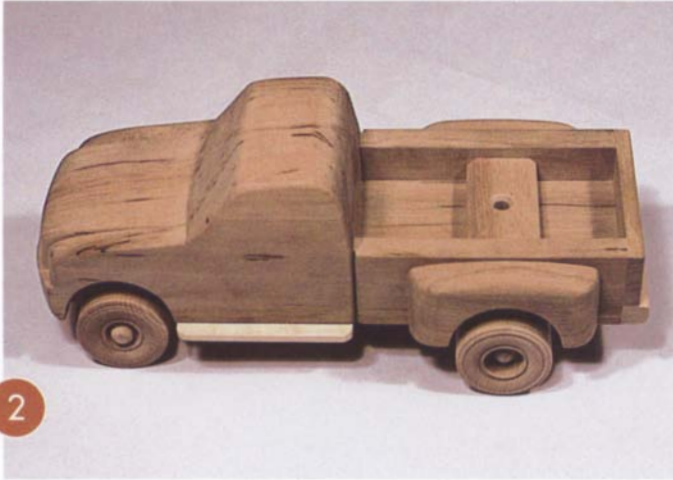
2. Wax the axle pins only on the section just under the head (where the wheel will ride) using paraffin wax or paste wax. Or you can wax the wheel hole with paste wax using a Q-tip, to ensure that your finish does not stick and to help the wheel spin freely.
3. Put glue in the axle holes using a toothpick. Tap the axle pins in place using a short piece of dowel. The wheels should spin freely but not have much side play. However, it is better to have them too loose than too tight.

Running Boards

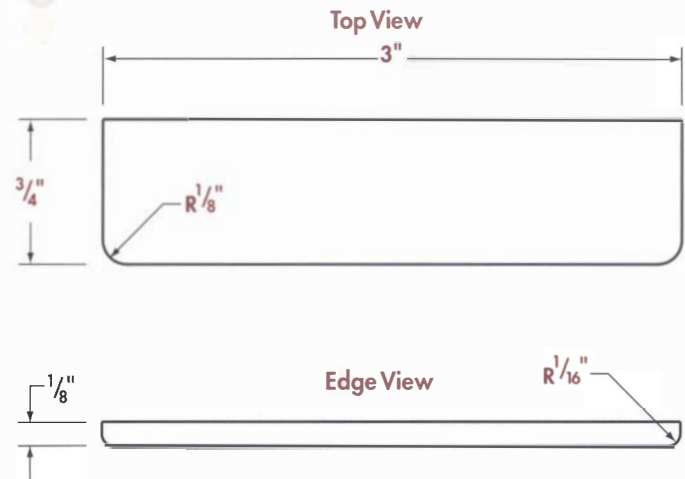
The last items to complete before the final sanding and finishing of the truck are the running boards. These running boards are not really needed but are a nice touch. Find some $\frac{1}{8}$ -in. material—either a slice of hardwood or a bit of plywood—and glue it to the bottom of the truck. You can make the running boards as long or as short as you like.

1. Cut two running boards from $\frac{1}{8}$ -in. material. While you're at it, cut one extra for the trailer doorstop ($\frac{3}{4}$ in. by $3\frac{1}{2}$ in.).

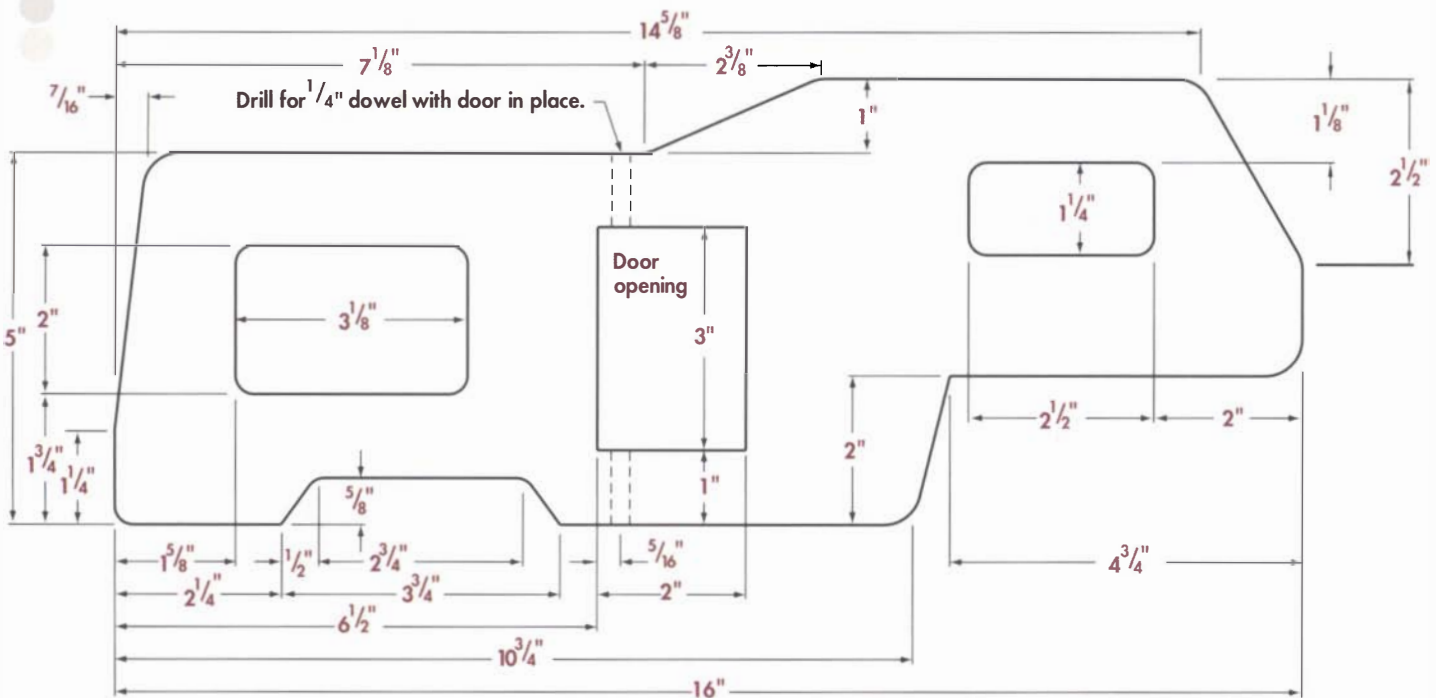
2. Round the edges that protrude, and glue the running boards to the underside of the truck.



RUNNING BOARDS



TRAILER SIDES AND BODY



Notes: 1. Other trailer side is the mirror image of this side but does not have the door.

2. Window-corner rounds and wheel-well rounds are drawn $\frac{1}{4}$ " radius.

3. Rounds on exterior of trailer are not critical but are drawn about $\frac{1}{2}$ " radius.

Trailer Body

The trailer body is made up of the hollow-core center section (the body itself) and the sides. Make up a core by laminating 2x6s or some equivalent wood, then glue the sides (with window and door cutouts) to this hollow body. The air conditioner, bumper, hitch assembly, and the axle assemblies are glued onto the trailer body later.

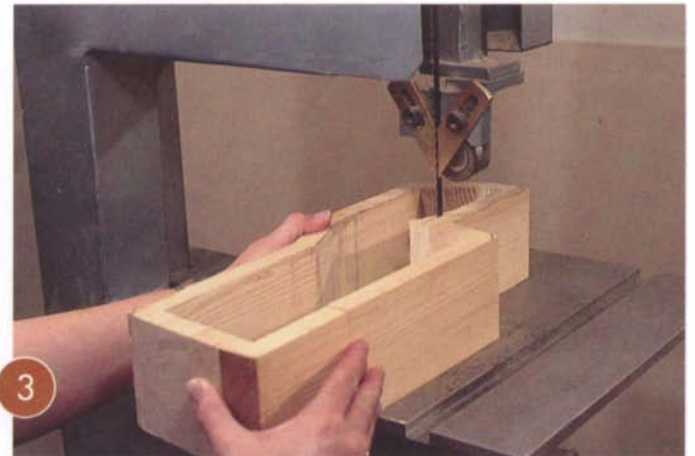
1. Laminate as shown on the drawing using lightweight wood. Fairly clear 2x6 construction lumber works well, as it is fairly light in weight; you could also use 2x4 lumber, but the trailer may end up a little narrow. So grab whatever is closest and have at it. For the trailer shown in this book, I used five 1¼-in. by 3⅜-in. pine boards, which were left over from another project.



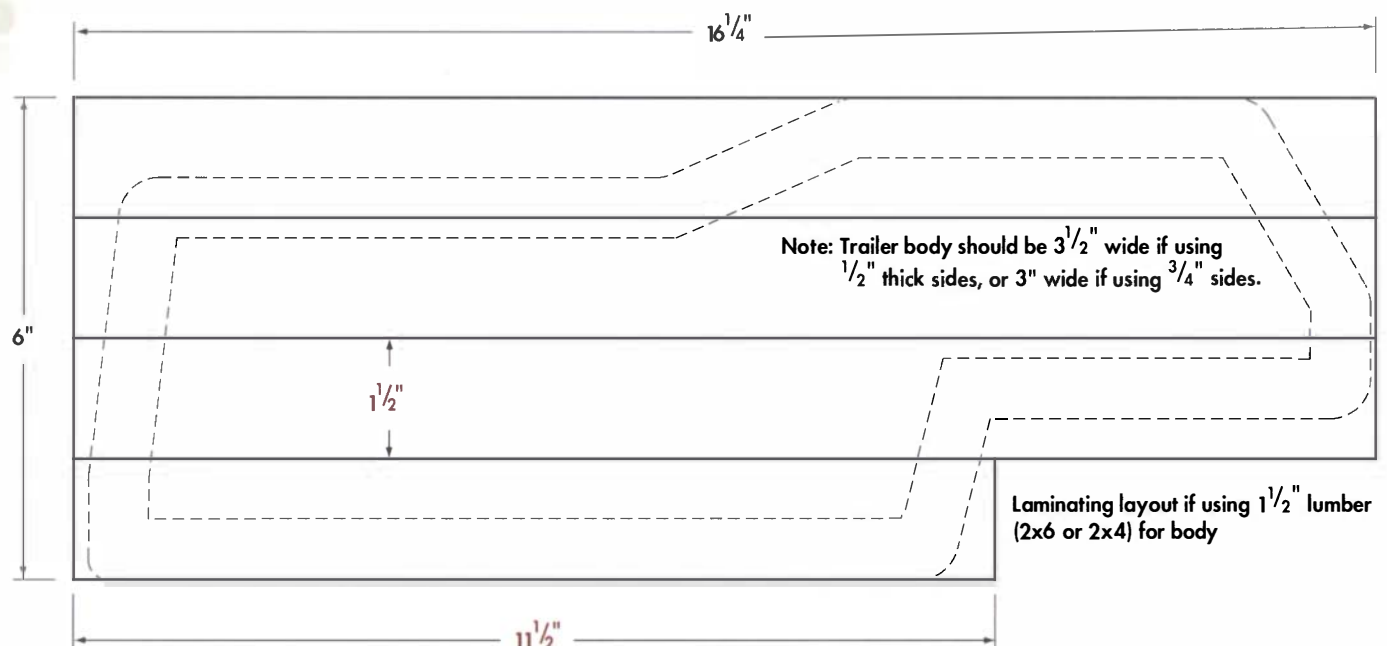
2. Sand, plane, or joint the sides flat and approximately parallel to one another.

3. Lay out and saw the outside and inside contours. For the inside, cut from the bottom up. The sides will hide the cut, as well as add strength to the trailer overall. The cut is visible through the windows unless you put it in the far back corner, but this is not a serious problem. If you want, make this cut in the exact center of a wheel location; that way the axle housing will cover the cut and the wheel will hide it on the side.

Cut the inside carefully. While you do not see it very well, it is difficult to sand and shape the inside surfaces. By cutting it carefully, you will only have to give the inside a quick once-over with a file.



LAMINATION LAYOUT

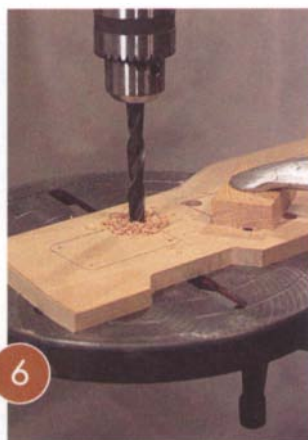


4. Lay out the trailer sides, but put the door on only one of the sides. Trace the outside contour of the body so that the sides will be the same exact shape as this center core.

If you have access to a photocopier that enlarges, photocopy the template and enlarge it, then trace it out or use carbon paper. Rubbing pencil around the underside of the template will transform the template into carbon paper.

5. Cut the sides to shape. Don't bother to sand the edges yet; it makes more sense to do this when they are glued onto the center core so that you can sand all the edges flush.

6. Drill holes in the corners of each window or door opening. The sides are shown with a $\frac{1}{4}$ -in. radius, so use a $\frac{1}{2}$ -in. drill bit. If this is not convenient for you, use a $\frac{3}{8}$ -in. bit.



This is a good time to decide which surfaces will be on the inside and which will show on the outside of the trailer. Drilling and sawing tend to leave chips and small splinters on one side of the material. Arrange your drilling and sawing so that the bad side will be on the inside.

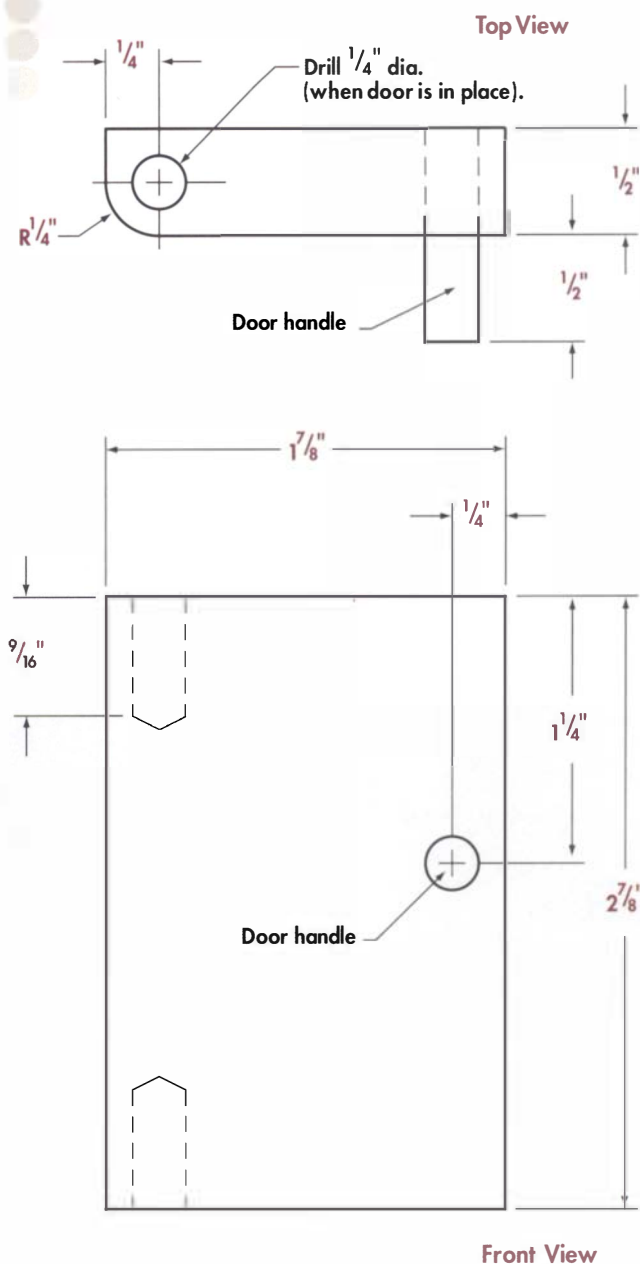
7. Use a jigsaw or a coping saw to cut around the openings. Do this as carefully as you can so that you do not have to do much filing and sanding later. Also, make sure that any splintering happens on the surface that will be on the inside. File and sand the cut edges.

8. Glue the sides to the body.



9. Sand around the outside using a belt sander or disk sander. File and sand in the corners.

TRAILER DOOR



Door and Doorstop

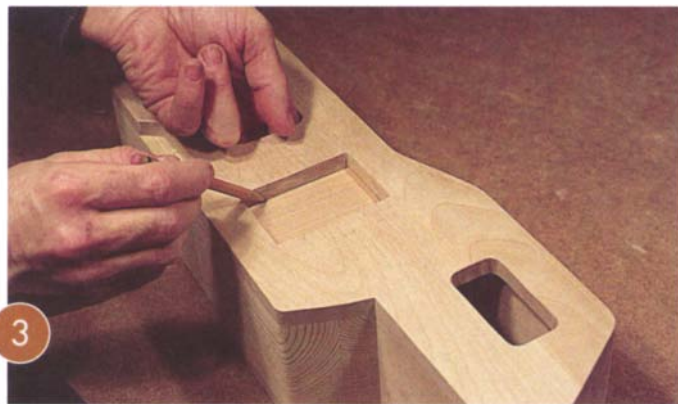
This door pivots on two $\frac{1}{4}$ -in. dowel hinges, which are drilled after wedging the door in place. It swings out and needs a small stop glued in place if you do not want it to be able to swing to the inside.

1. Find the doorstop that you cut out when you cut the running boards. Sand the edges and corners.

2. Glue it in place. The stop should protrude into the door opening about $\frac{3}{16}$ in. (see the plan drawing).

3. Cut the door to size, making sure that it has at least $\frac{1}{16}$ -in. clearance around the opening. Measure the opening before cutting out the door, or trace the door opening onto a block that is cut a little oversize.

4. Round the hinge side as shown on the drawing. If there is no round, the square corner will hit when you open the door.



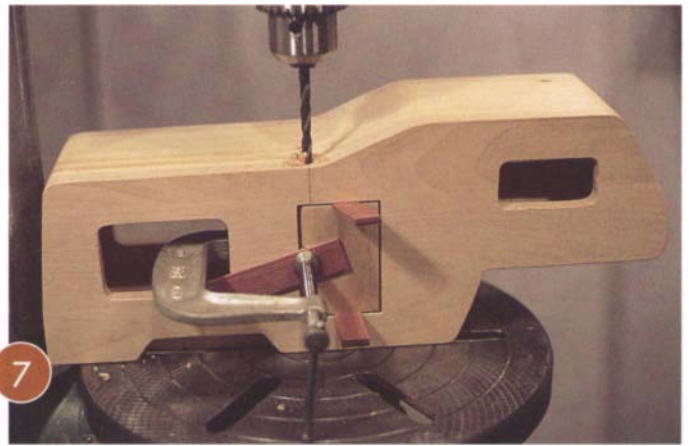
5. Lay out the holes for the hinge dowels. Do this on the roof of the trailer as well as on the bottom. Have the holes $\frac{5}{16}$ in. in from the edge of the door opening and $\frac{1}{4}$ in. in from the edge of the trailer side. Line up these holes as closely as possible. If they are offset, the door will bind when pivoting.

6. Wedge the door in place for drilling, and clamp it.

7. Drill the top and bottom holes deep enough for the drill to go into the door at least $\frac{1}{2}$ in. This drill should be sized for a sliding fit on the dowels.

8. Cut the dowels for the hinges. Sand the last $\frac{5}{8}$ in. where they will enter the door. I sand the dowels by putting them in a drill press—with the chuck just tight enough to hold them—and sand with the drill running. Sand just enough for a sliding fit in the door holes.

9. Drill for the door handle.



10. Cut the door-handle dowel and sand one end, beveling the end slightly.

11. Put some glue in the hole and insert the handle. After the glue is hard, sand off any excess glue.

12. Finish-sand the side of the trailer before installing the door.

13. Cut the door-hinge dowels, cutting them at least 2 in. long.

14. To install the door, make sure the door is centered in the opening and does not rub on the top or bottom. To do this, the dowel-hinge pins are intended to bottom out in the holes in the door. Try it without glue first.

Tap these dowels in, top and bottom together, adjusting so the door has a tiny bit of up-and-down movement but is approximately centered in the opening.

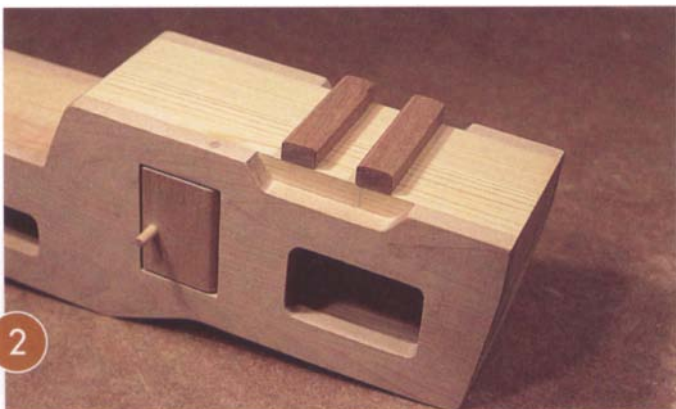
For final assembly, put the door in place, and tap in the dowel hinges until they just start to enter the door itself. Then put a little glue on the part of the dowel that is still exposed, and tap the dowel in another $\frac{1}{4}$ in. to $\frac{1}{2}$ in. This way there will be no glue entering the door, but the dowel will be glued to the door frame. Check often for up-and-down movement of the door as you install the dowels.

15. Trim the dowels to length, and file or sand them flush with the trailer.

Trailer Axle Housings

The two axle housings for the trailer do the same job as those on the truck. Use the leftover axle-housing material (see p. 32).

1. Cut two pieces. They should be $\frac{1}{16}$ in. wider than the trailer “frame” (which is really the width of the hollow core).



- 2.** Glue the axle housings to the trailer bottom. Check their location by holding the wheels in place so that they fit nicely in the wheel well. There should be about 1 in. from the edge of the wheel well to the axle center.
- 3.** Lay out the axle holes. Again, check by holding the wheels in place. Mark the center with an awl or center punch. Draw a circle around the center so you can check if the drill wanders a bit once you start drilling.
- 4.** Drill the axle holes from each side as you did with the truck (see p. 32).
- 5.** Install the wheels as you did on the truck (see p. 32).

Trailer Bumper

The trailer bumper is one of the finishing touches, which is not really a must but does help the appearance. It is just a small square beam that is glued directly to the back of the trailer.

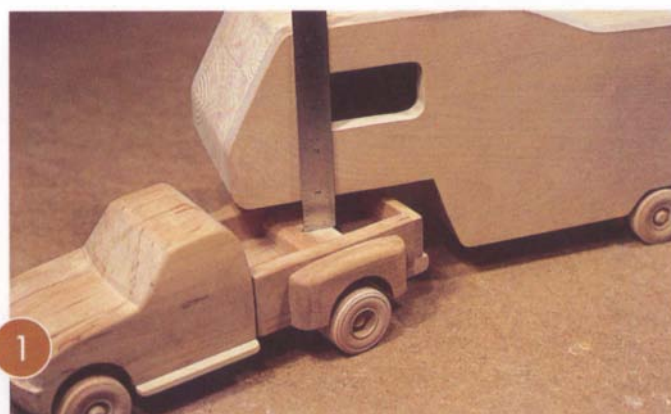
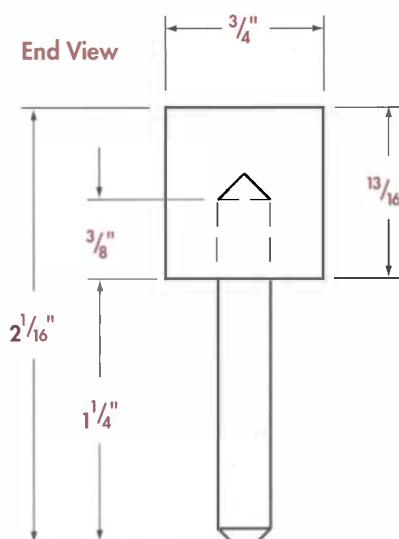
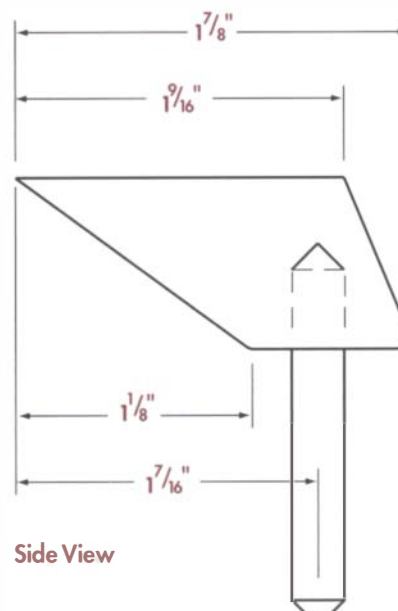
- 1.** Cut the bumper to size.
- 2.** Sand as needed.
- 3.** Glue the bumper to the back of the trailer. The back of the trailer needs to be flat. If it is not, carefully touch it against the disk sander to flatten it.

Trailer Hitch

The trailer hitch will raise the front of the trailer so that it sits flat. Measure the exact height needed, make the hitch, and glue it to the trailer. The hitch dowel goes in last.

- 1.** Measure the height needed by holding the trailer flat on its four wheels. Back the truck into place, and measure the gap between the truck hitch and the bottom of the trailer front. This height should be close to the $\frac{13}{16}$ -in. dimension shown on the drawing.

TRAILER HITCH



2. Lay out and cut the hitch from $\frac{3}{4}$ -in. wood.

3. Glue the hitch to the trailer; clamping is optional.

4. Drill the hitch dowel hole.

5. Cut the dowel and install it. I keep this dowel long so that when the trailer is unhooked from the truck, the trailer front leans down and rests on this dowel. You could also cut a small block that can be slid under the front of the trailer to hold it up when parked.



Air Conditioner and Exhaust Vent

These are the last two finishing touches. Make a small imitation air conditioner and glue it on the roof; the location is not important. Similarly, insert a $\frac{1}{4}$ -in. dowel for a vent; the location here can vary as well—just like in real trailers. The complete plan drawing shows where I chose to put these two items.

1. Cut the air conditioner to a rectangular shape.

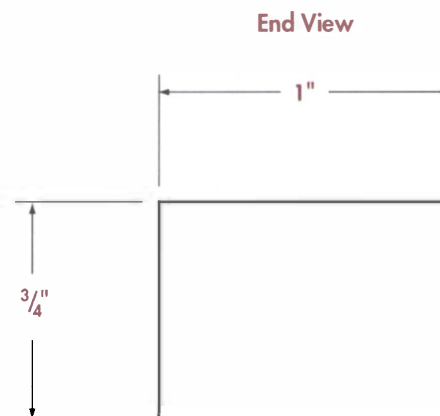
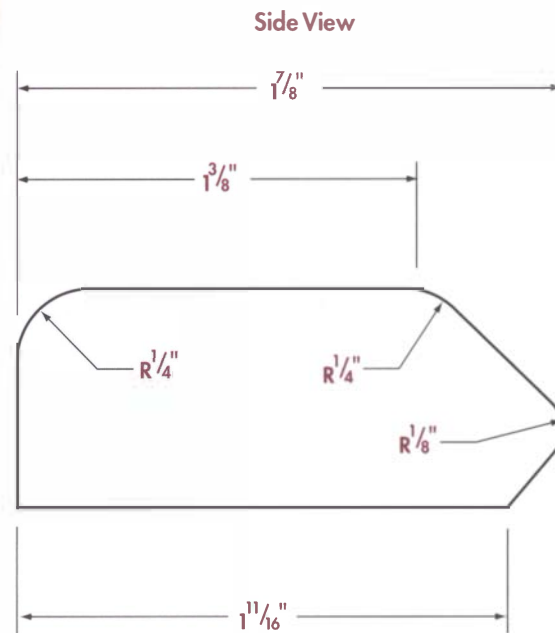
2. Sand the bevels on the front, and round the corners slightly.

3. Glue the air conditioner to the trailer roof; no clamping is needed.

4. Drill a hole for the $\frac{1}{4}$ -in. vent dowel, and cut a short piece of $\frac{1}{4}$ -in. dowel. Bevel the corners of the dowel so that there are no sharp edges.



TRAILER AIR CONDITIONER



5. Put a little glue in the hole, and insert the $\frac{1}{4}$ -in. dowel.

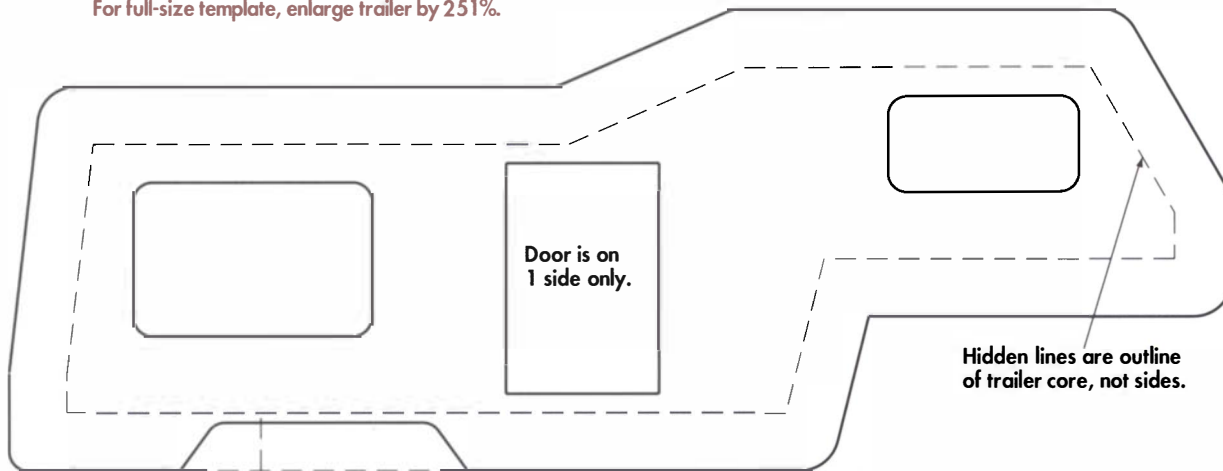
6. Add roof vents if you want: two or three vents measuring $\frac{5}{8}$ -in. by $\frac{5}{8}$ -in. by $\frac{1}{4}$ -in. Extra chimney dowels can also be added.

Finish

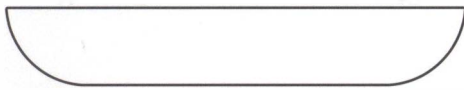
As desired. You may want to read the appendix on finishing on p. 172.

TEMPLATES

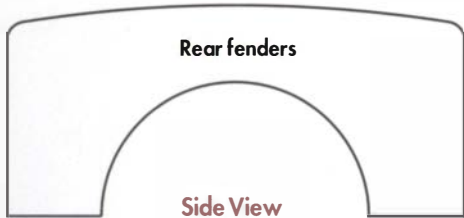
For full-size template, enlarge trailer by 251%.



Top View

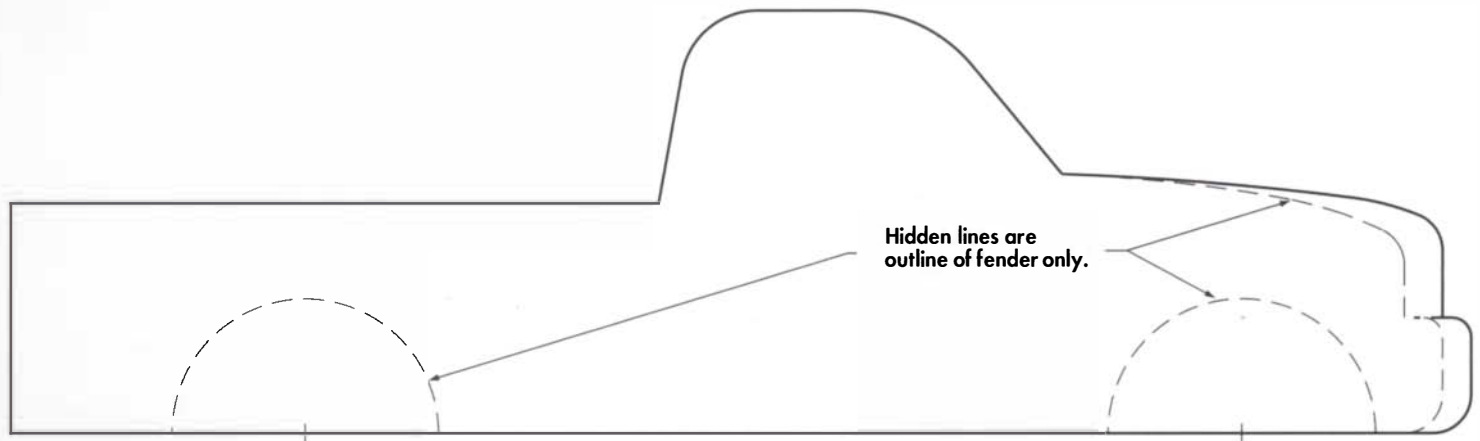


End View



Side View

For full-size templates, enlarge body and fenders by 125%.



Chapter 3

Dump Truck



Children like to use trucks to haul things.

They pile all sorts of items on the backs of trucks and unload them at their next stop. This chapter and the following two chapters detail the construction of three fairly simple working trucks: the dump truck (this chapter), the tow truck (chapter 4), and the flat-deck truck (chapter 5).

The dump truck can carry and dump any type of material from marbles to small wood blocks to sand. I have seen my kids use it to haul small teddy bears as well.

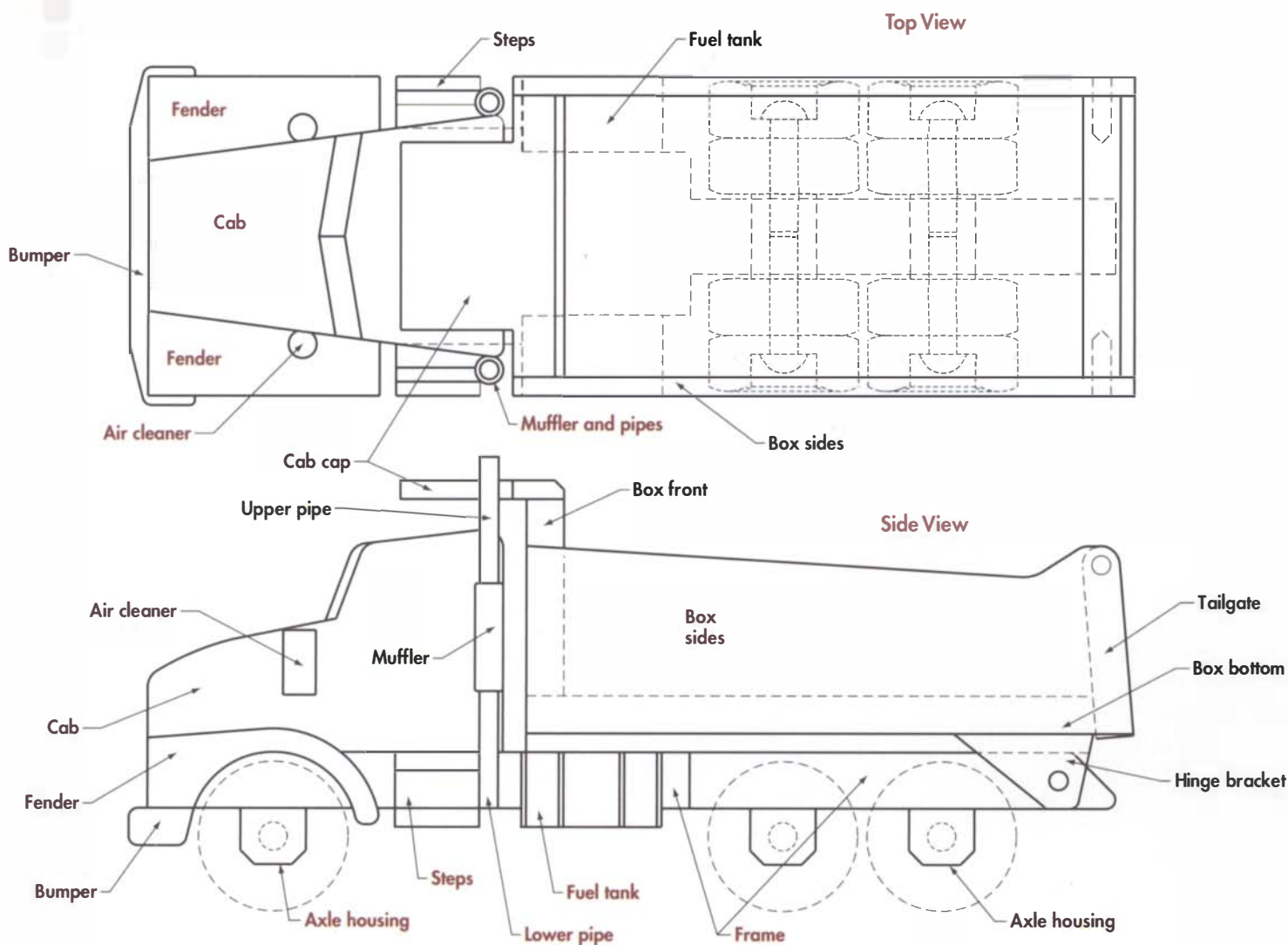
The tow truck will tow any of the toys in this book, provided you drill a small hole in the underside of the

front bumper to give the hook a place to grab. The winch will not unwind by itself, which allows the operator to lift a vehicle then drive around towing it.

The flat-deck truck is a general-purpose hauler and can be used with the forklift (chapter 11). The flat-deck truck can haul barrels, blocks, and small toys. Elastic bands can be used as tie-downs.

As much as possible, I tried to standardize these three trucks, using the same front section (cab, fenders, air cleaners, steps, bumpers, headlights, axle housings, and

DUMP TRUCK PLAN



exhaust stacks) for each. This makes construction of the set a much easier process, although there is nothing to prevent you from using a cab style from one of the other trucks in this book or from adding your own design features.

You may want to mass-produce these three toys since so many of the parts are identical.

This chapter will describe the construction process for all the parts, while the next two chapters will refer to this chapter for any parts that are identical (such as the cab, the fenders, etc.).

Put simply, this truck is a shaped block (the cab) glued to a flat frame. Hinged to the back of the frame is a rectangular hollow box.

Frame

The frame of this toy truck has the same basic function as the frame on a full-size truck. It is the backbone to which you glue the cab, the axles, and the dump box.

1. Lay out the frame on $\frac{3}{4}$ -in.-thick stock. Working from a centerline is probably the best system. Mark the $3\frac{5}{16}$ -in. distance with a line across both sides, using a square. This distance should be kept accurate because the fenders are attached to the angled section but the steps are more easily attached to the straight section. Too long an angle and the steps won't fit; too short an angle and the fenders won't fit. You have about $\frac{1}{16}$ in. to play with—maybe even $\frac{1}{8}$ in., if you shorten the steps a little.

DUMP TRUCK

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Cab	4¾ x 3 x 3	1	
Box	3⅛ x 2⅜ x 1⅜	1	
Frame	12⅕ x 2⅞ x ¾	1	
Cab	4¾ x 3¼ x 3	1	
Fenders	3⅜ x 1⅕ x 1⅛	2	Mirror images
Air cleaners	⅜ dowel x ⅞ long	2	
Steps	1⅛ x 1 x 1⅕	2	Cut one piece about 2½ in. long; split later
Bumper	4½ x ⅞ x ½	1	
Headlights	¼ dowel x ⅜ long	4	Round end before cutting to length
Front axle housing	2⅞ x ⅞ x ¾	1	Make enough for all three housings
Rear axle housings	1⅛ x ⅞ x ¾	2	
Lower pipes (exhaust)	¼ dowel x 2⅛ long	2	
Upper pipes (exhaust)	¼ dowel x 2⅜ long	2	
Mufflers	⅜ dowel x 1½ long	2	
Box front	2⅕ x 3¾ x ½	1	Cut front, bottom, and tailgate from one piece of wood
Box bottom	7⅙ x 3¾ x ½	1	
Box tailgate	2⅙ x 3¾ x ½	1	
Box sides	8⅛ x 2½ x ¼	2	
Tailgate-hinge dowels	¼ dowel x ¾ long	2	Cut about 1 in. long; trim later
Cab cap	3¾ x 2⅓ x ¼	1	Note grain direction
Box frame rail	7½ x 1 x ¼	1	
Hinge brackets	1⅞ x 1 x ¼	2	
Hinge dowel	1½ long x ¼ dowel	1	Cut about 1¾ in. long; trim later
Fuel tanks	1 dowel x 1¾ long	2	May use factory-made wooden barrels
Axle pins	1⅓ dia.	6	
Wheels—single	2 dia. (factory made)	2	
Wheels—dual	2 dia. (factory made)	4	

2. Bandsaw to shape.

3. Sand all surfaces except the long, angled ones; they are better sanded later together with the cab, after the cab is glued on. Keep an eye on the 3⅙-in. length. If you have to, cut the frame a little narrower than 2⅞ in. to make sure you retain the 3⅙-in. length.

4. Cut the 45-degree angle at the back of the frame. This angle will most likely be customized to fit your dump box later, but at least rough it out now with a handsaw or coarse disk sander.



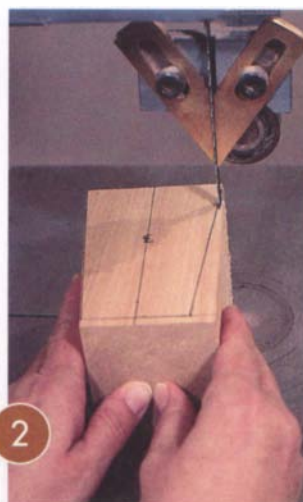
5. Drill the pivot hole at the end of the frame. A ¼-in. dowel should just slide into this hole. Depending on the



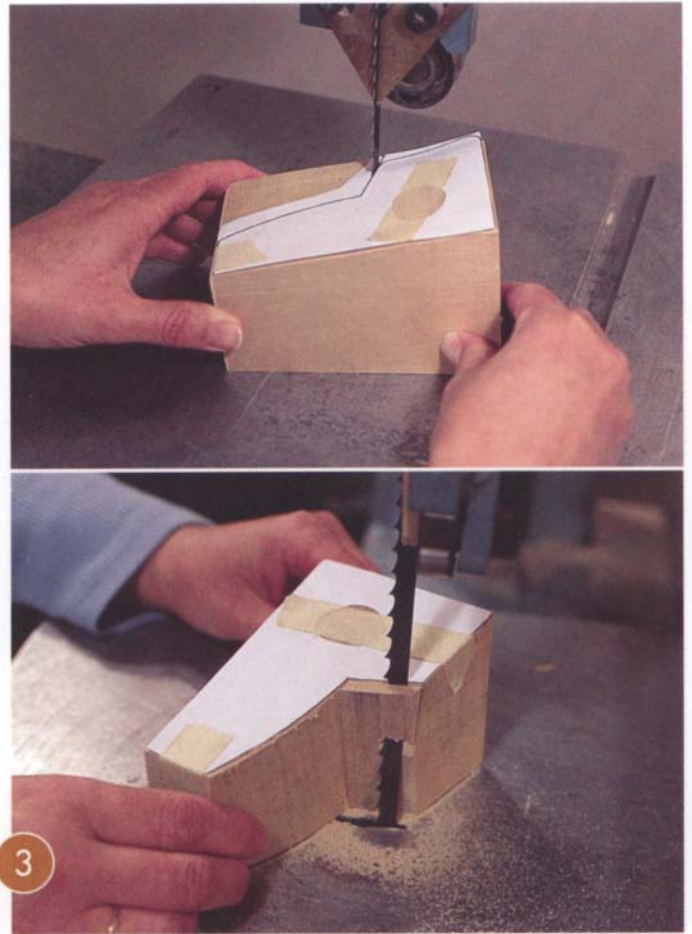
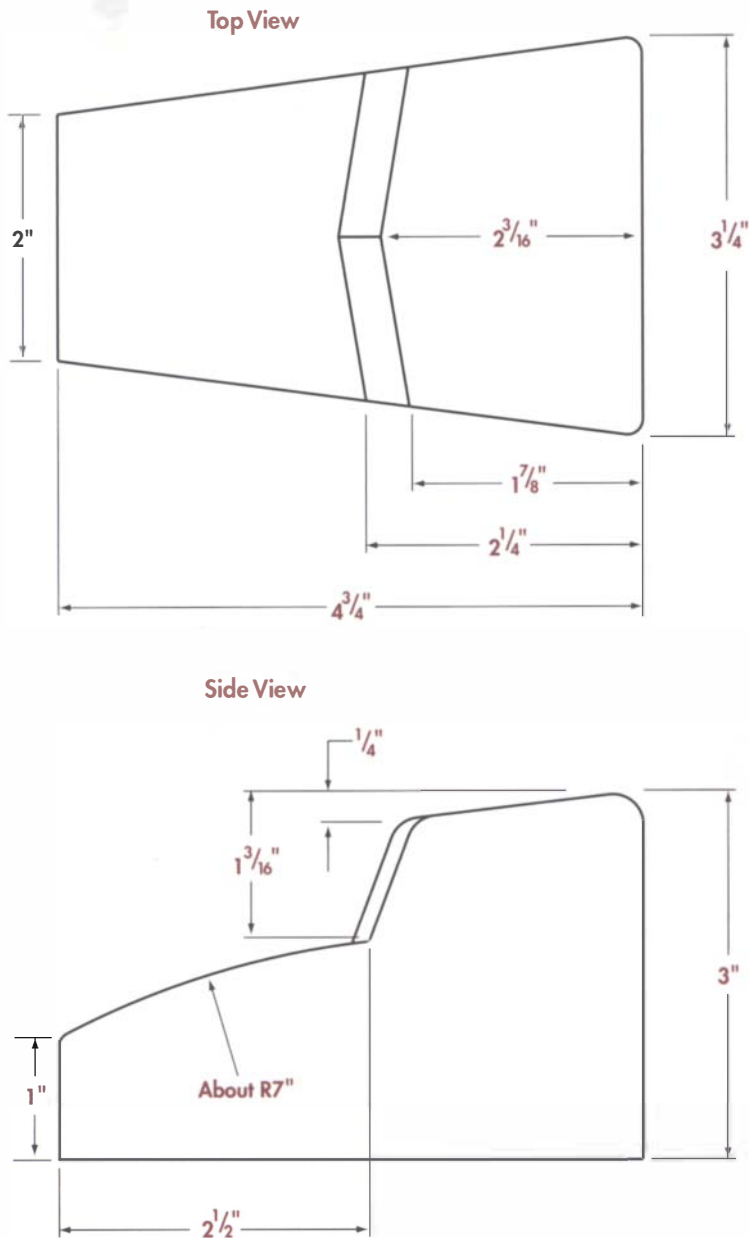


Cab

The window angles are formed as the hood is cut, so the cab is one of the easiest parts to make.



- CHAPTER 3 • DUMP TRUCK 43



3. Lay out the side profiles or tape the template to the side. Cut from one side. This will give you a lopsided windshield to start with.

Tape the template to the other side, and recut the hood (not much wood will be removed from the hood) and windshield. This will make the hood and windshield symmetrical and will form the shape of the windshield.

4. File and sand until smooth. Rough-file the windshield, being careful not to dig into the hood. Then finish-file it using a small (6-in.), flat, smooth file; the file may do a good enough job that you won't have to sand the windshield at all. Round the corners as shown on the drawing. Don't bother to sand the sides much since it is better to sand them together with the frame (see step 6 below).



5. Glue the cab to the frame. Clamp this using one clamp on the roof and another on the hood near the windshield. You may want to use soft blocks to protect the cab.

6. Sand or plane the angled surfaces flush.

7. Round the hood front and side corners, as well as

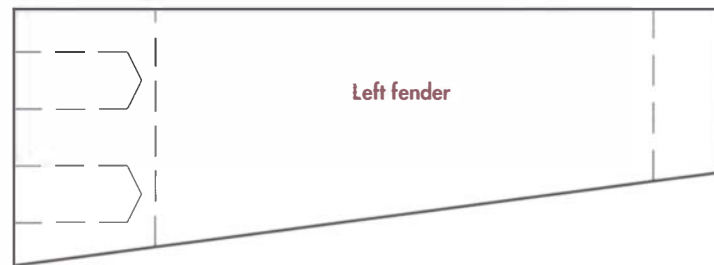
the roof and windshield corners. At the front of the truck (where the real truck has a radiator and grill), leave the

vertical corners quite sharp in the area where they meet the fender. If you are making the semi truck, however, round these corners as well (see chapter 9).

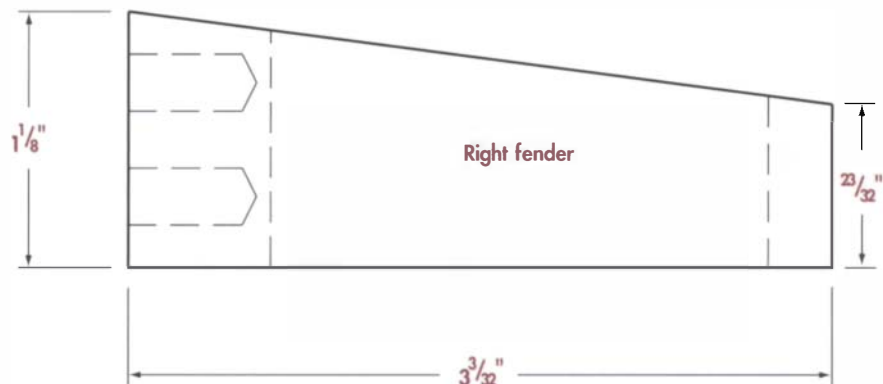
Fenders

You can make the fenders using a contrasting wood, as I do, or the same wood as the cab. Cut out the fenders and wheel wells, saw the angles to match the cab, and glue the fenders to the sides of the cab. Then sand the fender fronts flush with the front of the truck, and sand the bottoms even with the bottom of the frame. Headlights go in later.

FENDERS



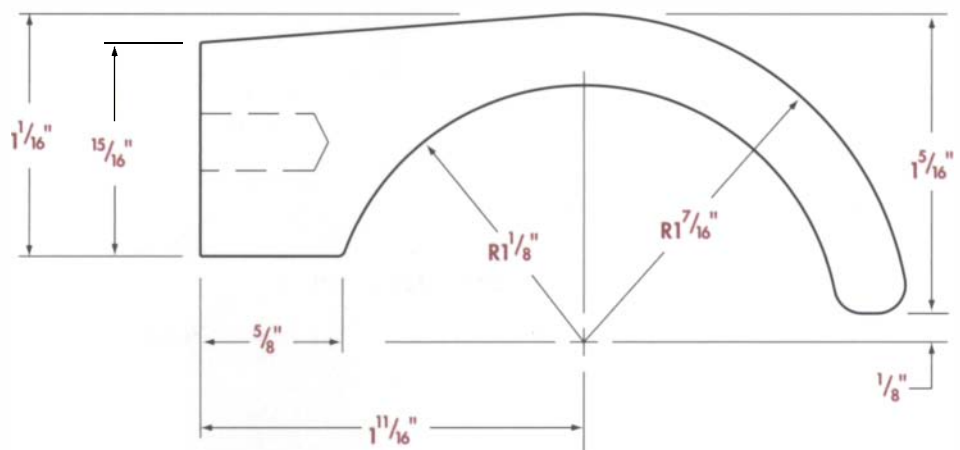
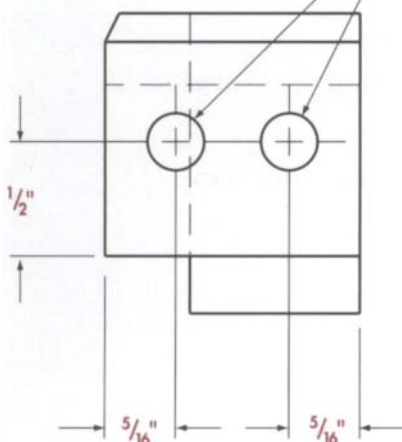
Top View

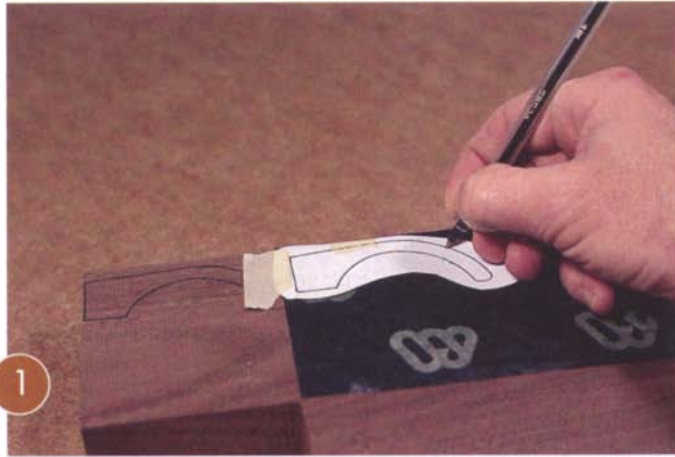


Side View

Front View

Drill $\frac{1}{4}$ " dia., $\frac{1}{2}$ " deep





1. Select the fender material. Stock can be thicker than shown on the cut list and drawing since it will be trimmed later anyway.

Lay out fenders using the templates and carbon paper. If you don't want to use carbon paper, just darken the underside of the template with a pencil and then trace onto the wood. The lead from the pencil will act as carbon paper.

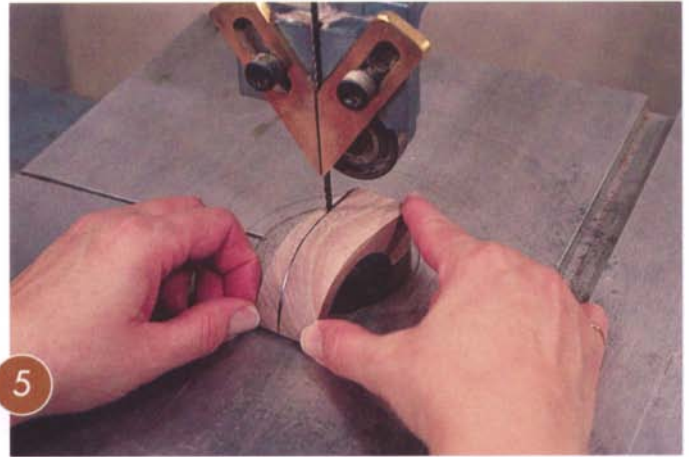
2. Bandsaw the fenders to shape. Use a $\frac{1}{4}$ -in. blade to cut the wheel-well arc. With a larger blade, you will need to make relief cuts.

3. Sand the fender, using a drum sander on the drill press to do the wheel well. You could do this by hand, but the drill-press drum sander is inexpensive and will come in handy many times if you do much toymaking. Sand the outside curves on a belt sander or by hand. Don't bother sanding the front because it is better to sand this after the fenders are glued to the cab (except if you are making the semi truck).



4. Lay out the angle on the top. Mark the dimensions on each end (for the dump truck, this is $1\frac{1}{8}$ in. at one end, $2\frac{3}{32}$ in. at the other end). Join these two end marks as well as you can with a straightedge. You are doing this over a curve, so some estimation is needed. After you cut this angle, a disk sander will quickly sand it straight.

Make sure you have a left fender and a right fender.



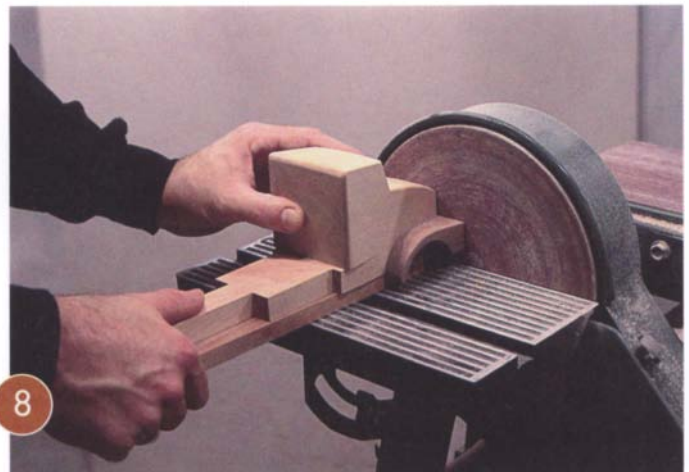
5. Cut the angle using a bandsaw. Leave a little extra, and sand to the line using a disk sander.

6. Sand the outside corners and edges to round them slightly, but leave the edges that will be in contact with the cab. Sand the frame bottom, if you have not already done so.

7. Glue the fenders to the cab. Use the glue sparingly because it is hard to remove excess glue around these curves. It is not a problem, however, if it squeezes out the front.

If there is a gap, you may want to clamp the fenders in place, but I usually just press them firmly in place.

Have the front of each fender protrude slightly past the front of the truck ($\frac{1}{4}$ in. back for the semi truck), and have the bottom of each fender front protrude slightly below the frame. The back end of each fender drops about $\frac{1}{4}$ in. below the frame. This can all be done by eye since measurement is not extremely critical here. When you look at the front of the truck, make sure the fenders are the same height.



8. When the glue is hard, plane, file, or sand the front bottom section of the fenders even with the frame.

Sand the front of the truck and the front of the fenders flush. You could use a disk sander for this. You may want to put a spacer board under the frame to ensure that the frame sits flat (otherwise it balances on the backs of the fenders).

If you are referring back to this chapter while making the semi truck, note that the semi does not have the fenders flush with the front of the truck.

9. Sand by hand as needed, and sand slight rounds or bevels on each sharp corner, except along the bottom where the bumper will go.

Air Cleaners

These are short pieces of dowel that imitate the truck's air cleaners. Sand small flats on one edge to make a strong glue joint. Length is not important here. You see trucks with all lengths of air cleaner.

- 1.** Cut two pieces of $\frac{3}{8}$ -in. dowel to length.
- 2.** Sand the ends, and bevel the corners slightly.
- 3.** Sand a small flat along the length of each dowel.
- 4.** Put a little glue on with a toothpick, and press the dowels onto the cab sides. Look at the plan drawing or the photo, and locate by eye. If they are within $\frac{1}{2}$ in. of where the drawing has them, they will look great.

Steps

Sometimes truck steps are combined with fuel tanks, but this truck has steps and separate fuel tanks. A double length of step material is made, then cut into two steps—one for each side of the truck. You may want to make the steps and the fenders from the same type of wood. Again, suit yourself.

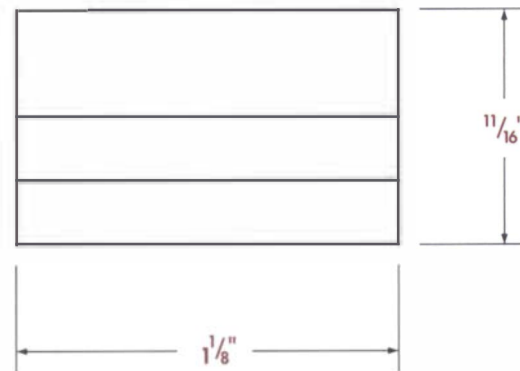
- 1.** Cut a rectangle of wood long enough to make two steps.

If you are referring back from another chapter, for most trucks, cut one piece about $2\frac{1}{2}$ in. long; for the log truck, cut two separate pieces.

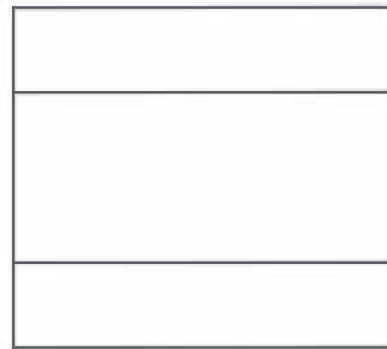
- 2.** Sand or cut the ends square, then lay out for the steps on one end.

STEPS

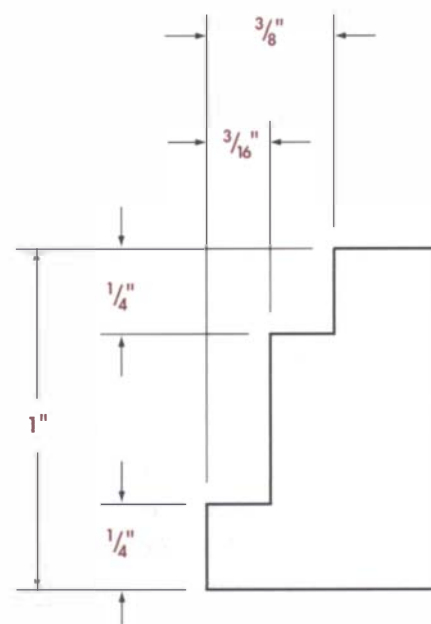
Top View

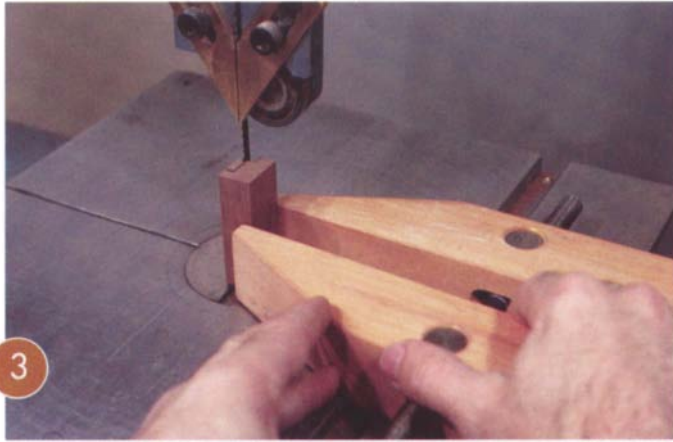


Side View



End View





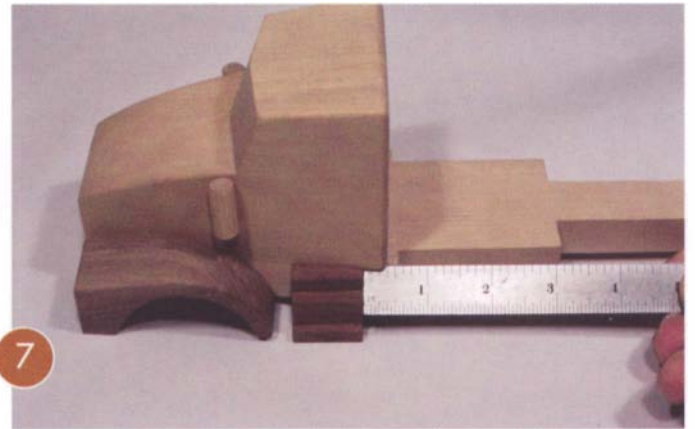
3. Cut the steps using a bandsaw. This is an easy operation if you clamp the steps on end using a handscrew clamp.

4. File and sand as needed.

5. Cut the material into two parts. The finished length will be about $1\frac{1}{8}$ in., perhaps a bit shorter, but adjust the length to fit the room you have under the cab, along the straight section of the frame.

6. File small bevels onto all sharp corners.

If you are making the steps for the semi truck, cut the angle on the back of the steps. This angle is the same as the angle on the frame and cab. Get it close enough so the steps look right when held against the frame.

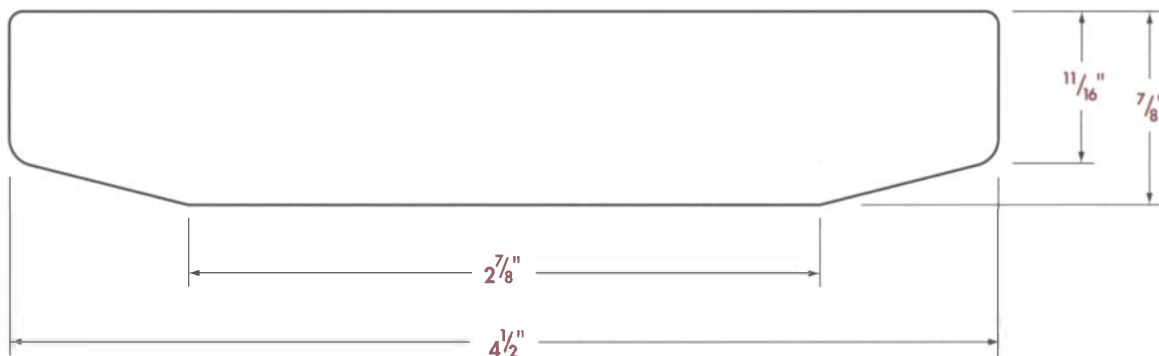


7. Glue the steps to the frame, one on each side.

Leave room on the cab for the exhaust stack (see the plan drawing). The rear edge of the steps should be $\frac{5}{16}$ in. to $\frac{3}{8}$ in. from the back of the cab.

BUMPER

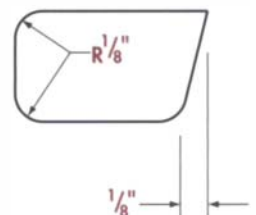
Top View



Front View



Side View



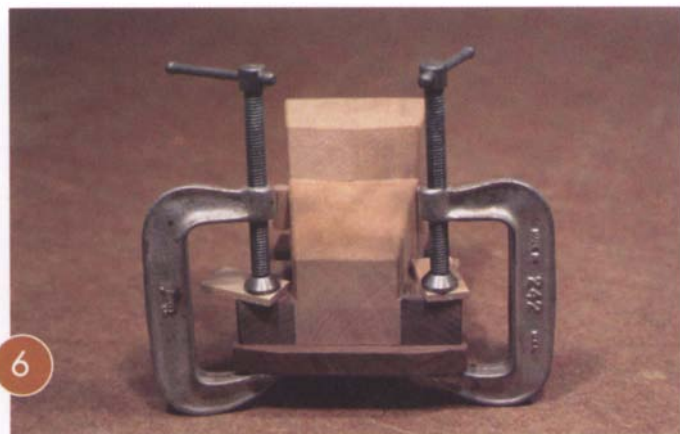
Bumper

Use wood that contrasts with the cab, and round the corners somewhat so that it looks more like a bumper. The back edge of the bumper should blend in with the wheel wells.

1. Lay out on $\frac{1}{2}$ -in. material, and cut it out using a bandsaw.
2. Sand as needed.
3. Bevel the back edge to line up with the wheel wells. You may want to hold it in place to mark out the bevel.



4. Plane or sand this bevel, keeping the width of the bumper consistent along its length.
5. File and sand as needed.
6. Glue the bumper in place. Line up the back (angled) edge with the fender wheel wells.
Clamping may not be needed, but if you need to clamp, two C-clamps work well here.



Headlights

You have several choices for headlights. One is not to bother—don't add any headlights. Another is to drill dimples in the front of the fenders which looks fine. The third choice is to drill holes in the fenders and insert dowels that contrast with the fenders (dark or stained dowels on light fenders, light dowels on dark fenders). I prefer the dowel version. It is only a little more work and looks pretty sharp, and I've noticed that lights tend to catch a child's eye.

1. Lay out for the headlight locations (see the fender drawing on p. 45).

2. Drill holes using a portable drill. Be careful that the drill does not weave about. Drilling at a slight angle is not serious, but try not to move side to side as you drill or the hole will be bell-mouthed. Use a drill press if you want, but it is a little awkward to clamp the truck in a vertical position.



Drill an experimental hole in a scrap of fender wood, on the end grain. If that doesn't work, take the time to set up a drill press or don't bother adding the lights.

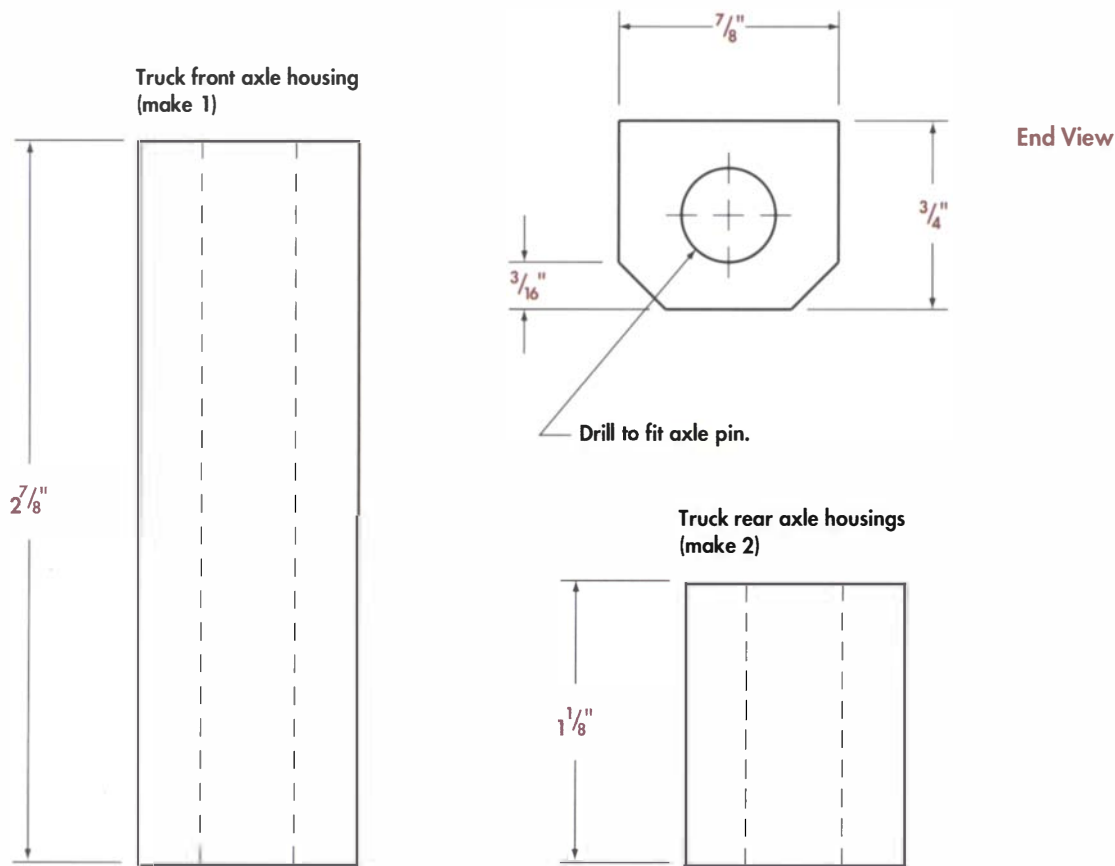
3. Make the first two $\frac{1}{4}$ -in. dowel lights by rounding each end of a long piece of $\frac{1}{4}$ -in. dowel.
4. When the rounded ends are smoothly sanded, cut each one about $\frac{3}{8}$ in. long. Bevel the cut edges a little, although it is hard to hold onto these little pieces at this stage.

Make two more headlights by repeating this process.

5. Put a little glue in each hole using a toothpick.
6. Line up each headlight dowel, making sure it's straight, and tap it gently into place using a mallet. Leave the rounded part protruding, with the rest in the hole.



AXLE HOUSINGS



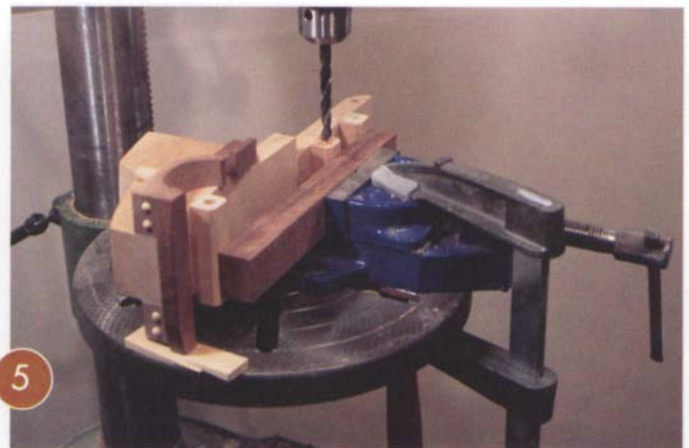
Axle Housings

One long piece is used for the front axle, and two shorter pieces are used for the back axles.

- 1.** For the dump truck, make about 6 in. of axle-housing material. For trucks that have trailers, make sure to include the trailer axle housings when determining the total amount needed.
- 2.** Cut the parts to length.
- 3.** Locate the axle housings according to the frame drawing on p. 43. The front axle should be centered in the wheel well.
- 4.** Lay out for the axle holes. Check that the front axle hole is centered on the wheel well by holding a wheel in place. If it looks good, it is good.

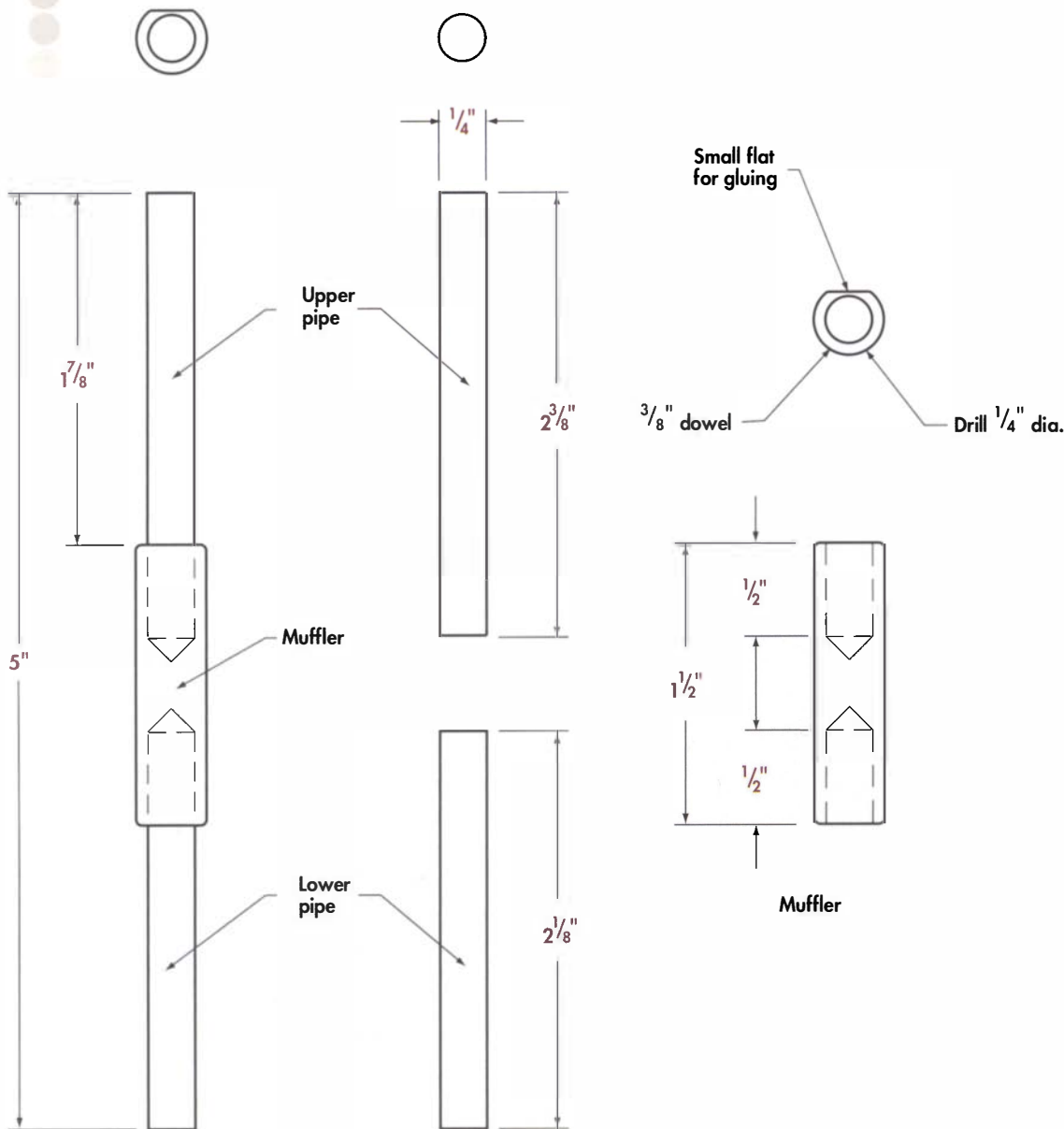
It is quite important that each hole is the same distance up from the floor. I lay out these holes by measuring up from a flat surface, using a table-saw top or bandsaw top.

You can also use a carpenter's rectangular pencil resting on a 1/4-in.-thick board, and slide it around to mark the center height.



- 5.** Drill from each side, using an 1 1/2-in. drill for standard axle pins. Do not put the wheels on yet.

EXHAUST STACKS



Exhaust Stacks

Make each exhaust stack using three pieces of dowel. Drill both ends of a short piece of 3/8-in. dowel, and glue lengths of 1/4-in. dowel in each end. A flat sanded on the side of the 3/8-in. dowel muffler provides a gluing surface.

1. Cut the six pieces of dowel needed for the exhaust system. Sand a small bevel on each end of each dowel.
2. Mark out the center of each end of the 3/8-in. dowel mufflers, using an awl or center punch.
3. Drill the dowel on the drill press, being careful to hold the dowel square to the table. Some vises have V grooves



that help here; if not, be sure to check with a square.

If you have a wood or metal lathe with a three-jaw chuck, this is a great time to fire it up.

You could drill the muffler right through, but it seems to be more accurate to drill each end. This also leaves the muffler a little stronger because it has a solid center section.

Check the location of the hole once or twice as the drill just starts to enter the wood. You can quickly see if the drill is moving off center, and correct it by gently straining the muffer to the side as you drill a little deeper. This only works until the drill point is completely buried in the wood.

4. Check that the $\frac{1}{4}$ -in. dowel slides into the muffer hole. If it is tight, sand the end a little by putting the dowel in a drill chuck and spinning it. Sand only the part that goes in the hole.

Put some glue in the holes and install the $\frac{1}{4}$ -in. dowel, making sure that both exhaust stacks end up the same length.

While the glue is wet, roll the assembly on a flat surface to see if the dowels are in alignment. They may be strained a little at this point if they are unduly out of line. If they

are way out of line, you may have to make another muffer.

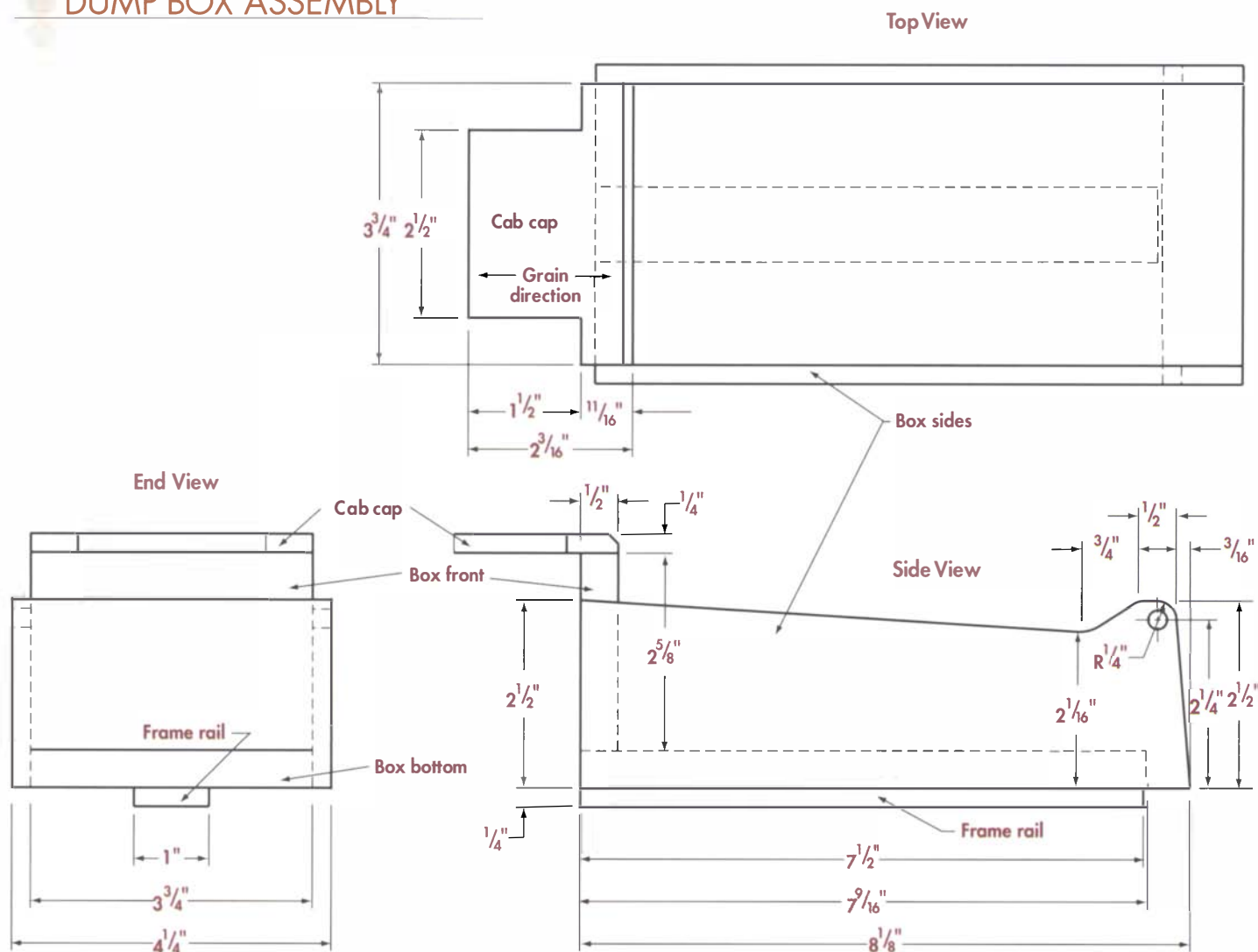
5. File or carefully disk-sand the small flat on the muffer.

6. Glue the assembly to the truck. Usually the bottom section of the stack touches the side of the steps, and the end of the stack is flush with the bottom of the steps.

Dump Box

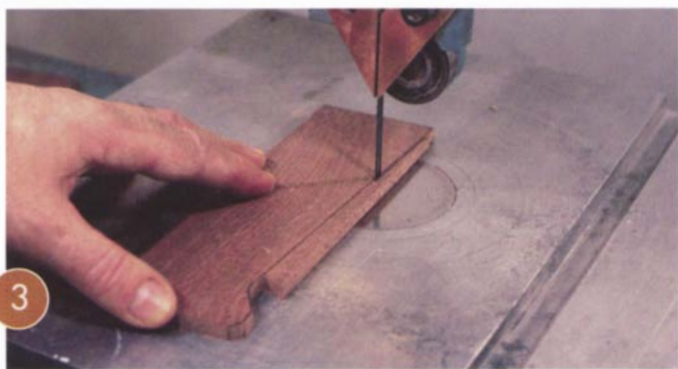
The box is made of seven main parts: front, bottom, two sides, a tailgate, a cab cap stuck on top, and a box frame rail glued on the bottom. Cut out the sides with the help of the template, then cut both the bottom and the front from the same piece of wood. Assemble these four parts, pin the tailgate in place with dowels, then glue the cab cap to the top of the assembly. The box frame rail and the hinges are added later.

DUMP BOX ASSEMBLY



1. Cut a board long enough to provide material for the bottom, the front, and the tailgate of the box. You want these to be exactly the same width, so it is probably easiest to make them from the same piece of $\frac{1}{2}$ -in.-thick stock, $3\frac{3}{4}$ in. wide and about 14 in. long.

2. Cut the bottom, the front, and the tailgate to length. Sand as needed.



3. Cut out the sides, after tracing them from the template onto $\frac{1}{4}$ -in.-thick stock. Thicker stock would also be fine here, but $\frac{1}{4}$ -in. stock gives the box greater capacity. Stock that is $\frac{1}{2}$ in. would work if you make the bottom, front, and tailgate $\frac{1}{2}$ in. narrower ($3\frac{1}{4}$ in. wide).

Mark the center of the tailgate pivot holes, but drill them later with the tailgate in place.

4. Sand all the box parts.

5. Glue the front, bottom, and sides together. This is a bit of a challenge but manageable:

Spread glue on the appropriate edges of the bottom and front pieces. Press the sides into place and clamp gently.

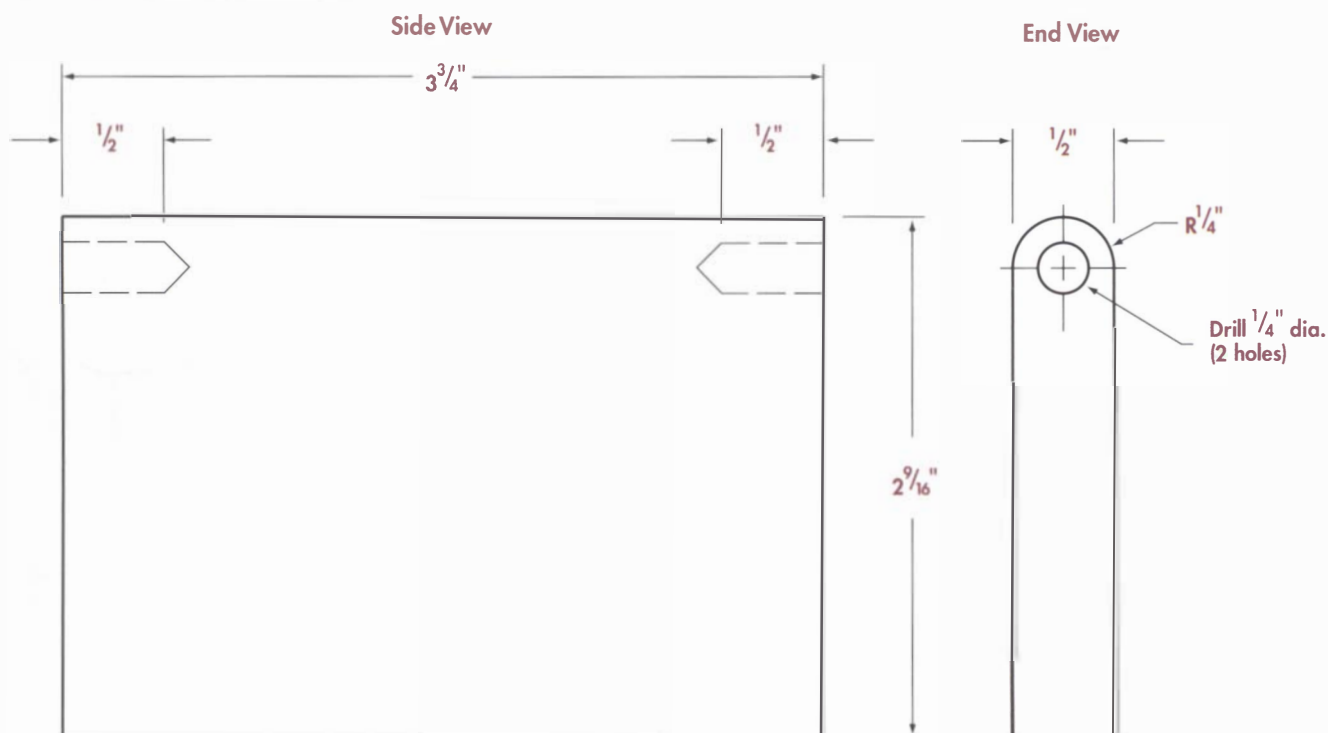
Slip the tailgate in but don't use glue. It will act as a spacer to keep the sides parallel.

Tap the parts into place and snug up the clamps. Either C-clamps or handscrew clamps work here.

It is fine if the sides protrude a little past the bottom and the front because these surfaces can be easily trimmed away later.



TAILGATE



- 6.** When the glue is hard, trim and sand the edges as needed.
- 7.** Cut out the cab cap, and sand as needed.
- 8.** Glue the cab cap to the top of the box front. Since this cap is probably glued to the end grain of the box front, you may want to drill a couple of $\frac{1}{4}$ -in. holes and put in dowels to reinforce the joint. Wait till the glue in the joint is hardened, then drill with a portable drill. Install the dowels, then sand them flush.
- 9.** Remove the tailgate, and file or sand the round at the top of the tailgate. This does not have to be a perfect radius—just round the corners a little.
- 10.** Slip the tailgate back in place. If it is not tight, place a strip or two of paper between the tailgate and the box sides until it is quite snug. When you clamp it to the drill-press table, the tailgate will be held firmly in place by the clamping pressure.



- 11.** Drill the two pivot holes using a drill size that a $\frac{1}{4}$ -in. dowel just slips into. Usually this is a $\frac{1}{4}$ -in. drill, but sometimes dowel is a little oversize and so the hole must be a little oversize also. Drill a trial hole on a scrap piece, and check the fit (if you haven't already done so).

Drill about $\frac{1}{2}$ in. deep into the tailgate.

- 12.** Remove the tailgate, and sand down the edges so that the fit is a little loose if anything, because you want it to swing freely.



- 13.** Use the drill press to sand the ends of the hinge dowels to ensure that the tailgate can spin on the dowel.

- 14.** Attach the tailgate to the truck box. The goal is to have the tailgate swing freely on the dowels, which are glued into the truck-box sides. Wax the holes in the tailgate using paste wax and a Q-tip, then place the tailgate in location. Before

applying any glue, push the dowels through the box sides, far enough that they begin to enter the tailgate holes, but stop when the dowel has about $\frac{1}{4}$ in. to go. Put glue on this $\frac{1}{4}$ in. of dowel, and tap it in the rest of the way. That way, no glue is pushed into the tailgate holes.

You could do this the other way: put glue in the tailgate hole, and let the dowel spin in the box sides. However, this increases the chance of the box sides splitting. It is better that the dowel is glued to the box sides since this keeps that corner stronger.

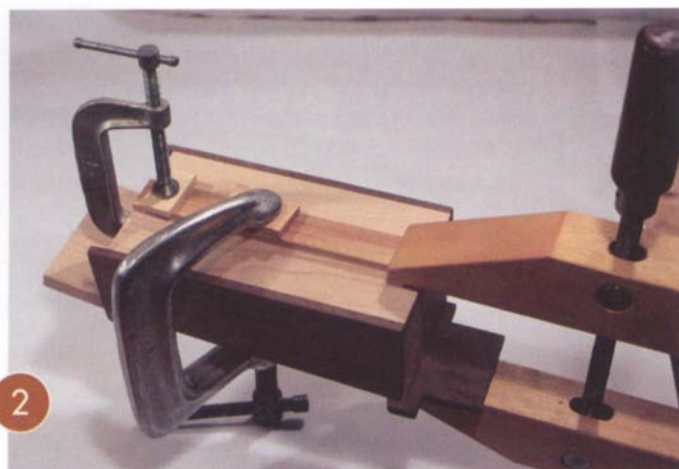
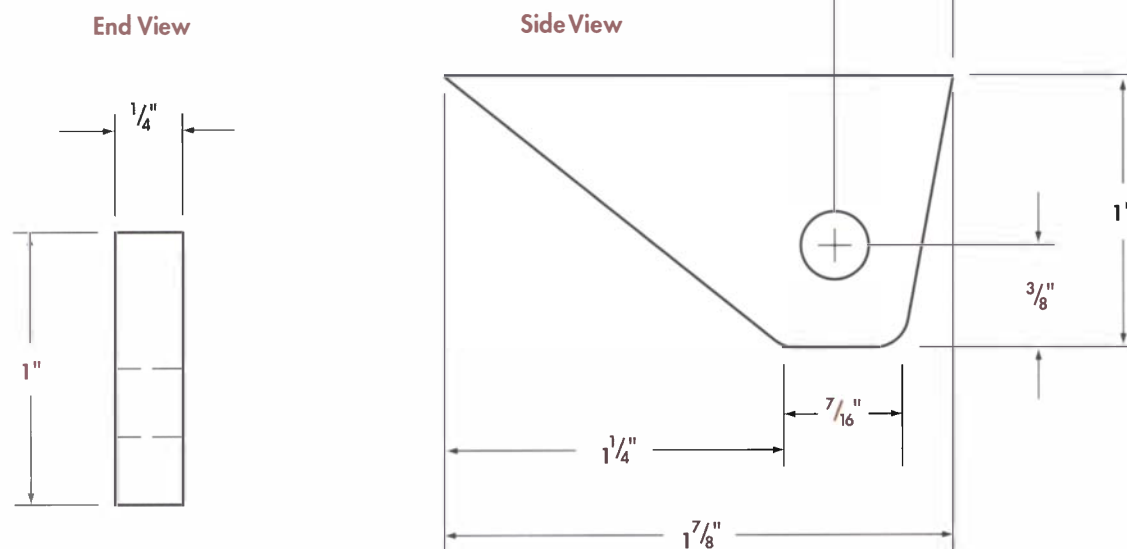
- 15.** Sand the ends of the dowel flush with the box sides.

Hinge and Box Frame Rail

The box frame rail is glued to the bottom of the box, then the hinges are glued to each side of this box frame rail (see the dump-box drawing on p. 52).

- 1.** Cut out the box frame rail. The finished width should be the same size or perhaps slightly wider ($\frac{1}{64}$ in.) than the narrow, 1-in. part of the truck frame so that the box will pivot easily when the hinges are in place. Sand as needed.
- 2.** Glue the box frame rail to the bottom of the box, making sure that the box frame rail is centered on the box bottom. Measure at both ends.

HINGE BRACKETS



3. Lay out the two hinge pieces on 1/4-in.-thick wood, but don't cut them yet. It is easier to drill these small pieces before cutting them out.

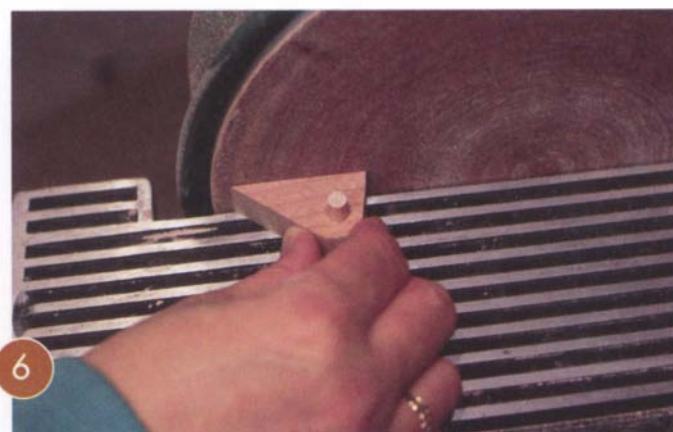
4. Drill the holes for the 1/4-in. dowel pivot. These holes should be a sliding fit on the dowel but not loose. The dowel will be glued into them later, but this dowel will turn freely in the hole in the truck frame.

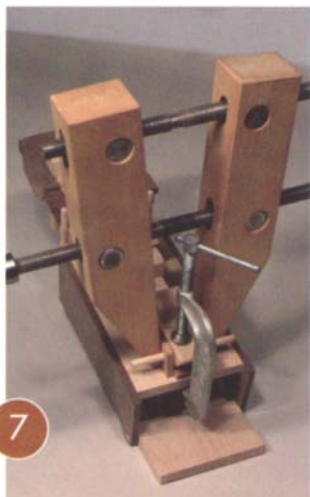
5. Use the bandsaw to cut out the hinges, cutting a little oversize for now.



6. To sand the hinge pieces to the exact shape, put a short dowel into both holes and pin the hinge pieces together. Sand around the edges using a disk sander. This helps ensure that the holes will line up later.

Be careful not to sand the long straight edge undersize. Better to leave a little extra wood here, if anything.





7. Assemble the parts (no glue yet), including a length of $\frac{1}{4}$ -in. dowel for the hinge. There should be about a $\frac{3}{8}$ -in. gap between the cab and the box. When the box is located correctly and the hinges are in place, glue the hinges to the box frame rail. Before clamping, put the hinge dowel back in place to keep everything aligned. Don't apply glue to the

dowel yet because you need to remove the dowel later.

8. After the glue is dry, check that the box pivots properly.

It may hang up on that 45-degree angle at the back of the truck frame. This angle will keep the box from going back too far, but you will likely have to file or sand it down a little to get the box to tilt enough.

Remove the dowel, and trim the 45-degree angle until you are satisfied that the box tilts far enough. It should stay up on its own once it lifts up to its maximum tilt.

9. When attaching the box assembly to the truck frame, the dowel is glued to the hinges but turns freely in the truck frame. I do this in a fashion similar to the way the tailgate is attached to the box sides, to ensure no glue gets into the truck frame.

Put some paste wax in the hole in the truck frame, using the Q-tip again. Place the box assembly in location on the truck frame. Put glue in the hole of one of the hinge pieces, then slide the dowel in from the other side. When there is about $\frac{1}{4}$ in. left to go, put glue on the exposed part of the dowel and push it into place.

10. When the glue is hard, sand or file the ends of the dowel flush with the hinge pieces.

Fuel Tanks

Use either 1-in. dowel or factory-made wooden barrels, which look very much like fuel tanks.

1. Sand a flat on the dowel or barrel, until the flat is almost $\frac{3}{4}$ in. wide.

2. Glue to each side of the truck (see the drawing on p. 41 for location).

Wheels

1. Cut the pins as needed, to make sure they do not meet in the center of the axle housing. This may not be a problem for the front axle but will be for the rear axles.

2. Check that all six wheels turn when the truck is on a flat surface. Don't glue in the axle pins yet.

If one does not turn, drill out all wheel holes $\frac{1}{64}$ in. oversize, and try again.

3. Put paste wax in the wheel holes using a Q-tip, but don't leave any excess wax in the hole. Put glue in the axle-housing holes, using a toothpick.

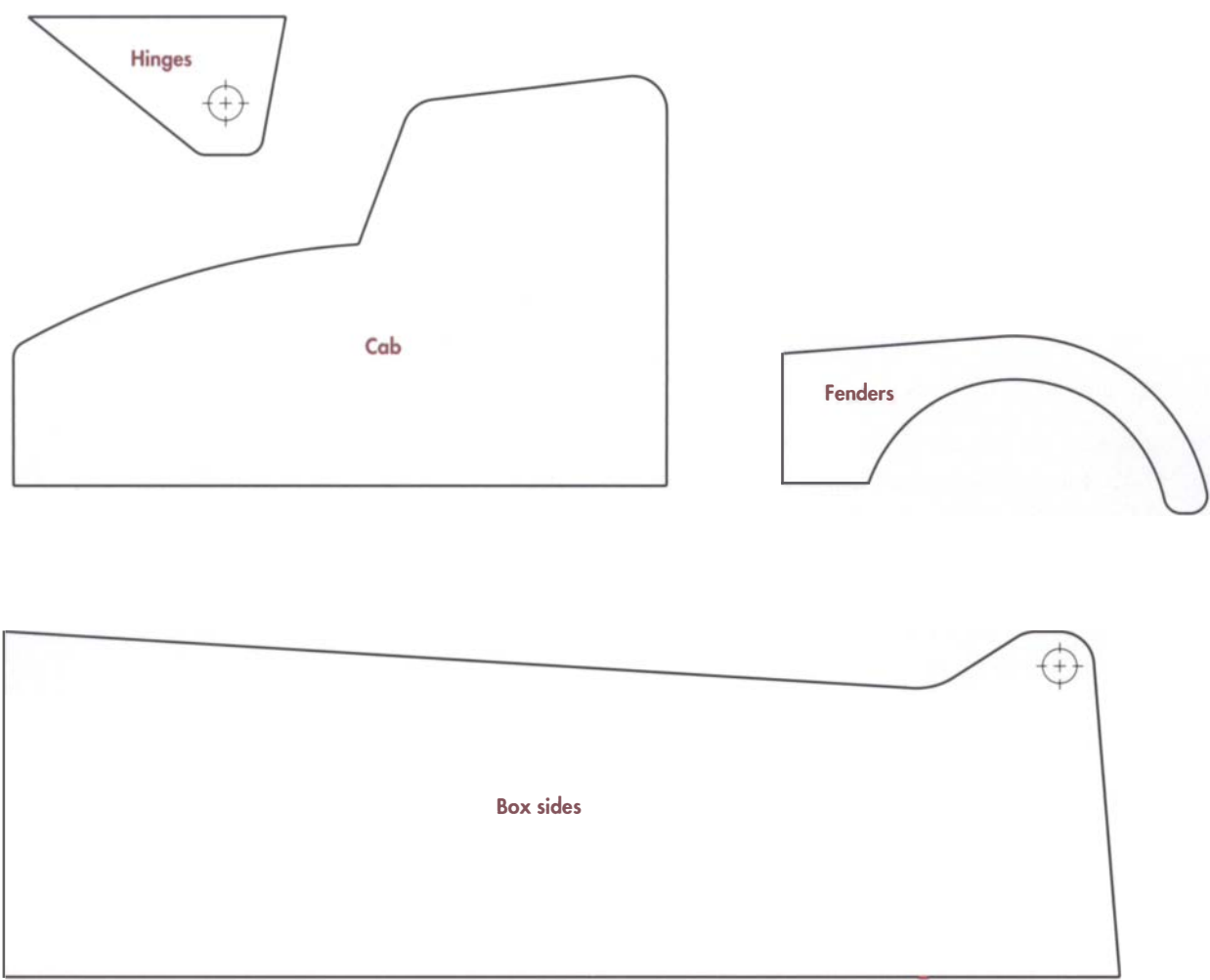
4. Tap the axle pins in place, leaving the wheels a little loose to spin freely.



Finish

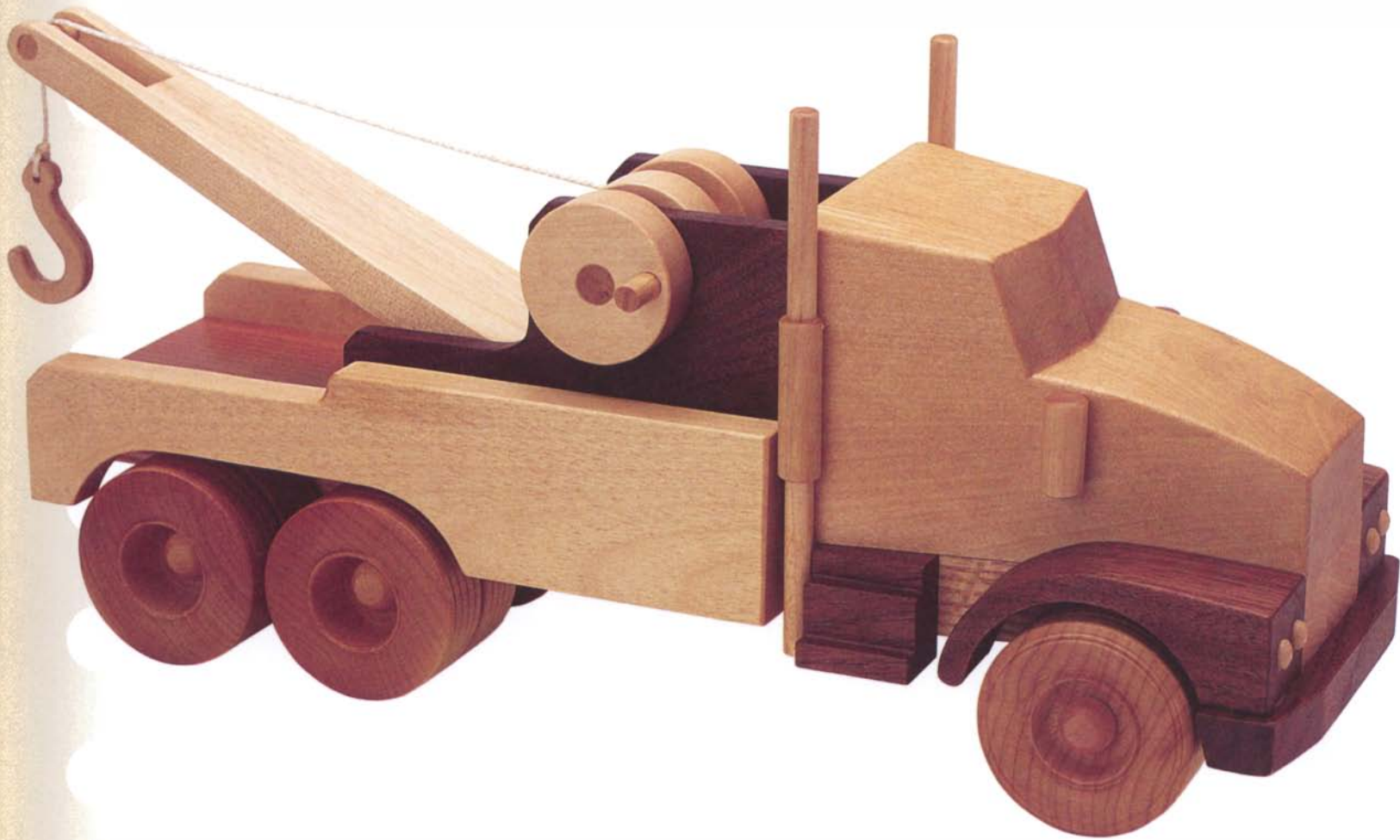
As desired. You may want to read the appendix on finishing on p. 172.

TEMPLATES



For full-size templates, enlarge by 137%.

Chapter 4 Tow Truck



Driving down the road you often see tow

trucks but every now and again you see a huge tow truck built on a Kenworth or Peterbilt chassis.

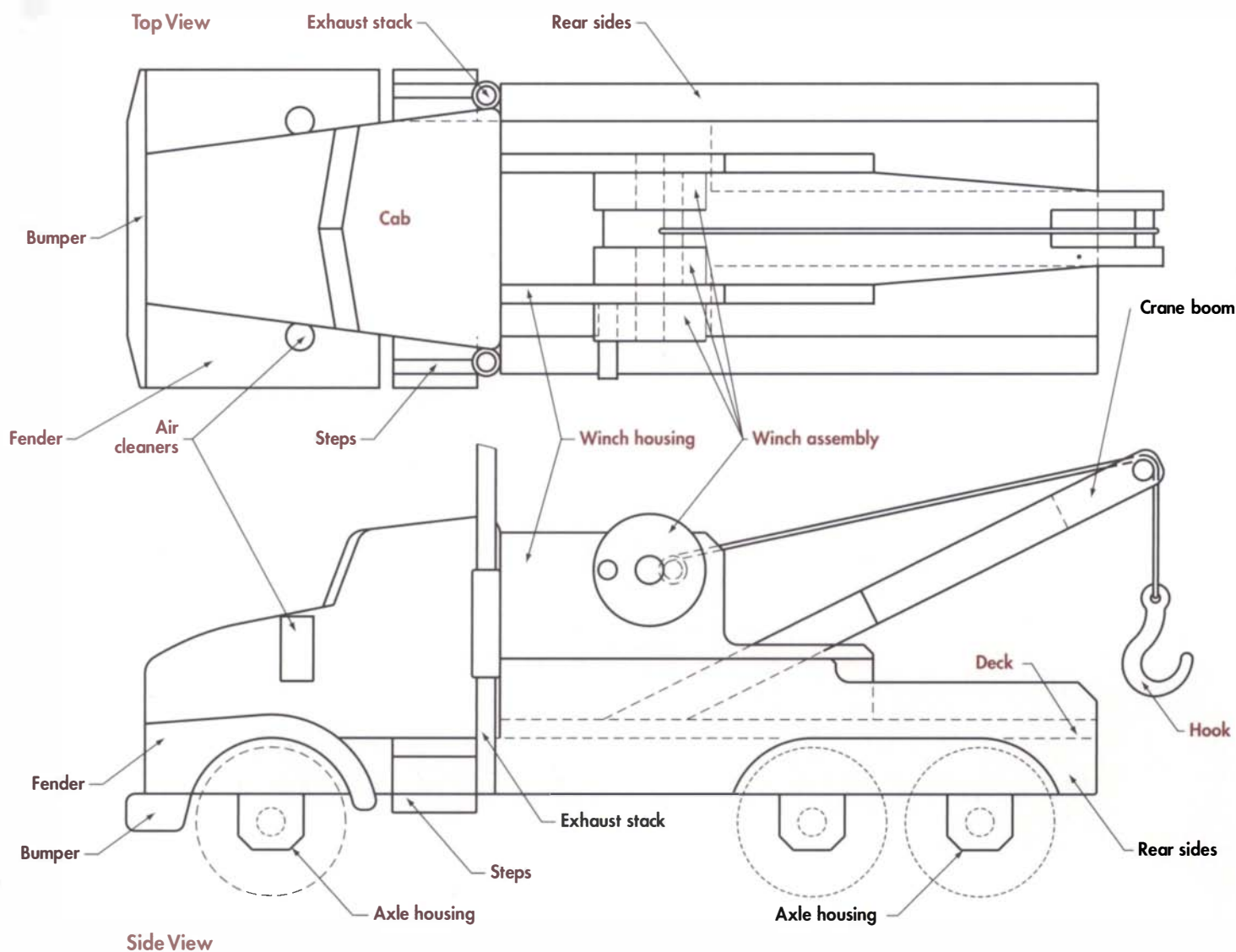
If you need to tow a highway truck, this is the machine you use. After having made a few toy trucks, it seemed natural to develop a matching wooden tow truck.

The winch on this toy—also used on the skidder (chapter 7) and the forklift (chapter 11)—has a simple cam design that prevents the string from unwinding when

pulled. The winch will only unwind when the handle is turned. This means the tow truck can pull other toy vehicles around, holding them raised off the floor, until the operator decides to lower them.

This tow truck is a natural companion to the other wooden toy trucks in this book. In fact, it works well with most toy vehicles including factory-made toys. The tow truck is the second in a series of three similar working trucks, which includes the dump truck (chapter 3) and the flat-deck truck (chapter 5).

TOW TRUCK PLAN



The tow truck builds on the basic frame and body of the dump truck, so the directions will refer to the dump-truck instructions for the parts they have in common (see chapter 3) and then will give the details on the construction of the towing mechanism.

The cab, fenders, air cleaners, steps, bumper, headlights, axle housings, and exhaust stacks are all detailed in chapter 3.

Refer to that chapter for instructions on constructing those parts for the tow truck, then come back here for the towing assembly.

The tow truck consists of a shaped block (the cab) glued to a board frame. On the back are two side boards sandwiching both an angled crane and a rotating dowel assembly as a winch.

TOW TRUCK

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Frame	12 ³ / ₄ x 2 ⁷ / ₈ x ³ / ₄	1	
Cab	4 ³ / ₄ x 3 ¹ / ₄ x 3	1	
Fenders	3 ³ / ₃₂ x 1 ⁵ / ₁₆ x 1 ¹ / ₈	2	Mirror images
Air cleaners	³ / ₈ dowel x ⁷ / ₈ long	2	
Steps	1 ¹ / ₈ x 1 x 1 ¹ / ₁₆	2	Cut one piece about 2 ¹ / ₂ in. long; split later
Bumper	4 ¹ / ₂ x ⁷ / ₈ x ¹ / ₂	1	
Headlights	¹ / ₄ dowel x ³ / ₈ long	4	Round end before cutting to length
Front axle housing	2 ⁷ / ₈ x ⁷ / ₈ x ³ / ₄	1	Make enough for all three housings
Rear axle housing	1 ¹ / ₈ x ⁷ / ₈ x ³ / ₄	2	Make enough for all three housings
Lower pipes (exhaust)	¹ / ₄ dowel x 2 ¹ / ₈ long	2	
Upper pipes (exhaust)	¹ / ₄ dowel x 2 ³ / ₈ long	2	
Mufflers	³ / ₈ dowel x 1 ¹ / ₂ long	2	
Rear deck	8 x 2 ⁷ / ₈ x ¹ / ₄	1	
Deck sides	8 x 1 ¹³ / ₁₆ x ¹ / ₂	2	
Crane boom	8 ¹ / ₄ x 1 ¹ / ₂ x ¹ / ₂	1	
Winch housings	5 x 2 ¹ / ₂ x ¹ / ₄	2	
String-guide dowel	1 long x ¹ / ₄ dowel	1	Cut 1 ¹ / ₄ in. long; trim later
Winch-handle disk	1 ¹ / ₂ dia. x ¹ / ₂ thick	1	May be cut from 1 ¹ / ₂ -in. dowel
Winch-drum side disks	1 ¹ / ₂ dia. x ¹ / ₂ thick	2	May be cut from 1 ¹ / ₂ -in. dowel
Winch-axle dowel	³ / ₈ dowel x 1 ³ / ₁₆ long	1	
Winch-handle side axle	³ / ₈ dowel x 1 ⁵ / ₁₆ long	1	
Winch handle	¹ / ₄ dowel x 1 long	1	
Winch-drum dowel	¹ / ₄ dowel x 1 ⁷ / ₁₆ long	1	
Axle pins	1 ¹ / ₃₂ dia.	6	
Wheels—single	2 dia. (factory made)	2	
Wheels—dual	2 dia. (factory made)	4	
Hook	1 ¹ / ₂ x 1 ⁵ / ₁₆ x ¹ / ₄	1	Baltic plywood

Frame

See the dump-truck instructions in chapter 3.

The frame here is nearly identical to the dump truck but is a little longer at the rear end and does not have the 45-degree angle or the dump tilt hole.

Flat Deck

The tow assembly (crane boom and winch) sits on this flat surface, which in turn is glued to the truck frame. The sides will be glued to the edges of this deck.

1. Cut the deck from ¹/₄-in.-thick material. You could use ³/₈-in.- or ¹/₂-in.-thick wood as well, if that is more convenient, although it would slightly raise the whole tow assembly.

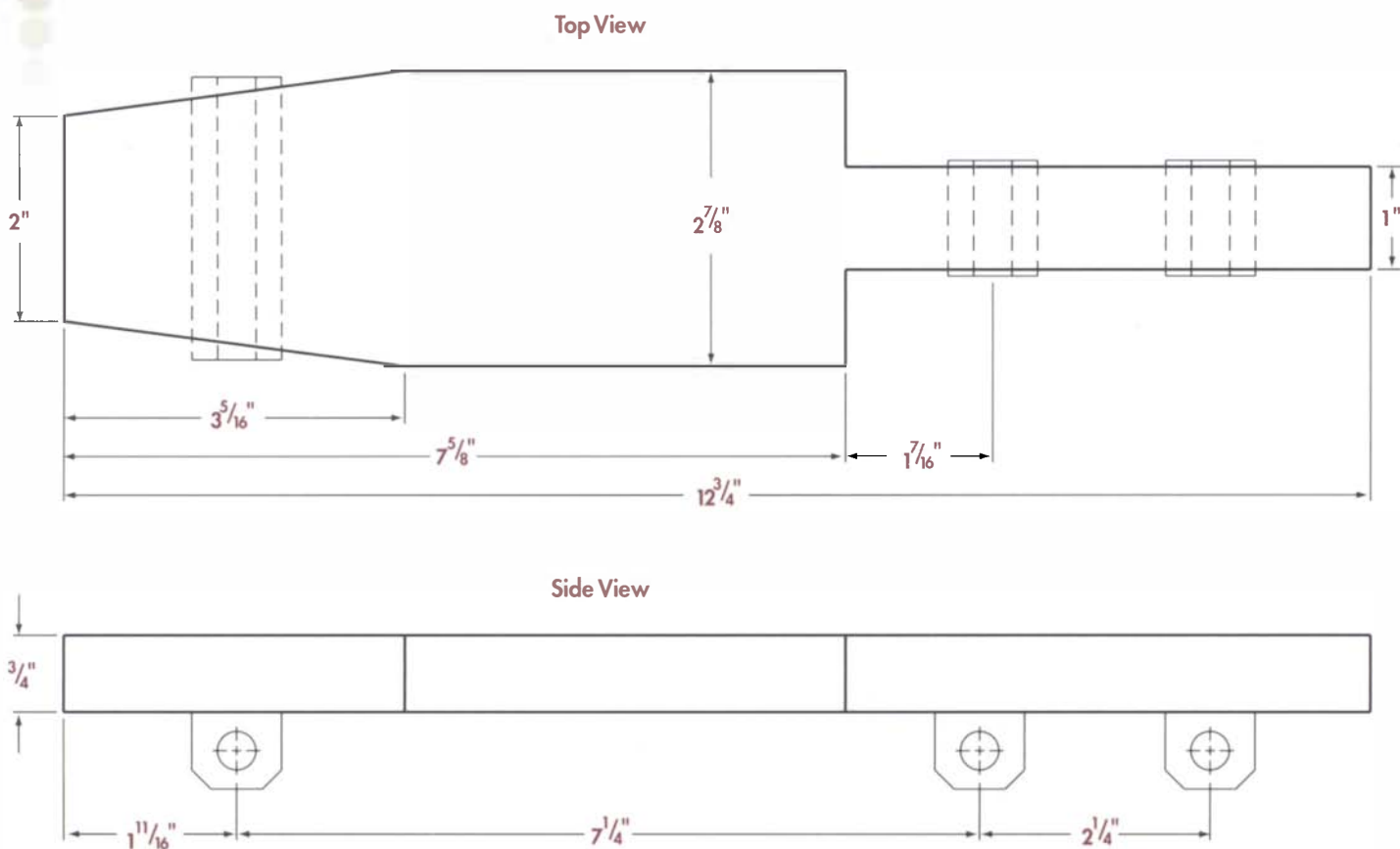
Make the deck the same width as, or slightly wider than, the wide part of the frame. You can always file, scrape, or sand off a small overhang.

2. Sand as needed. Fit the front edge of the deck to the rear of the cab to make sure there is no large gap. It is possible that the back of the cab is not perfectly square to the frame, so fit the deck to the cab.

3. Glue the deck to the frame. Measure at the back to ensure that the deck is centered over the frame. At the front of the deck, have the edges flush as closely as possible with the frame. Clamp in place.

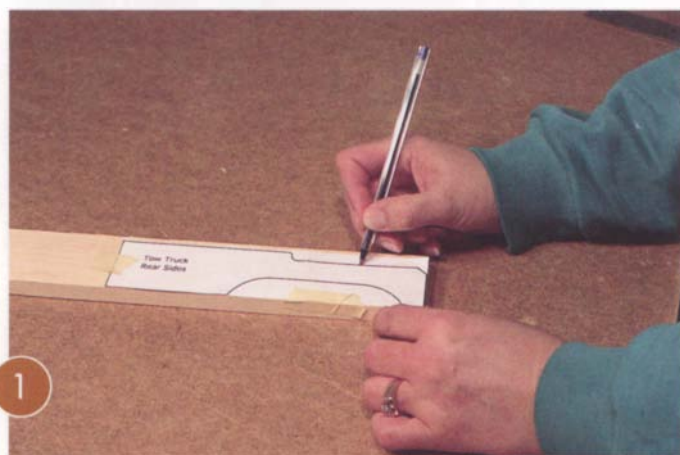
4. Sand or scrape the edges of the deck flush with the edges of the frame.

FRAME



Deck Sides

The sides are part of the body of a large tow truck and are vital to the appearance of the truck. They are glued to the sides of the deck (see the drawing on p. 62).



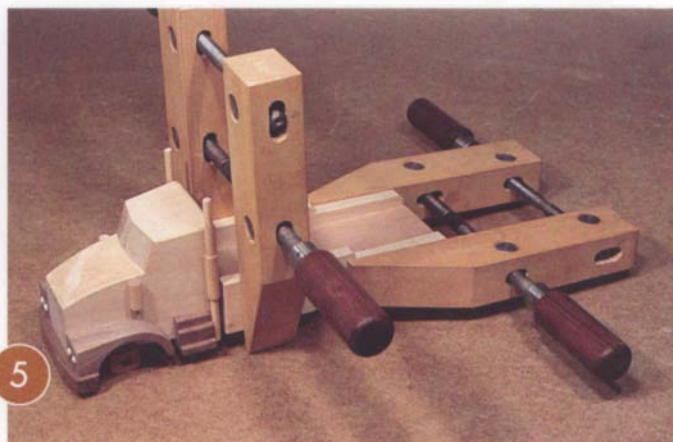
1. Lay out the sides, using the template or the drawing as a guide.

2. Saw to shape using the bandsaw.

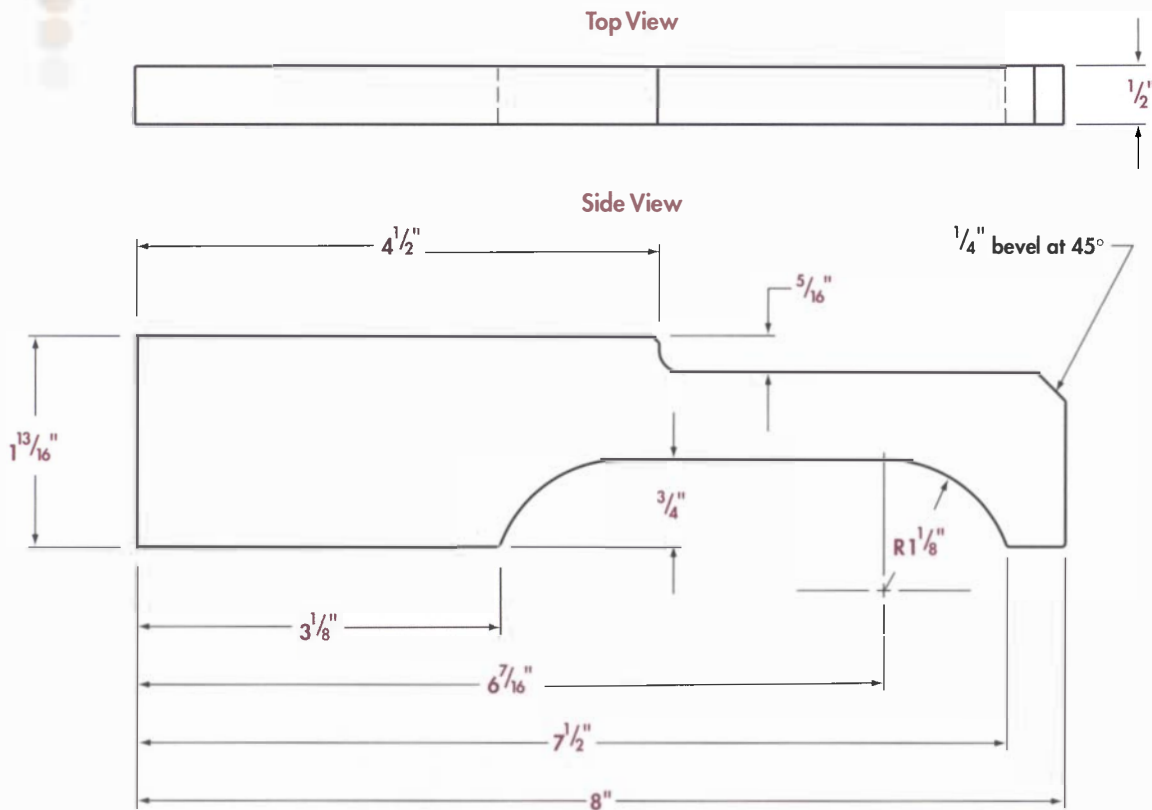
3. File and sand as needed. Use a drum sander for the wheel wells, then bevel all corners slightly with sandpaper.

4. Prior to gluing the sides to the truck, hold or clamp them against the truck. Check that the wheels will be centered in the wheel wells. If not, cut a little extra from the wheel well as needed.

5. Glue to the truck. When you clamp this assembly, check that the sides are square to the deck.



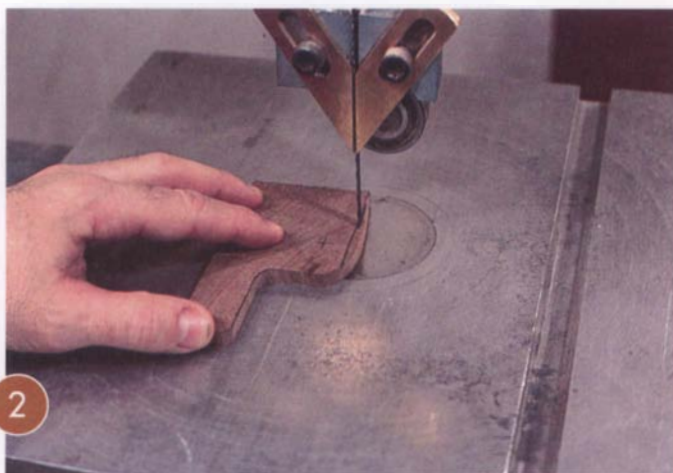
DECK SIDES



Crane Boom

The crane boom is glued between the winch-housing sides, and then the whole assembly is fitted and glued to the deck. The boom does not move; it just supports the string, which in turn lifts the towed vehicle.

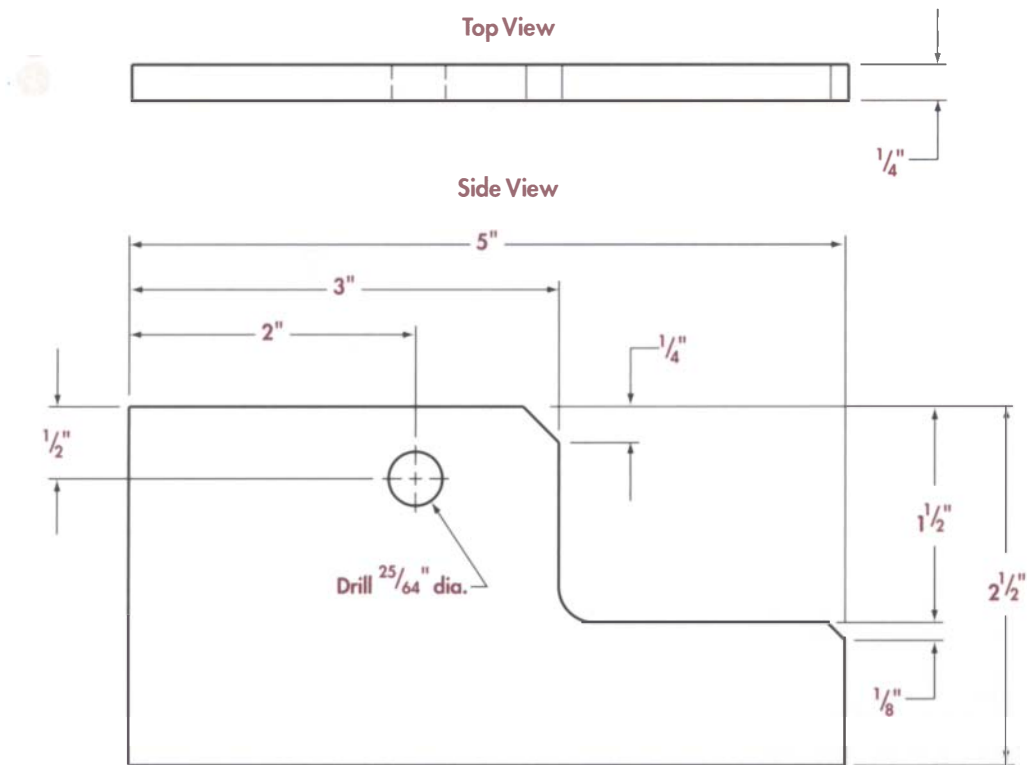
1. Lay out the winch housings on $\frac{1}{4}$ -in.-thick wood, using the template or the drawing as a guide.



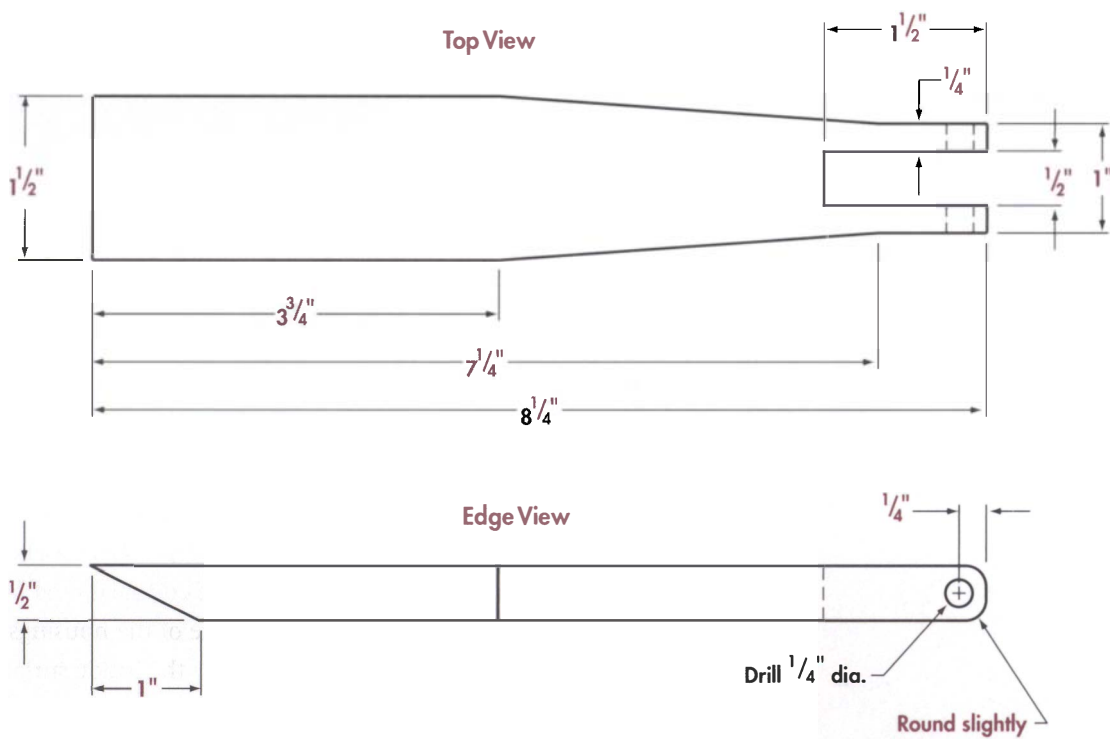
2. Cut to shape using the bandsaw. Sand as needed.

3. Decide which side of the housings will be facing the boom, and mark the outline of the boom from the template onto the wood. You could do this by using a sharp awl to put a small dent in the wood at the ends of the dotted lines. Have the template faceup to lay out one of the housings and facedown for the other so that only the inside surface of each housing is marked for the boom.

WINCH HOUSING



CRANE BOOM





4. Lay out the crane boom on a piece of $\frac{1}{2}$ -in. wood. You may want to use the template to trace out the design.

5. Cut the outline using a bandsaw. Sand all the surfaces.

6. Cut the angle on the wide end of the boom. File and sand as needed. Round the small end as shown on the drawing.

7. Drill the hole for the string guide dowel.



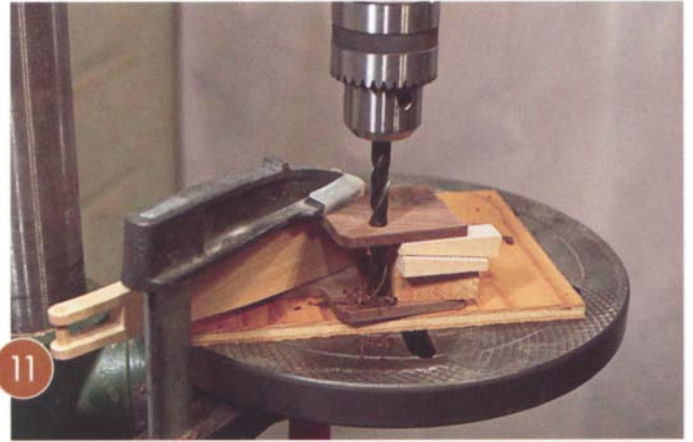
8. Install the dowel. Put a little glue in one of the holes, then tap the dowel in from the other side. When there is about $\frac{1}{4}$ in. to go, spread a little glue around the part of the dowel that still protrudes. Tap in the dowel the rest of the way.

Sand off the excess dowel after the glue hardens.

9. Glue the winch-housing sides to the boom. You will need to place the parts on a flat surface to ensure that they are all flush on the bottom. Clamp in place.

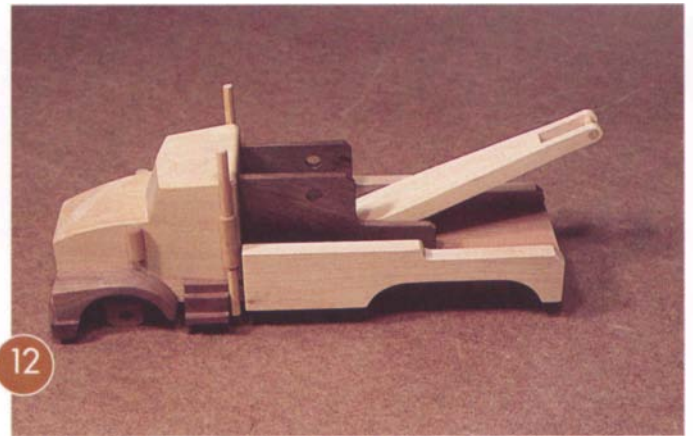
If you don't have four hands and it is too hard to hold all three parts in place at once, glue one side at a time onto the crane boom.

10. After the glue is hard, sand the bottom of the assembly flat to make sure that the assembly has a good flat surface for gluing to the deck.



11. Drill the $\frac{25}{64}$ -in. hole for the winch pin. The exact location is not vital but try to get the hole square to the assembly. Do this by drilling through both sides at once using the drill press.

12. Check that the assembly sits flat and square on the truck deck and against the back of the cab. When you have a good fit, glue the assembly in place on the deck. Clamping should not be needed if the fit is reasonably good.

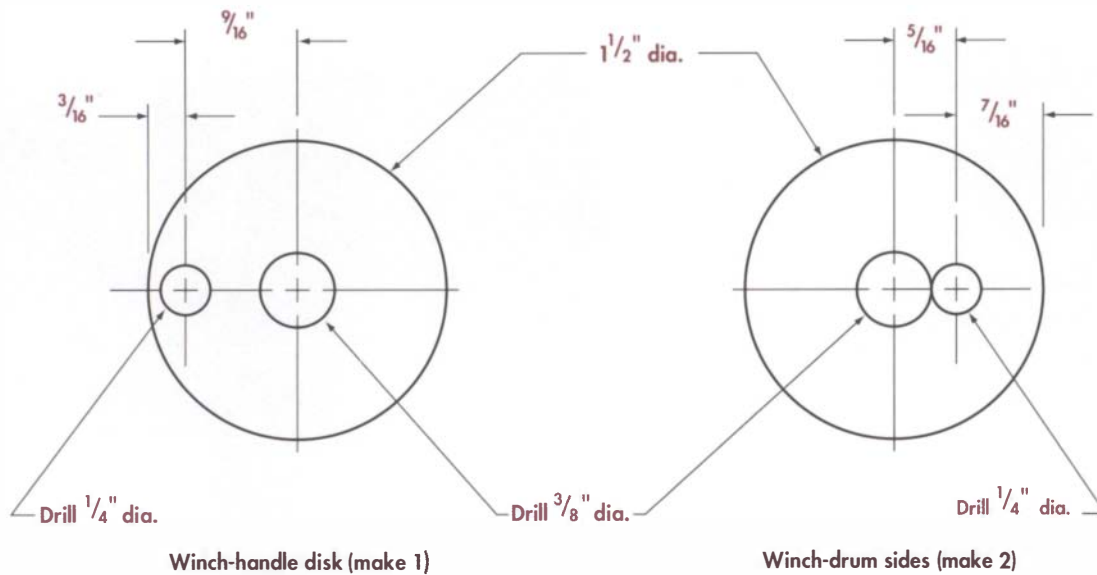
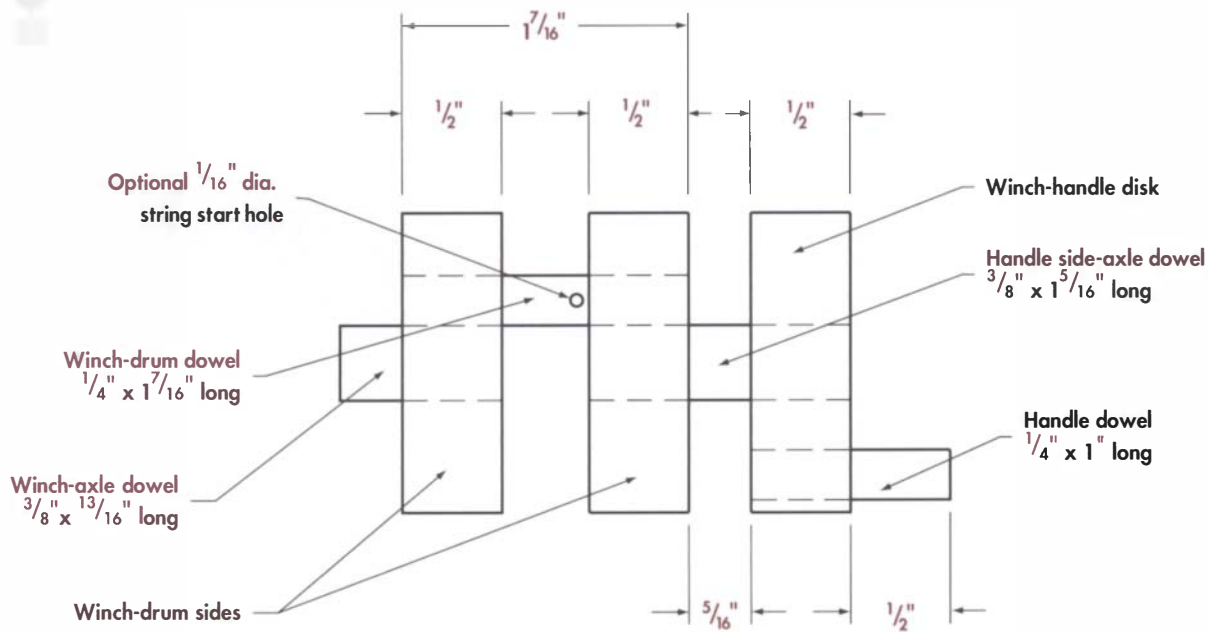


Winch

This winch is used on the tow truck, the skidder (chapter 7), and the forklift (chapter 11).

The winch is made from three disks: One forms the handle, and the other two form the sides of the winch itself. The hole in the center of all three disks is for the pivot dowel, while the off-center holes are for the cam-string dowel and the handle dowel.

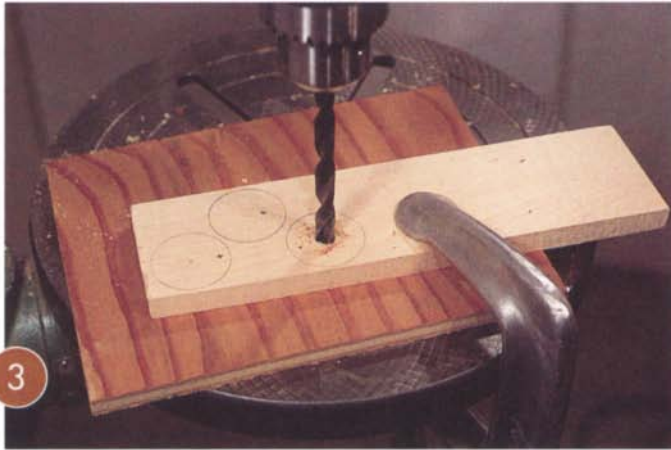
WINCH ASSEMBLY



There isn't a really good reason for these three disks to be disks. They could just as easily be squares, in terms of function. The handle disk especially could be a rectangle or a square. However, the round shape seems appropriate for a spinning assembly.

1. Lay out the three disks, using a compass. Enlarge the small center mark with an awl, but do *not* cut out the disks yet. It is much easier to drill the holes before the parts are cut out.

2. Lay out for all the holes.



3. Drill the holes in the center to a size that is a snug fit on a $\frac{3}{8}$ -in. dowel. This will likely be a $\frac{3}{8}$ -in. drill, but not always, depending on the dowel you have.

4. Drill the $\frac{1}{4}$ -in. holes for the cam dowel in two of the disks. These $\frac{1}{4}$ -in. holes will almost touch, or even just touch, the $\frac{3}{8}$ -in. center hole.

You may want to use a slightly larger drill if your $\frac{1}{4}$ -in. dowel is slightly oversize, as is sometimes the case. I often use an F drill, which is 0.007 in. over $\frac{1}{4}$ in.

5. Drill the $\frac{1}{4}$ -in. handle hole in the third disk.

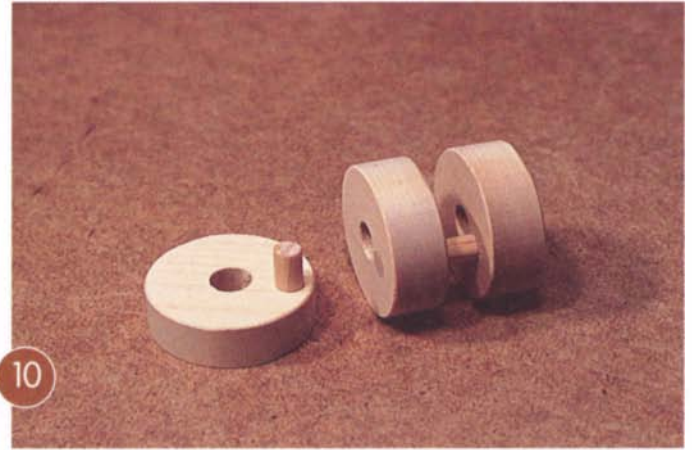
6. Cut out the disks, and carefully disk-sand the edges to the line.

7. Cut the winch-drum dowel, which is a piece of $\frac{1}{4}$ -in. dowel that will just fit into the space between the winch-housing sides with $\frac{1}{16}$ -in. play. The winch-drum dowel should be about $1\frac{7}{16}$ in. long.

You may want to drill a tiny ($\frac{1}{16}$ -in.) hole crossways in the center of this winch-drum dowel. This will make it easier to start the string later. This is not a must because you can also tie the string on or tie and glue it. You can drill the hole later, too, if necessary.

8. Dry-assemble the $\frac{1}{4}$ -in. winch-drum dowel into the offset holes in the two winch disks (not the handle disk). Check that this assembly fits into the housing, and spin the disks as needed so that the center holes are aligned. When it all looks like it fits, take it apart and put some glue in the $\frac{1}{4}$ -in. holes, then glue the dowel in. Check the fit again, before the glue dries. A $\frac{1}{32}$ -in. gap on each side is about right.

9. Cut the handle dowel and glue it in place. Put glue in the hole only.

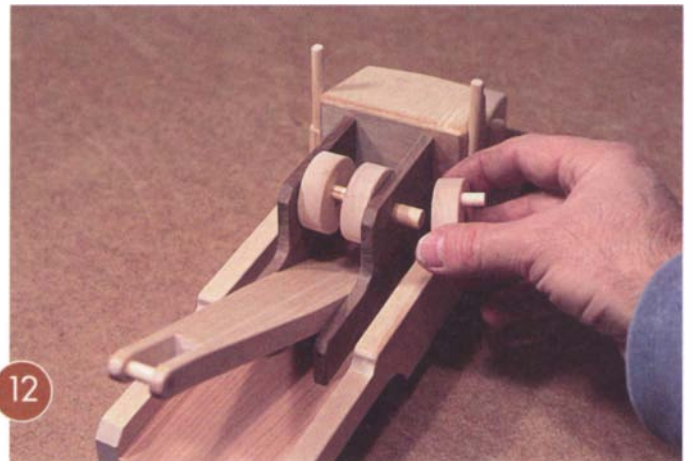


10. When the glue is hard, sand off the excess dowel, if any.

11. Cut the $\frac{3}{8}$ -in. dowel for the winch-axle dowel as well as the handle side-axle dowel. Bevel the corners slightly.

12. Dry-assemble these dowels and the winch disks in place. Use a Q-tip to rub some paste wax in the holes on the housings but not in the holes in the disks.

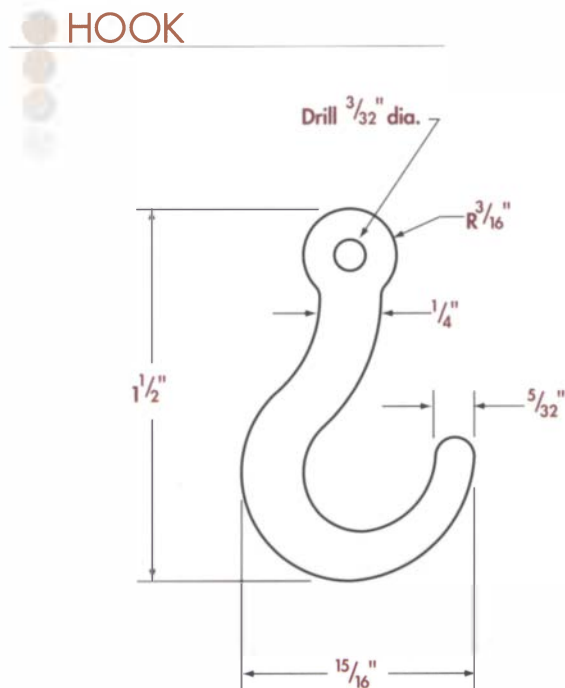
When it all fits, then put a little glue in the hole in each disk, and assemble the winch. Leave the fit a little loose so that the winch spins freely.



Wheels

These are standard 2-in.-dia. wooden toy wheels: four duals for the back and two singles for the front. Most hobby stores carry them.

1. Cut the pins as needed to make sure they do not meet in the center of the axle housing. This may not be a problem for the front axle but might be for the rear axles.
2. Follow the procedure described for the dump truck in chapter 3.



Hook

While there are small hooks available at hardware and hobby stores, you can also make wooden ones. These hooks need to be made of fairly strong plywood, such as the Baltic plywood available from woodcraft suppliers and most hobby stores.

1. Obtain a small piece of good-quality $\frac{1}{4}$ -in. plywood. Baltic plywood has many thin laminations, but you can make your own by gluing together two thicknesses of $\frac{1}{8}$ -in. paneling plywood.
2. Trace the hook from the template.

3. Drill the $\frac{3}{32}$ -in. hole for the string. The size of this hole is not crucial— $\frac{1}{16}$ in. or even $\frac{1}{8}$ in. will do.

4. Cut out with a coping saw, scrollsaw, or bandsaw. File and sand to shape.

5. Round all the corners with a small file or with sandpaper.

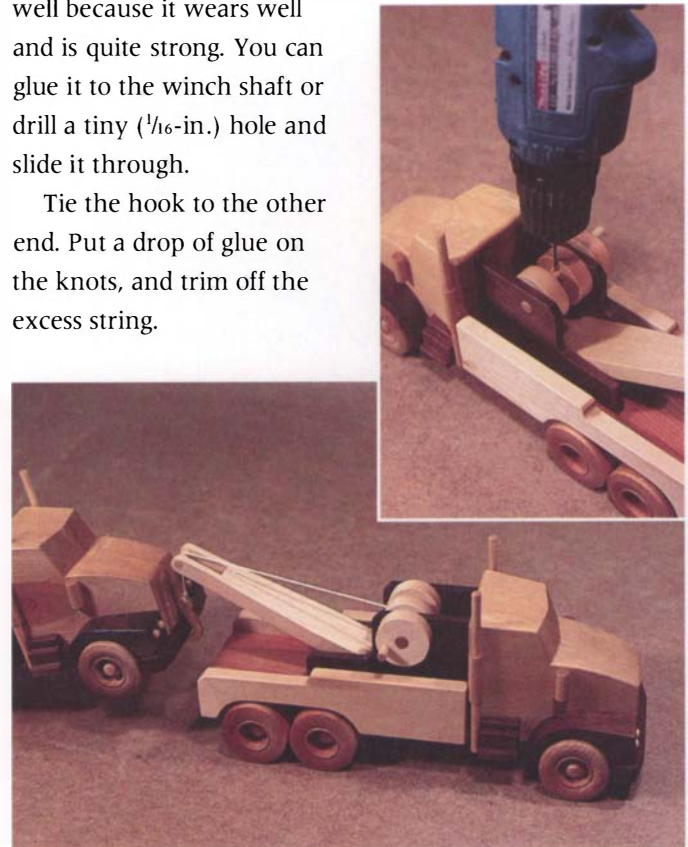
Finish

As desired. You may want to read the appendix on finishing on p. 172.

String

Cut the string about 2 ft. to 3 ft. long. Nylon string works well because it wears well and is quite strong. You can glue it to the winch shaft or drill a tiny ($\frac{1}{16}$ -in.) hole and slide it through.

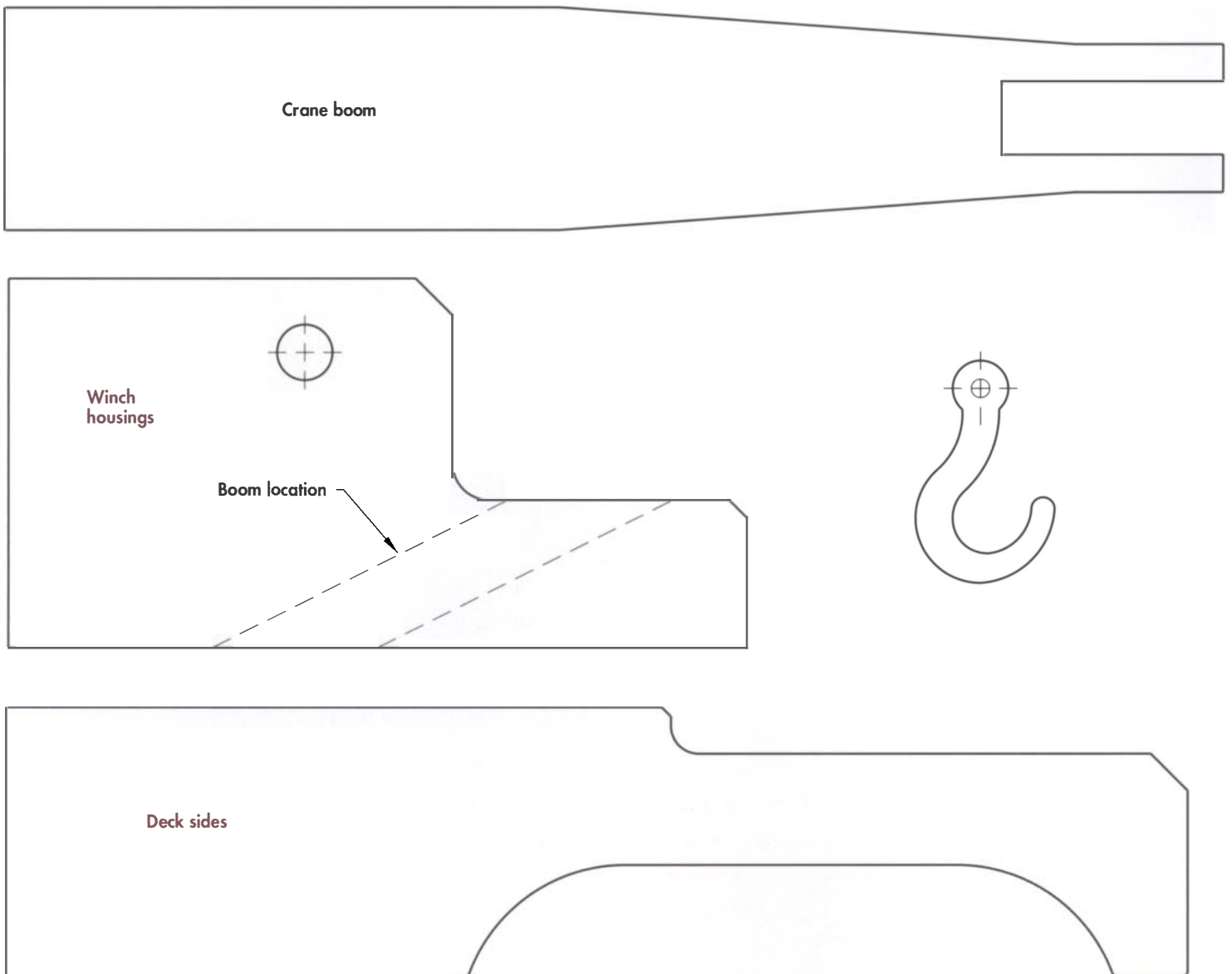
Tie the hook to the other end. Put a drop of glue on the knots, and trim off the excess string.



To use this tow truck with other wooden toys, drill a $\frac{5}{16}$ -in. hole in the underside of the bumper of the vehicle to be towed. Drill this hole about $\frac{1}{4}$ in. to $\frac{3}{8}$ in. deep, with the center about $\frac{5}{16}$ in. back from the front edge (see the bottom photo on p. 67).

TEMPLATES

For full-size templates, enlarge by 108%.



Flat-Deck Truck

Chapter 5



This flat-deck truck is the third in a series of three similar working trucks, which includes the dump truck (chapter 3) and the tow truck (chapter 4).

Of all the trucks in this book, this truck is the simplest and easiest to build. What's more, it is probably the most versatile toy in the book because it can be used to carry almost anything, from plastic cars to cattle. The ramp and special bumper for the back of the semi truck (chapter 9) can be attached to this truck as well.

The sides (fences) for the deck can be removed; they just slide in and out of the holes in the deck. The deck has dowels protruding from the bottom so elastic bands can be hooked over them and used to tie down cargo.

The forklift (chapter 11) can be used with this truck for loading and unloading.

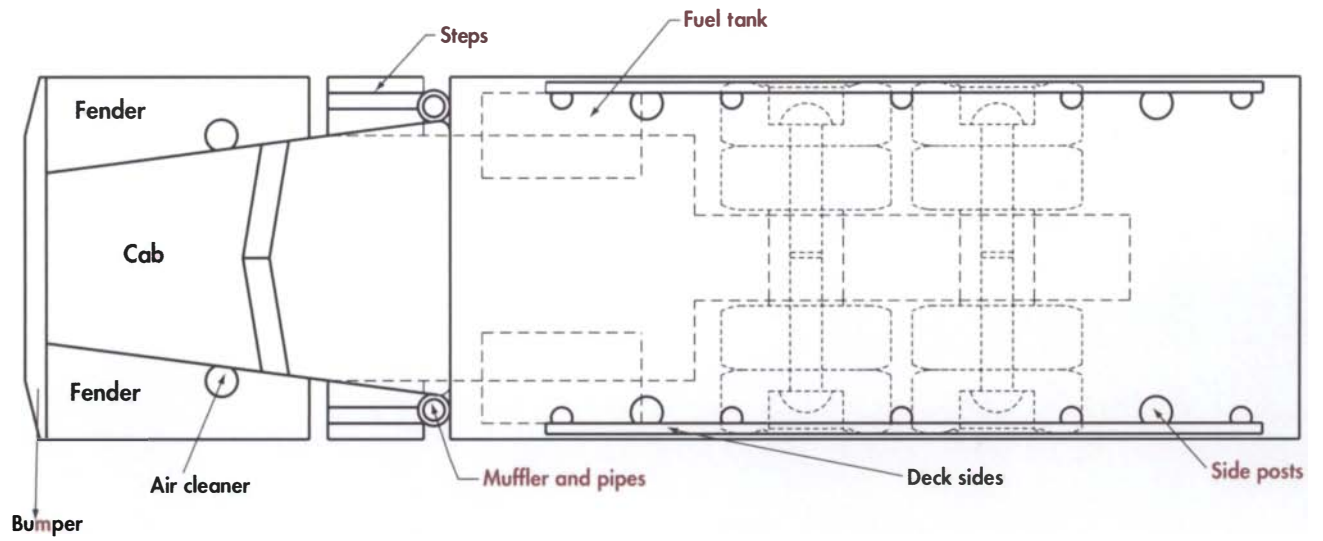
The flat-deck truck builds on the basic frame and body of the dump truck, so the directions will refer to the dump-truck instructions for the parts they have in common (see chapter 3) and then will give the details on the construction of the deck mechanism.

The cab, fenders, air cleaners, steps, bumper, headlights, axle housings, and exhaust stacks are all detailed in chapter 3. Refer to that chapter for instructions on constructing those parts for the flat-deck truck, then come back here for the rest.

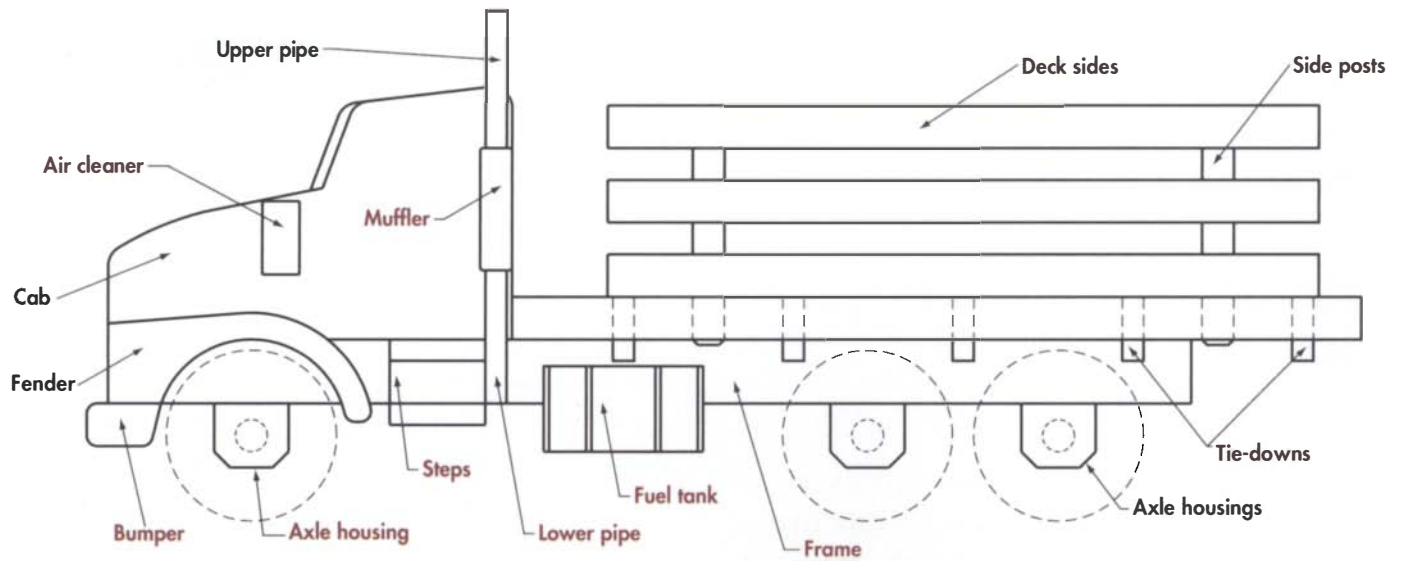
The flat-deck truck consists of a shaped block of wood (the cab) glued to a board frame. Behind the cab is a rectangular board (the deck) attached to the frame.

FLAT-DECK TRUCK PLAN

Top View



Side View



FLAT-DECK TRUCK

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Frame	14 ³ / ₄ x 27 ⁷ / ₈ x ³ / ₄	1	
Cab	4 ³ / ₄ x 3 ¹ / ₄ x 3	1	
Fenders	3 ³ / ₃₂ x 1 ⁵ / ₁₆ x 1 ¹ / ₈	2	Mirror images
Air cleaners	³ / ₈ dowel x ⁷ / ₈ long	2	
Fuel tanks	1 dowel x 1 ³ / ₄ long	2	May use factory-made wooden barrels
Steps	1 ¹ / ₈ x 1 x ¹¹ / ₁₆	2	Cut one piece about 2 ¹ / ₂ in. long; split later
Bumper	4 ¹ / ₂ x ⁷ / ₈ x ¹ / ₂	1	
Headlights	¹ / ₄ dowel x ³ / ₈ long	4	Round end before cutting to length
Front axle housing	2 ⁷ / ₈ x ⁷ / ₈ x ³ / ₄	1	Make enough for all three housings
Rear axle housings	1 ¹ / ₈ x ⁷ / ₈ x ³ / ₄	2	
Lower pipes (exhaust)	¹ / ₄ dowel x 2 ¹ / ₈ long	2	
Upper pipes (exhaust)	¹ / ₄ dowel x 2 ³ / ₈ long	2	
Mufflers	³ / ₈ dowel x 1 ¹ / ₂ long	2	
Flat deck	10 x 4 ¹ / ₄ x ¹ / ₂	1	
Deck side posts	³ / ₈ dowel x 2 ¹³ / ₁₆ long	4	
Deck tie-down dowels	¹ / ₄ dowel x ³ / ₄ long	10	Cut ⁷ / ₈ in. long; trim later
Deck side boards	8 ³ / ₈ x ¹ / ₂ x ¹ / ₈	6	
Fuel tanks	1 dowel x 1 ³ / ₄ long	2	May use factory-made wooden barrels
Axle pins	¹ / ₃₂ dia.	6	
Wheels—single	2 dia. (factory made)	2	
Wheels—dual	2 dia. (factory made)	4	

Frame

See the dump-truck instructions in chapter 3. The frame here is nearly identical to the dump-truck frame but is longer at the rear end and does not have the 45-degree angle or the dump tilt hole (see the drawings on p. 72).

Flat Deck

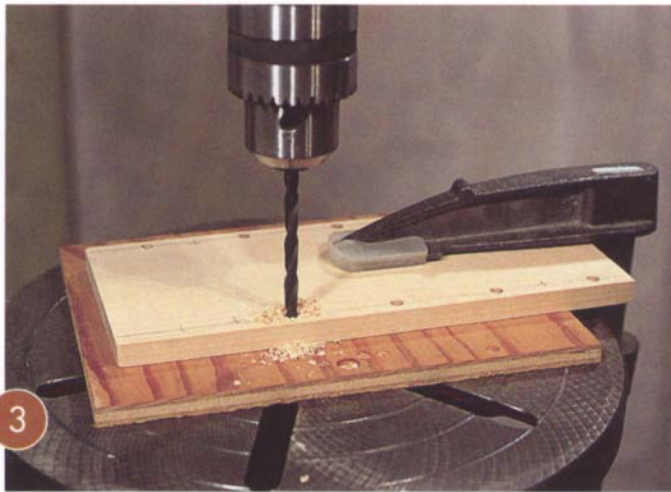
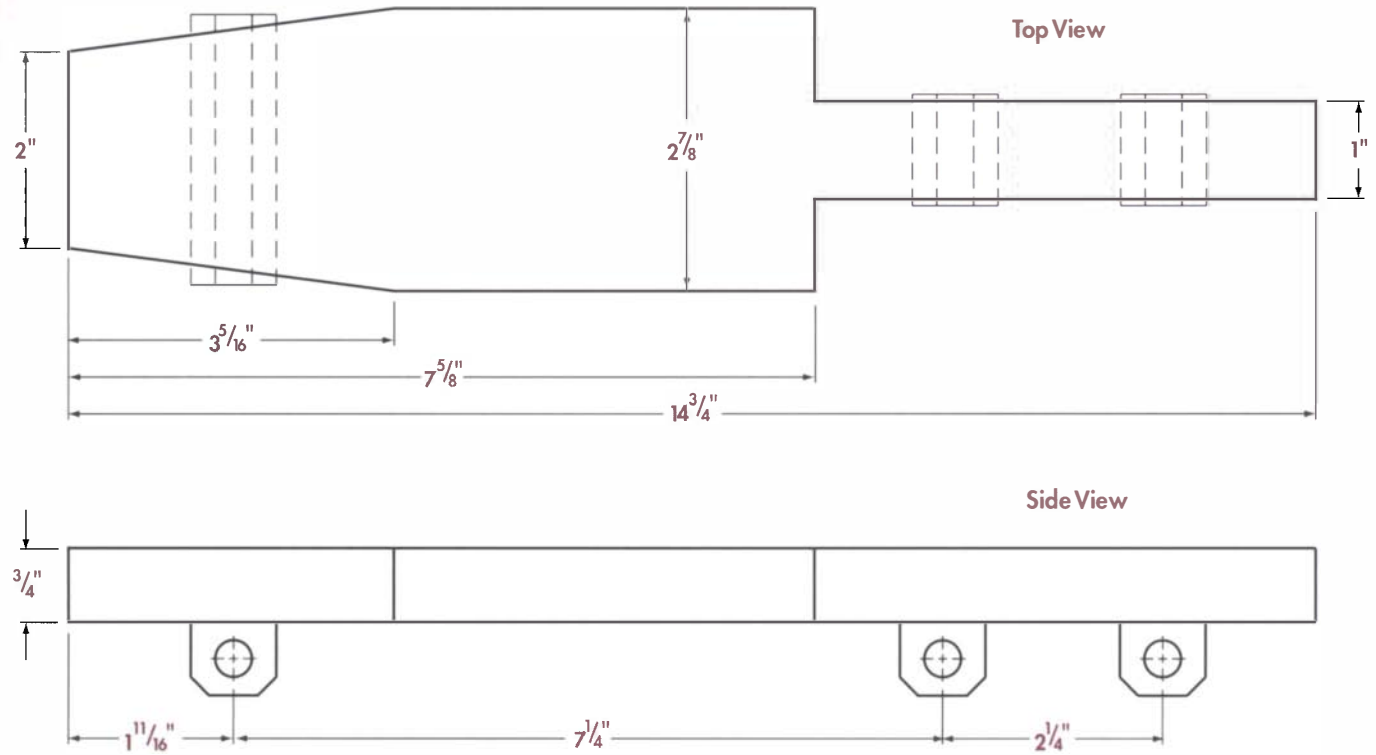
The deck is cut and drilled, the tie-down dowels are installed, and then the assembly is glued to the frame. The sides (fences) are made to fit the deck, after the deck is complete.

1. Cut the deck from ¹/₂-in.-thick material. Sand as needed.

2. To lay out for the deck holes, place the deck on the truck frame. Check that the ¹/₄-in. holes will be spaced evenly over the wheels. It looks best if one hole is exactly centered between the two axle housings. Other than this, the drawing layout may need to be changed a little because it depends on the exact location of the cab on the frame and the exact finished size of the cab. These measurements vary a little from truck to truck.

Keep the hole pattern as shown on the drawing but, if needed, vary the distances from the front (about 1³/₁₆ in.) to keep one hole centered between the axle housings.

FRAME



3. Drill the ten $\frac{1}{4}$ -in. holes for the dowels. If your $\frac{1}{4}$ -in. dowel is a little oversize, you may want to drill with an F drill or a $\frac{17}{64}$ -in. drill so that the dowel is not too tight.

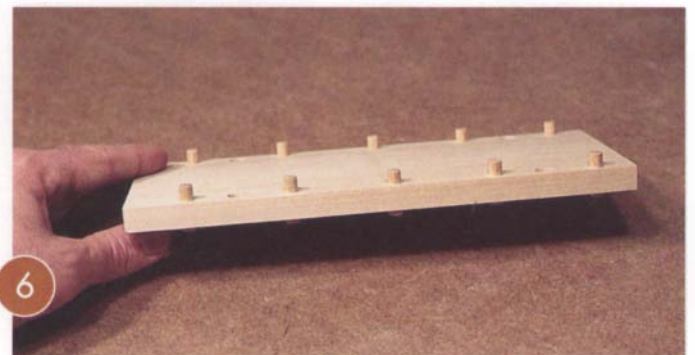
4. Drill the four $\frac{3}{8}$ -in. holes or whatever size fits your $\frac{3}{8}$ -in. dowel. The sides have $\frac{3}{8}$ -in. dowel posts, and these posts will fit in these holes but will not be glued in (unless you decide to do so). For right now, have the holes fairly

snug on the $\frac{3}{8}$ -in. dowel. Later, after the sides are complete, you may want to drill them out slightly for easier installation and removal of the sides.

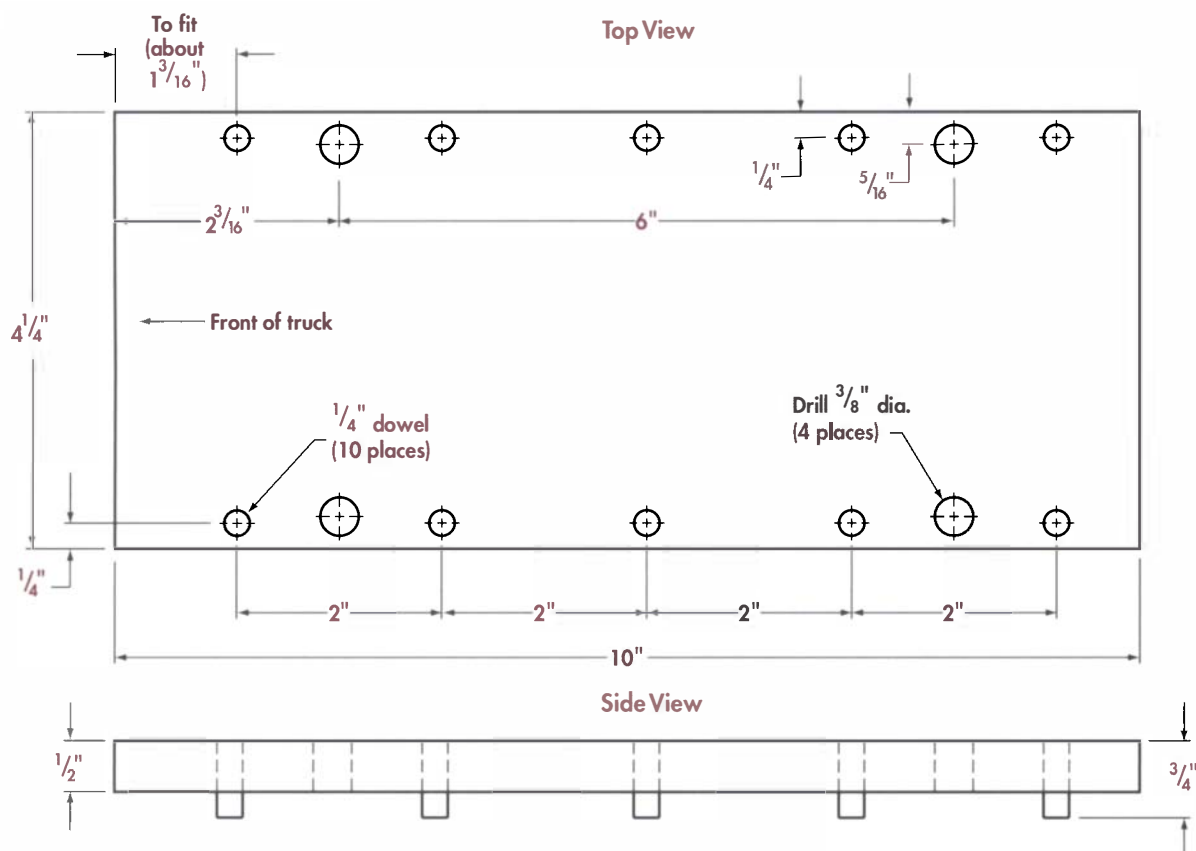
5. Cut the 10 short pieces of dowel for the tie-downs, leaving them about $\frac{1}{8}$ in. too long. After they are installed, you'll sand off this extra wood flush with the top of the deck.

Sand one end of each dowel and bevel each end slightly.

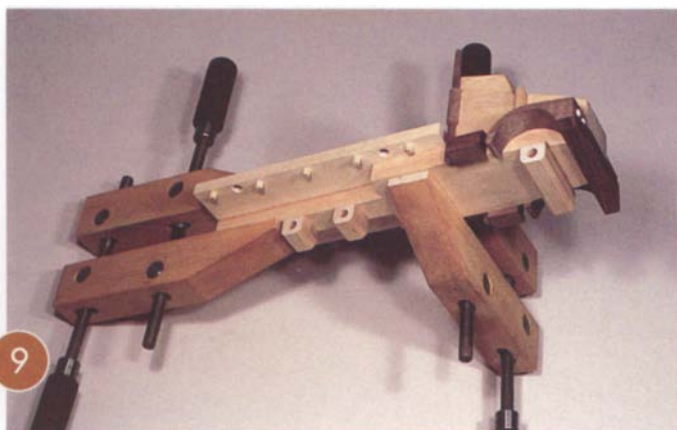
6. Put a little glue in each hole, and tap the dowels in place from the bottom side of deck. Have them protrude $\frac{1}{4}$ in. out of the bottom side of the deck and about $\frac{1}{8}$ in. out the top.



FLAT DECK



- 7.** After the glue is hard, sand the excess off the top side.
- 8.** Sand to fit the front edge of the deck to the rear of the cab to make sure there is no large gap. It is possible that the back of the cab is not perfectly square to the frame, so fit the deck to the cab.
- 9.** Glue the deck to the frame. Measure at the back to ensure that the deck is centered over the frame. At the front of the deck, have the edges flush (as closely as possible) with the frame. Clamp in place.

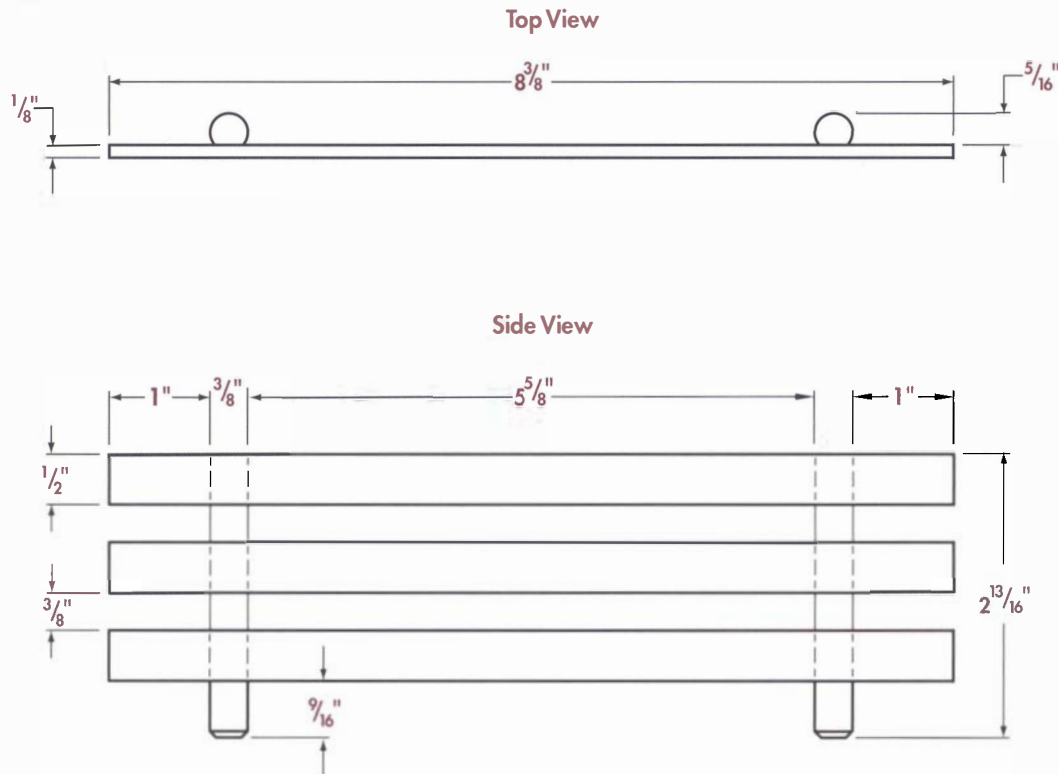


Deck Sides

These sides are intended to be removable. Sand a small flat on the posts, then assemble the boards and the posts with the posts in place.

- 1.** Cut the four dowel posts from $\frac{3}{8}$ -in. dowel. Lightly sand and slightly bevel both ends.
- 2.** Sand a flat along the length of the posts. Actually it is best to have the bottom $\frac{1}{2}$ in. (the part that goes in the hole) left round, which means you need to do a little extra shaping with a disk sander or a file. However, sanding a small flat (about $\frac{1}{8}$ in. wide) along the whole length also works fine and is much easier.

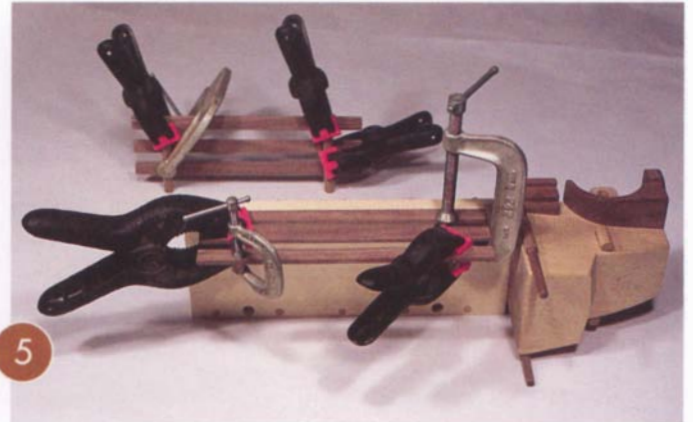
DECK SIDES



3. Cut the boards. Solid wood works well but so does $\frac{1}{8}$ -in. plywood. The thickness here is not too important but should be between $\frac{1}{8}$ in. and $\frac{3}{16}$ in. You could also cut strips from a piece of $\frac{1}{2}$ -in.-thick wood.

4. Sand the boards as needed, rounding all the corners slightly with sandpaper.

5. Put glue on the flats of the posts but do so sparingly—only in the spots where the boards contact the posts. It is hard to remove the glue from gaps between the boards. Assemble one side at a time by putting the posts in the holes and clamping the boards to the posts.



Assemble one side fence using the holes on the left side of the deck, and assemble the other side fence using the holes on the right side of the deck. This way the sides are certain to fit in their respective locations.

Wheels

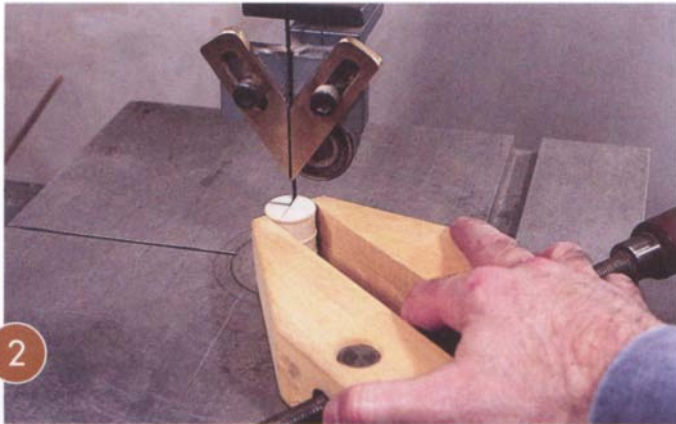
See the wheel section of the dump-truck instructions in chapter 3 (see p. 56).

Fuel Tanks

As with the dump truck (chapter 3), factory-made barrels can be used as fuel tanks. For the flat-deck truck, cut a 90-degree notch in the barrels to fit them to the frame.

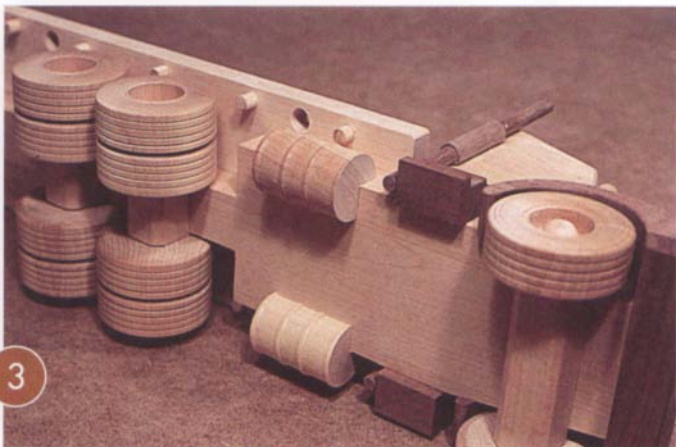
1. Lay out for the notch, as shown in the drawing at right.

Mark out the centerlines (there is a tiny center mark left from the original machining). Then move up $\frac{1}{8}$ in. off center on one line to lower the tanks a little. This ensures there will be a gap between the tank and the tie-down dowel.



2. Cut the notch using the bandsaw. It is a good idea to use a clamp to hold the work safely.

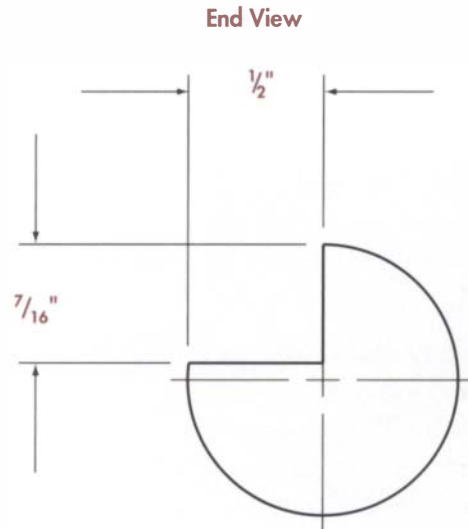
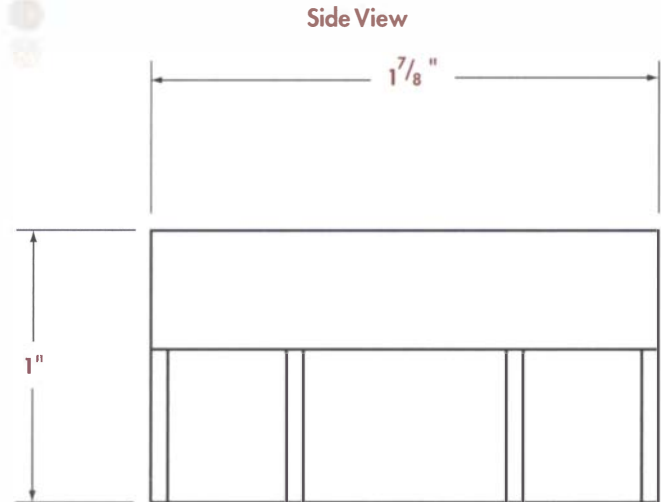
3. Glue the tanks to the truck. You may want to center them under a tie-down dowel, but actually the location is not critical.



Finish

As desired. You may want to read the appendix on finishing on p. 172.

FUEL TANKS



Chapter 6 Log Truck

When I started building wooden toys, my

first successful attempt was a log truck (there were one or two rather sad-looking trucks first).

My kids thought the toy was great, so I decided to try other trucks. Part of the log truck's appeal is that it is easily loaded and unloaded. Also, realistic toy logs are readily available. I just cut some willows or other branches and

the top of the headache rack holds the front of the trailer, and a small block on the truck—the piggyback spacer—holds the weight of the trailer.

There is a skidder (chapter 7) and a log loader (chapter 8), both of which work very well with the log truck. The skidder is made to drag the logs to a landing, and the loader picks up the logs and deposits them neatly on the log truck.

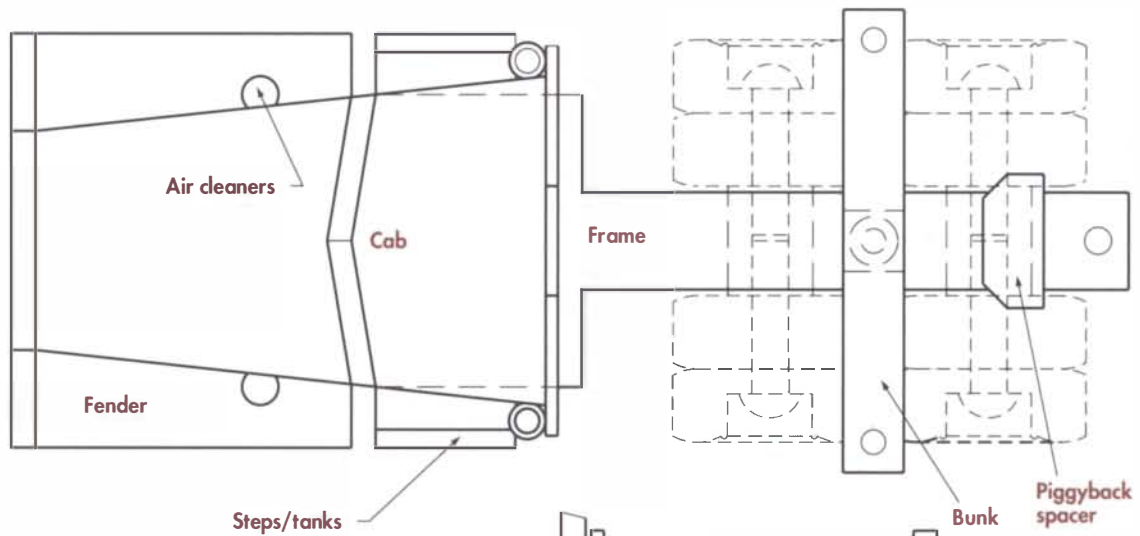


clean them up a little. They make very realistic logs and can be used indoors without a mess.

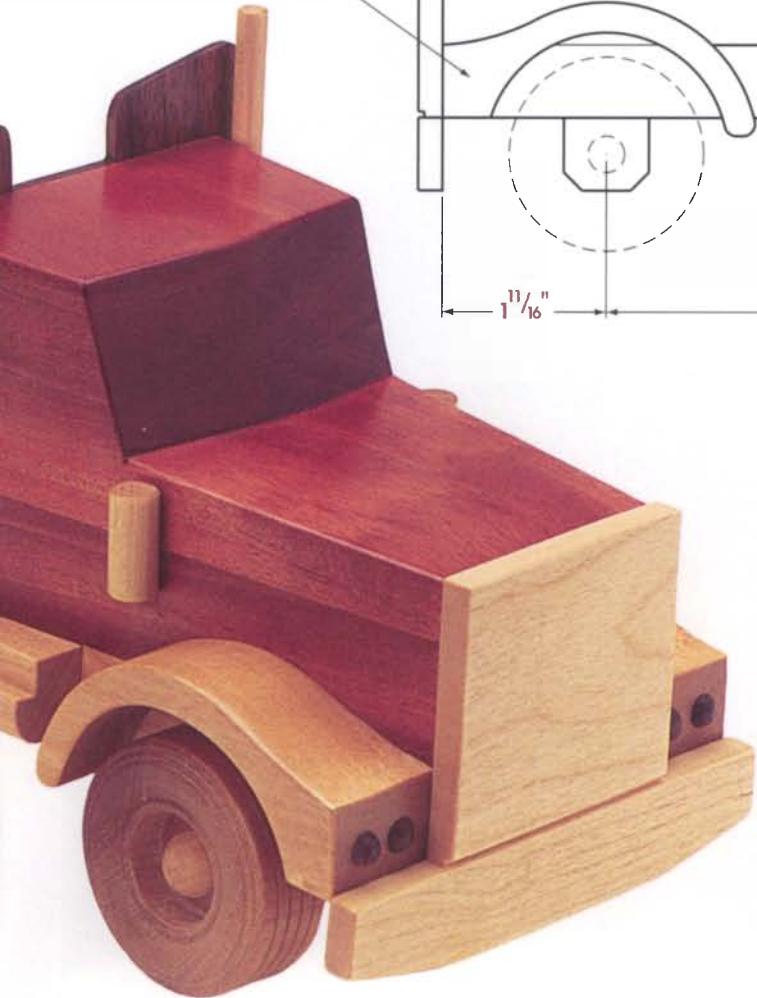
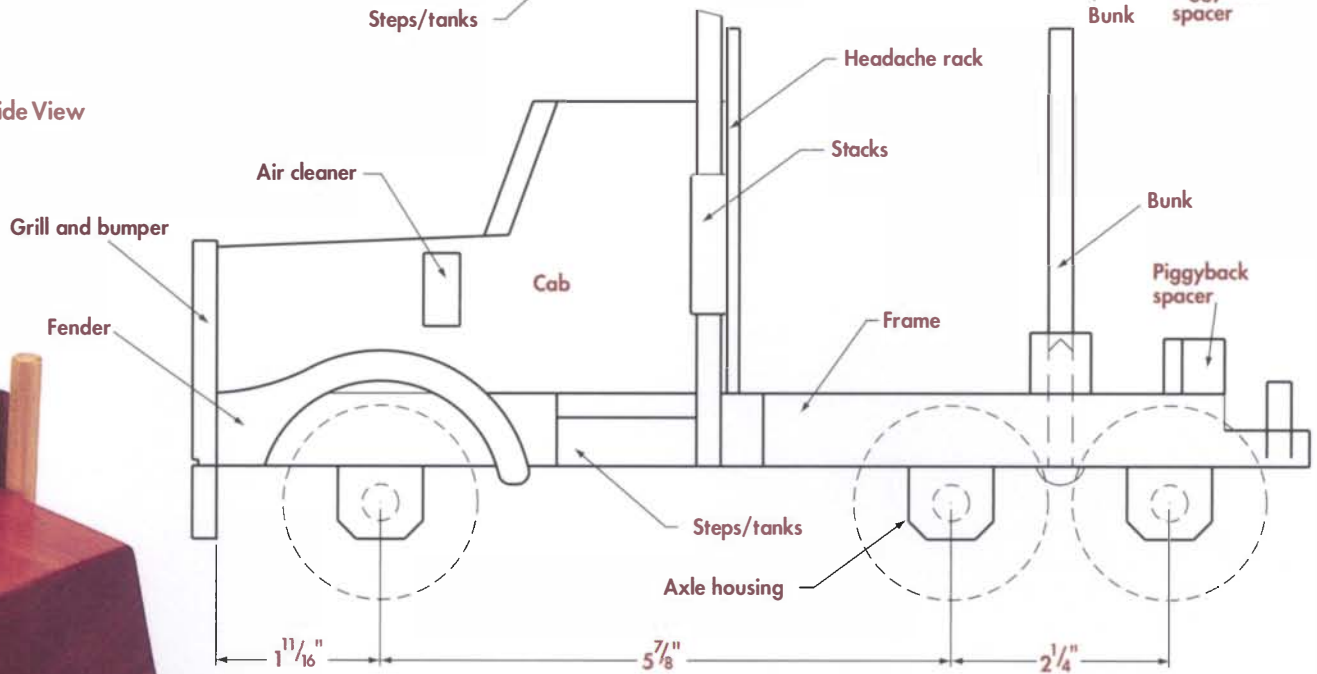
Log trucks tend to carry their trailers when they are empty. This makes the trucks much easier to drive and safer on slippery roads. The toy trailer is designed to do the same thing by spacing the wheels to fit over the truck bunk (the framework that holds the logs). The notch in

LOG TRUCK PLAN

Top View



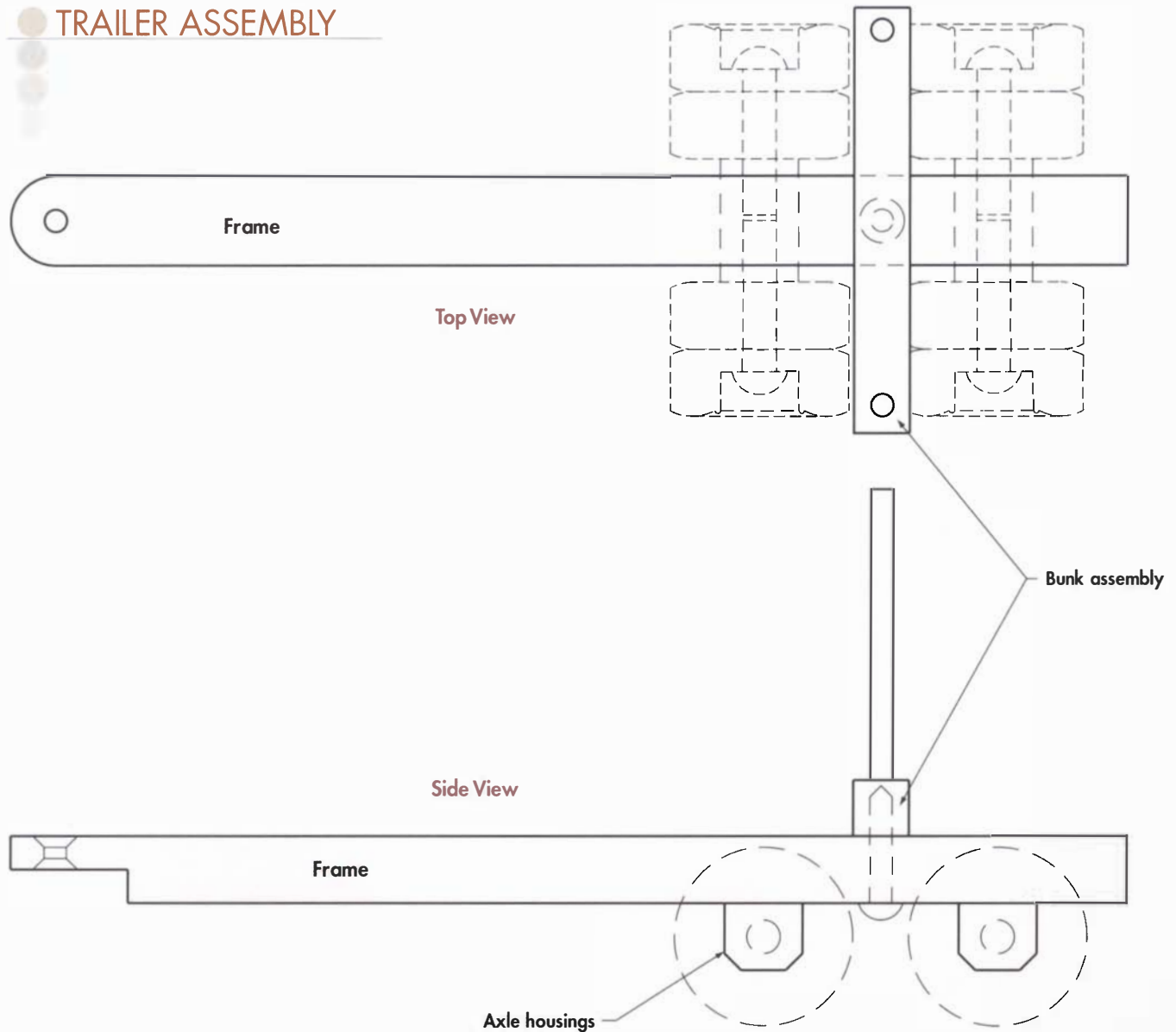
Side View



A few of the parts of the log truck are very similar to the corresponding parts of the dump truck (chapter 3), and in the appropriate cases I'll refer you to the dump-truck instructions.

The log truck consists of an angular block (the cab) glued to a long, thin block (the frame). A U-shaped bunk cradles the logs. The trailer is just a long beam, with another U-shaped bunk to hold the other end of the logs. Of course, wheels go under both truck and trailer.

TRAILER ASSEMBLY

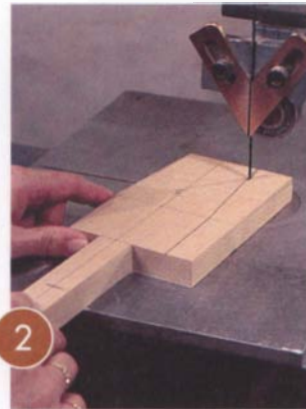


Truck and Trailer Frames

There are two frames: one for the truck and a very simple one for the trailer. The cab, bunks, steps, and most of the other parts are attached to the frames.

1. Lay out the frames, and bandsaw them to size. The trailer frame is just a 1-in. strip. Also lay out the holes at this time (see the drawings on pp. 80 and 81).

2. Bandsaw to size.



3. Do some filing and disk-sanding along the edges, but leave the angled parts of the truck frame a little oversize; you can finish filing and sanding the frame *after* the cab is glued on. It is easier to match up the angled surfaces at that time.

4. Drill the hitch holes. The truck hitch hole is drilled to fit a $\frac{1}{4}$ -in. dowel. You may end up using an F drill (.257) or $\frac{1}{64}$ -in. drill (.266) if your dowel is a little oversize, as it often is.

LOG TRUCK

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Truck frame	11 1/4 x 3 x 3/4	1	
Trailer frame	12 1/2 x 1 x 3/4	1	
Cab	5 1/4 x 3 3/8 x 3	1	
Fenders	3 3/16 x 1 3/8 x 1	2	Mirror images
Headlights	1/4 dowel x 3/8 long	4	Round end before cutting to length
Air cleaners	3/8 dowel x 7/8 long	2	
Truck front axle housing	2 7/8 x 7/8 x 3/4	1	Make enough for all five housings
Truck rear axle housings	1 1/8 x 7/8 x 3/4	2	Make enough for all five housings
Trailer axle housings	1 3/8 x 7/8 x 3/4	2	Make enough for all five housings
Hitch dowel	3/4 long x 1/4 dowel	1	Cut about 7/8 in. long; trim later
Exhaust pipes	1/4 dowel x 2 1/8 long	4	
Mufflers	3/8 dowel x 1 1/2	2	
Steps/fuel tanks	1 7/16 x 3/4 x 5/8	2	
Grill/bumper	4 1/4 x 3 x 1/4	1	
Headache rack	4 x 3 13/16 x 1/8	1	
Bunk crosspieces	4 3/4 x 5/8 x 5/8	2	
Bunk uprights	1/4 dowel x 3 7/8 long	4	
Piggyback spacer	1 3/8 x 5/8 x 1 9/32	1	
Axle pins	1 1/32 dia.	12	
Wheels—single	2 dia. (factory made)	2	
Wheels—dual	2 dia. (factory made)	8	



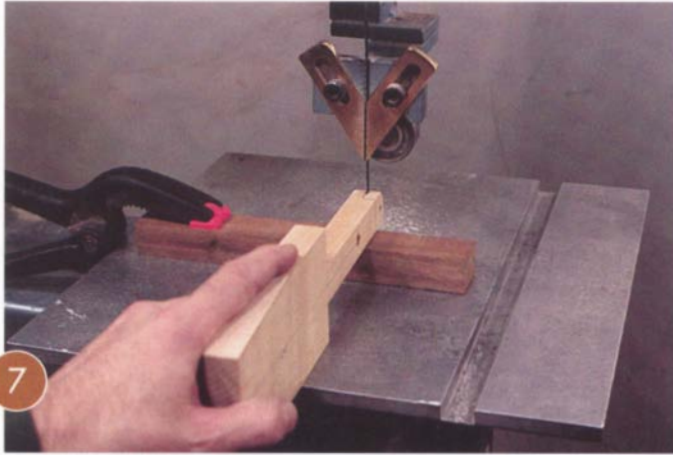
5. Drill the 3/32-in.-dia. hitch hole in the trailer. This is a little larger than the dowel because it has to fit easily over the truck hitch dowel.

6. Drill the holes for the bunk pins. These holes should be about 1/64 in. bigger than the swivel pins, to allow the pins to spin freely. Measure the size of the pin (usually a 1 1/32-in. axle pin of the type used to hold the wheels on).



7. Cut the trailer-hitch notches. The 7/8-in. and 1 5/16-in. dimensions are not extremely important and could be longer without having much effect. Note the spacer block clamped to the bandsaw table, as shown in the left photo on p. 80.

The 3/8-in. size is important because the notch should be half of the total thickness of the frame. If you end up with a frame that is less than or more than 3/4 in., just make sure the notch is half the total thickness.



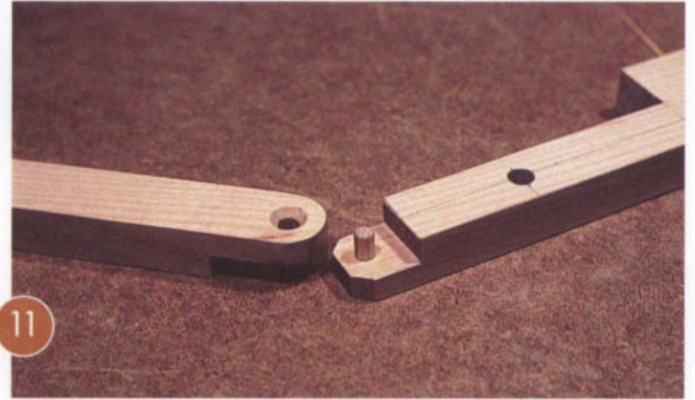
The truck and trailer notches are the same, but note the curve on the trailer end, which allows the trailer to pivot on the hitch without binding.

8. Countersink each side of the hitch hole (drilled in step 4) in order to allow the trailer to pivot a little up and down if needed.

9. Cut the truck-hitch dowel. It is a $\frac{1}{4}$ -in. dowel, $\frac{7}{8}$ in. long. Sand the ends and bevel the corners slightly.

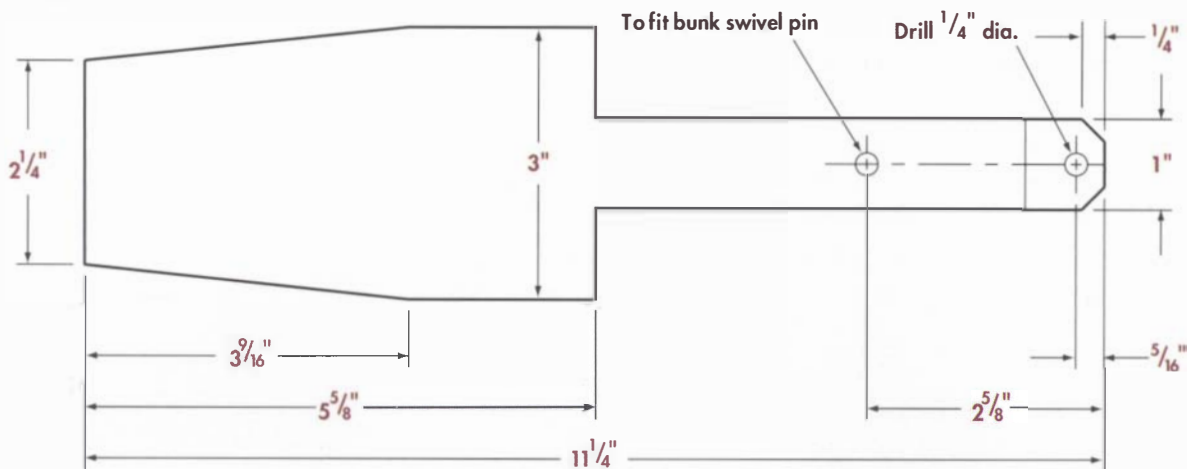
10. To glue the hitch pin in place on the truck, put a little glue in the hitch hole using a toothpick, then slide or tap the dowel into place.

11. Sand the bottom side flush if the dowel protrudes out the bottom.

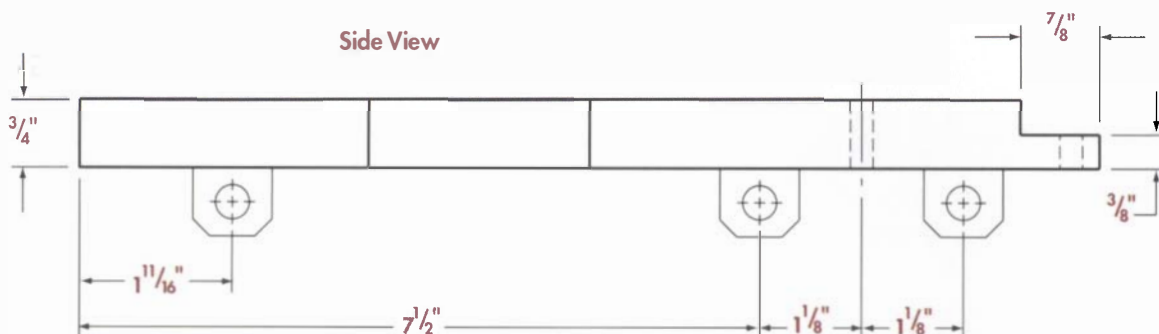


TRUCK FRAME

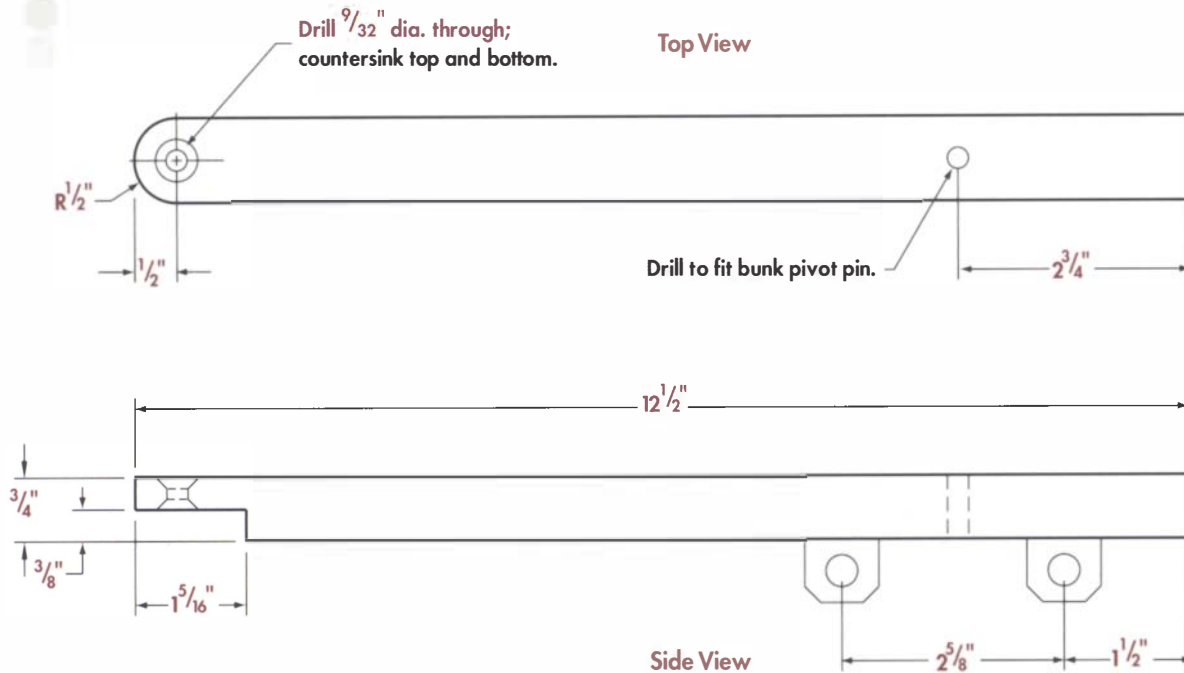
Top View



Side View



TRAILER FRAME

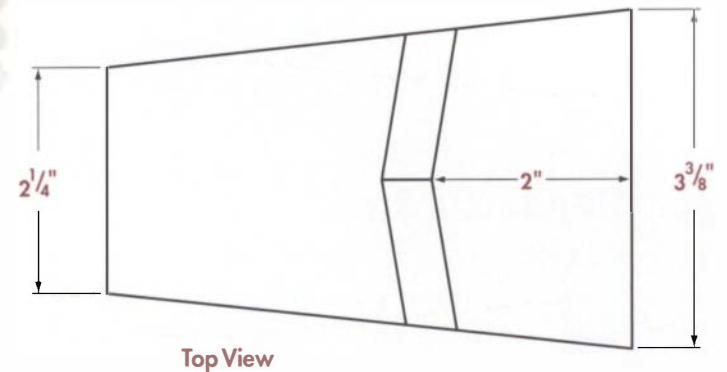


Truck Cab

Many log trucks, especially heavy-duty off-road trucks, still have a large flat hood to maximize cooling and power. However, you could curve the hood down in front a little, if you prefer the style of the dump-truck hood.

See the dump-truck cab instructions on p. 43. Although the hood is flat, not curved, and the sizes are a little different, the construction procedure is the same. Do not round the corners at the front (a grill is glued on here) or at the back of the cab (the headache rack goes there).

CAB

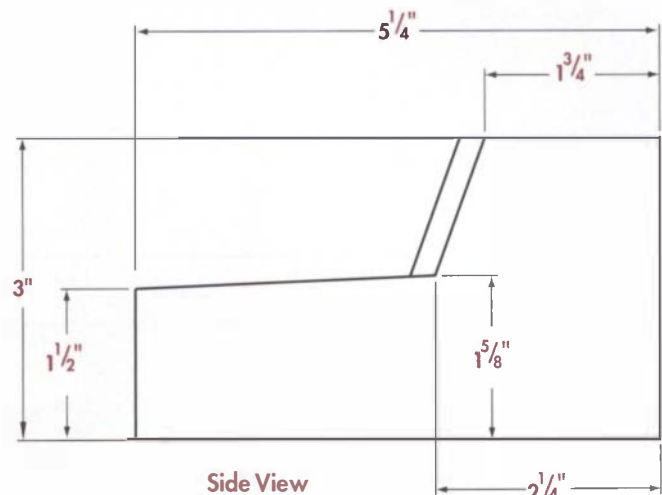


Fenders

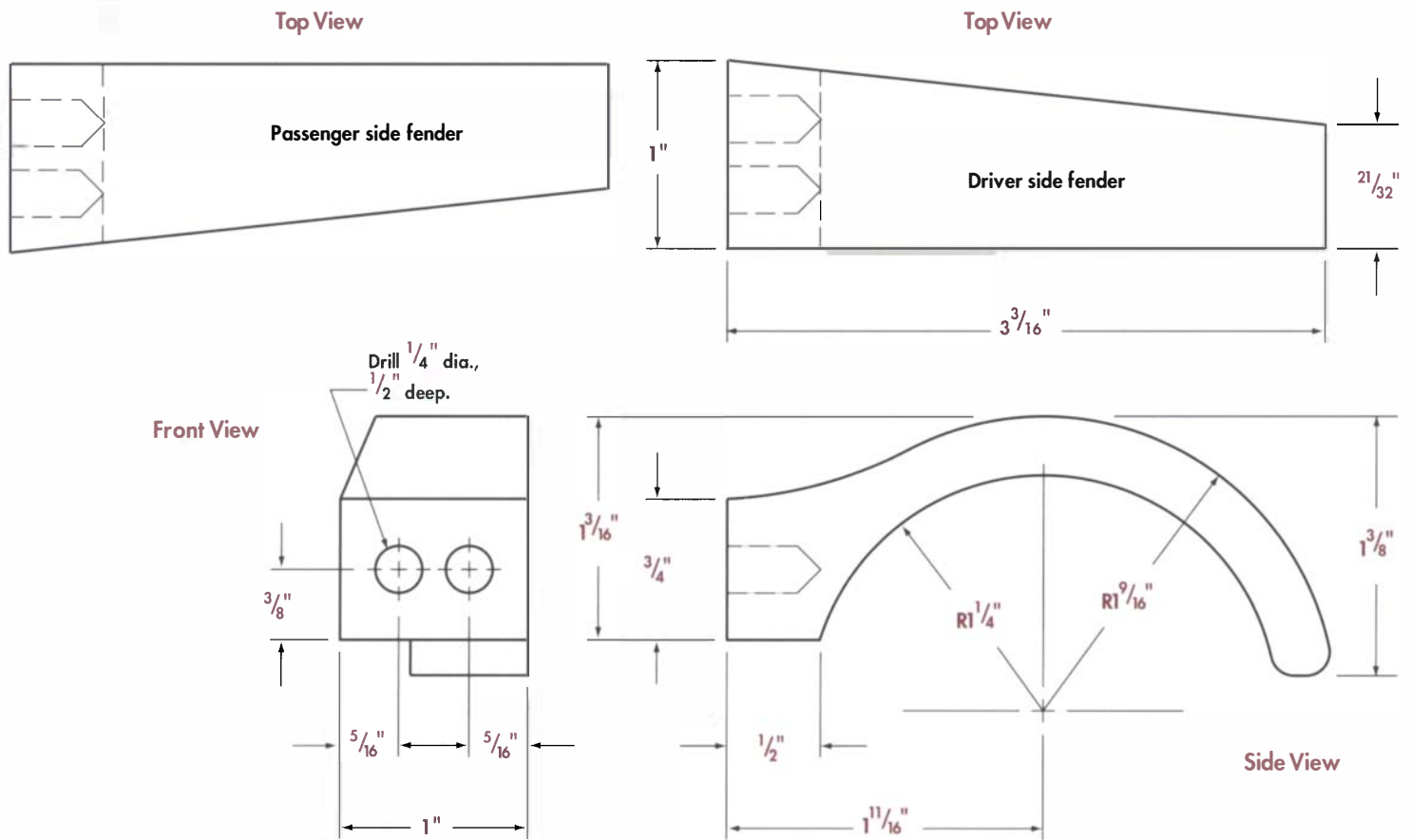
See the dump-truck cab instructions on p. 45. Note the slightly different shape and dimensions, but the process is identical (see the drawings on p. 82).

Headlights and Air Cleaners

See the dump-truck instructions and drawings on pp. 47 and 49.



FENDERS

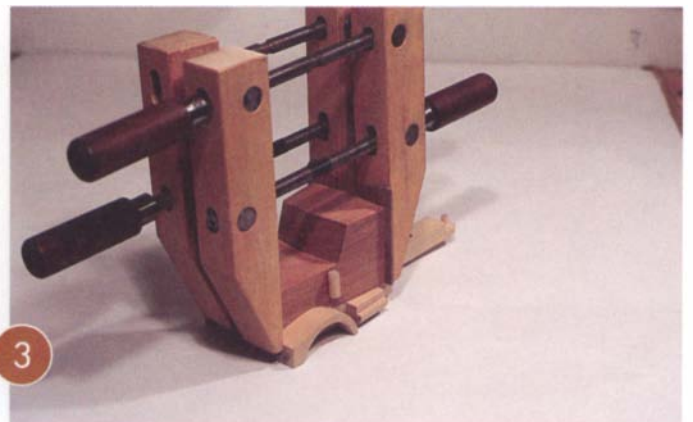


Headache Rack

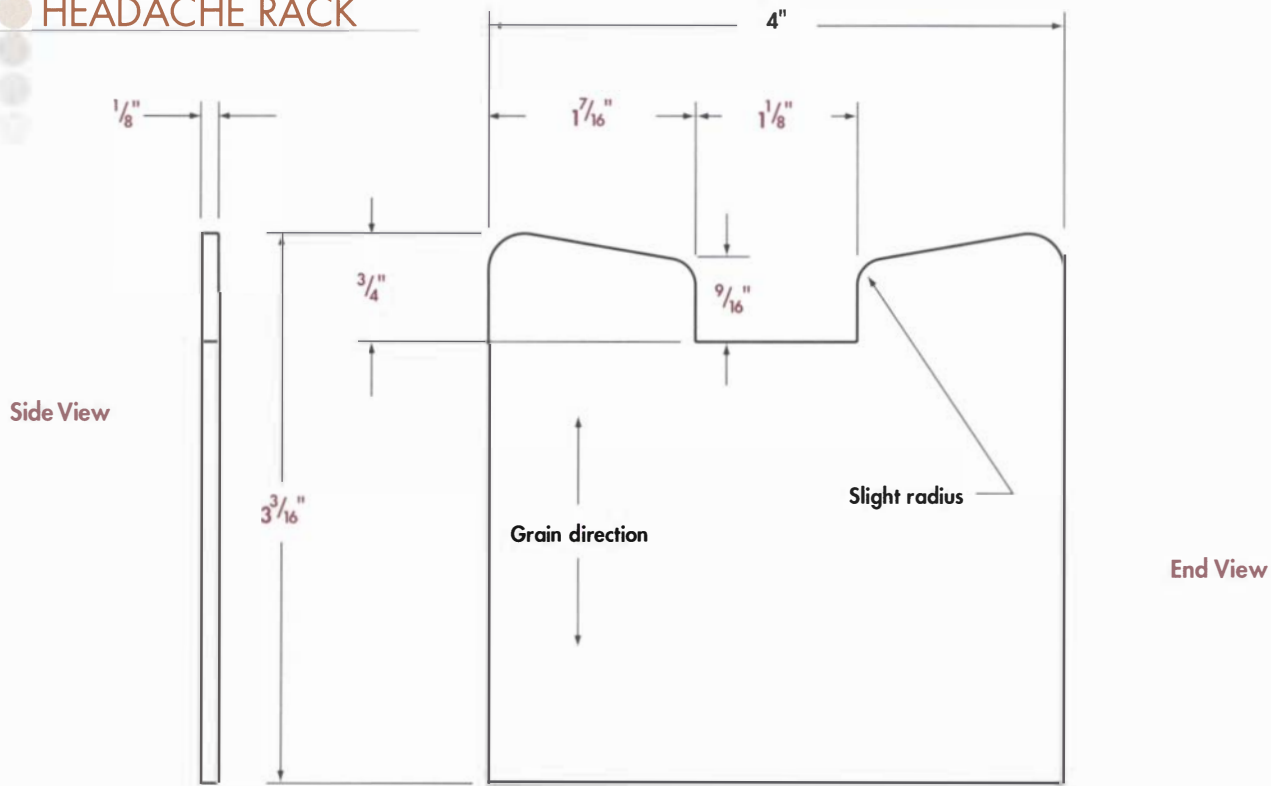
The headache rack is designed to prevent logs from sliding forward and smashing into the back of the cab, which would give the driver a rather serious headache. In the

case of the toy truck, it also holds the trailer frame when it is piggybacking on the back of the truck (see the bottom drawing on p. 87).

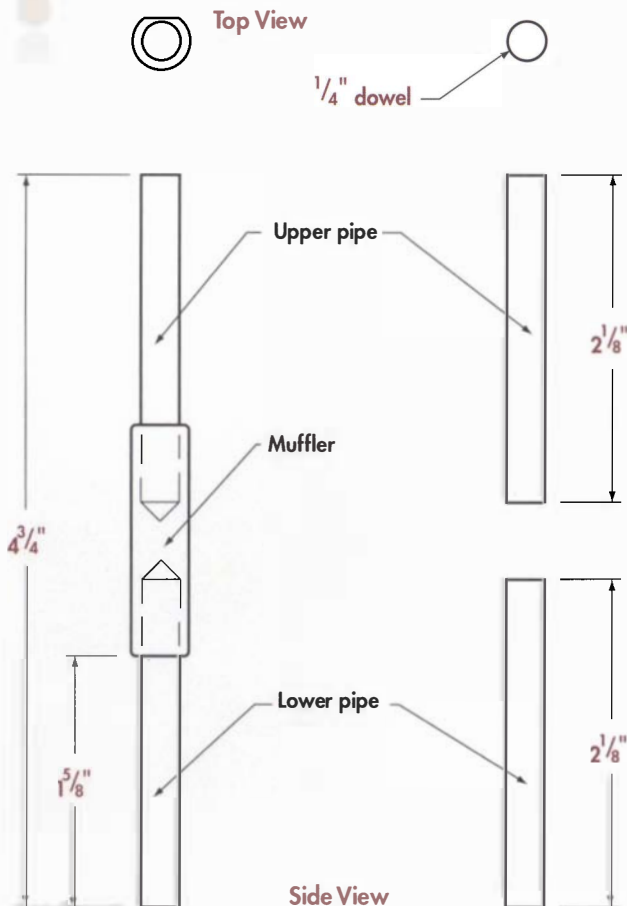
1. Lay out the headache rack, and saw it to rough size.
2. File and sand as needed.
3. Glue the rack to the back of cab.



HEADACHE RACK

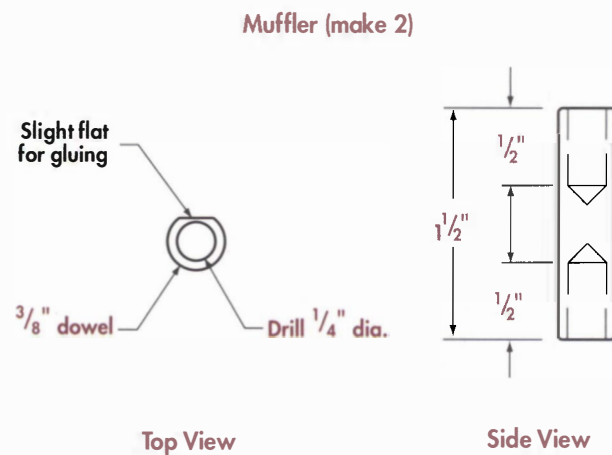


EXHAUST STACKS

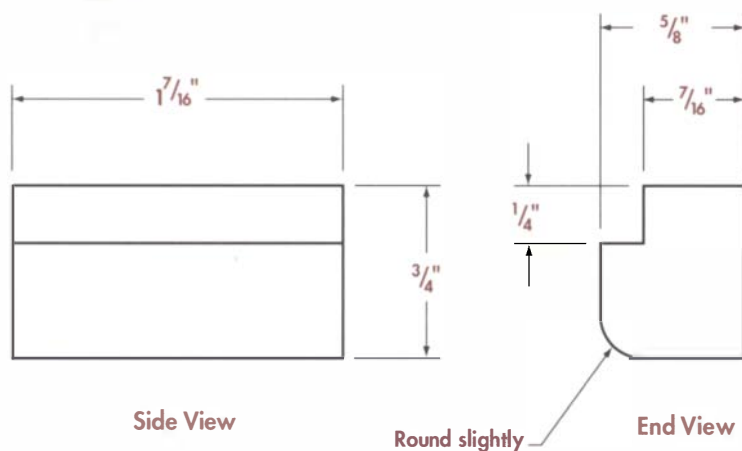


Exhaust Stacks

See the instructions for the dump-truck exhaust stacks on p. 51. Although the sizes are slightly different, the process is the same. When you glue the stacks on, have the muffler touching both the cab and the headache rack, as shown on the plan drawing.



STEPS/TANKS

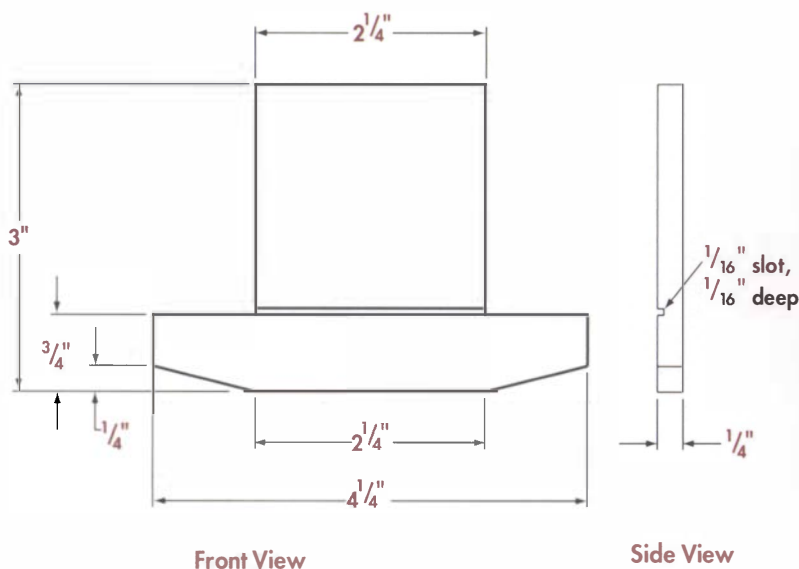


Steps/Tanks

See the instructions for the dump-truck steps on p. 47. The log-truck steps have a little different shape—more rounded than the dump truck—in order to simulate the fuel tank/step combination that log trucks often have.

Glue on the tanks so they touch the bottom side of the cab. There is a small overhang here. Have the back of the tanks just touch the exhaust pipe.

GRILL/BUMPER



Grill/Bumper

The cab style of this log truck generally has a distinct grill. Here the grill and the bumper are combined into one piece and made from wood whose color contrasts with the cab. The grill is attached to the front of the cab.

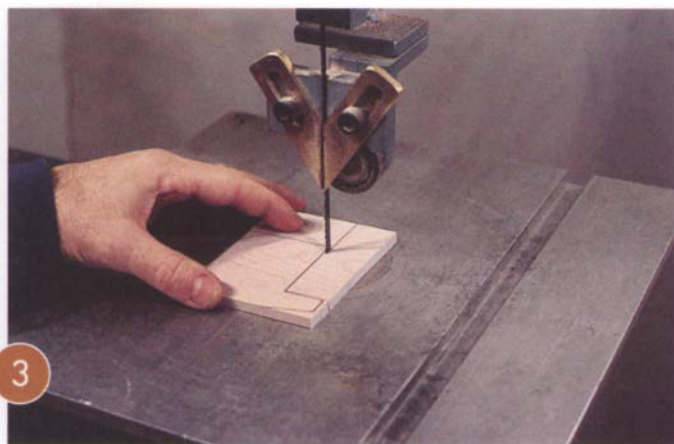
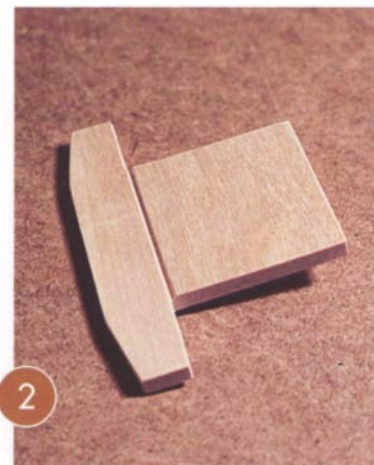
1. Lay out from the drawing or by using the template provided. In this case I used carbon paper to trace the grill/bumper template onto a piece of 1/4-in.-thick wood. Another option is to rub pencil lead on the back of the template, then trace it.

2. Saw the grill to rough size using the bandsaw.

3. File and sand the edges. I sand the faces using a belt sander and the edges using a disk sander; when this is not practical, I file with a 6-in. smooth file. This file works well on end grain, and generally I don't even need to sand very much after filing.

Leave the finished size just barely larger than the front of the truck. About a 1/32-in. overhang all around seems to work the best. The top of the bumper will just cover the bottom of the fenders.

4. Make a saw cut about 1/16 in. deep to visually separate the grill from the bumper. A small sharp handsaw is probably the best thing to use, but a hacksaw will work, too.



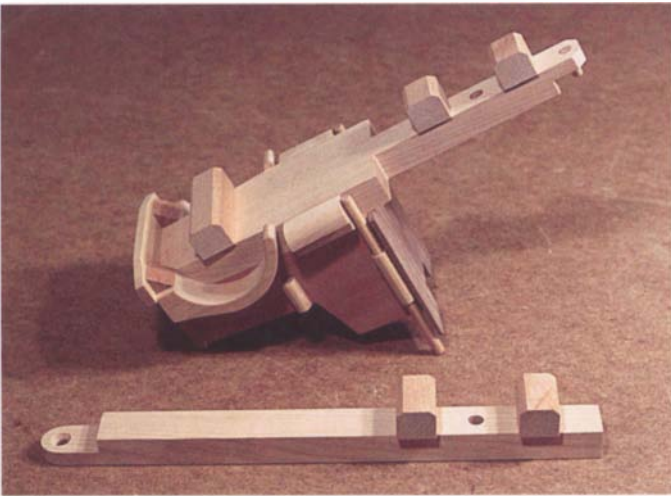
5. Glue the grill/bumper to the front of the cab. Be careful that the grill does not slide out of position when clamping. Check that the grill protrudes the same amount on each side and just a little at the top.

Note that I have put small gussets in on the ends of the bumper, but they are optional. It is exactly the same gusset material used for the axle housings on the monster truck (see chapter 1). Here I cut them about $\frac{3}{4}$ in. long and pressed them into place.

Axle Housings

See the dump-truck instructions on p. 50. Make a little more axle-housing material than indicated in the dump-truck instructions because you need an extra 3 in. or so for the log-truck trailer.

Also attach the axle housings to the trailer frame at this time.



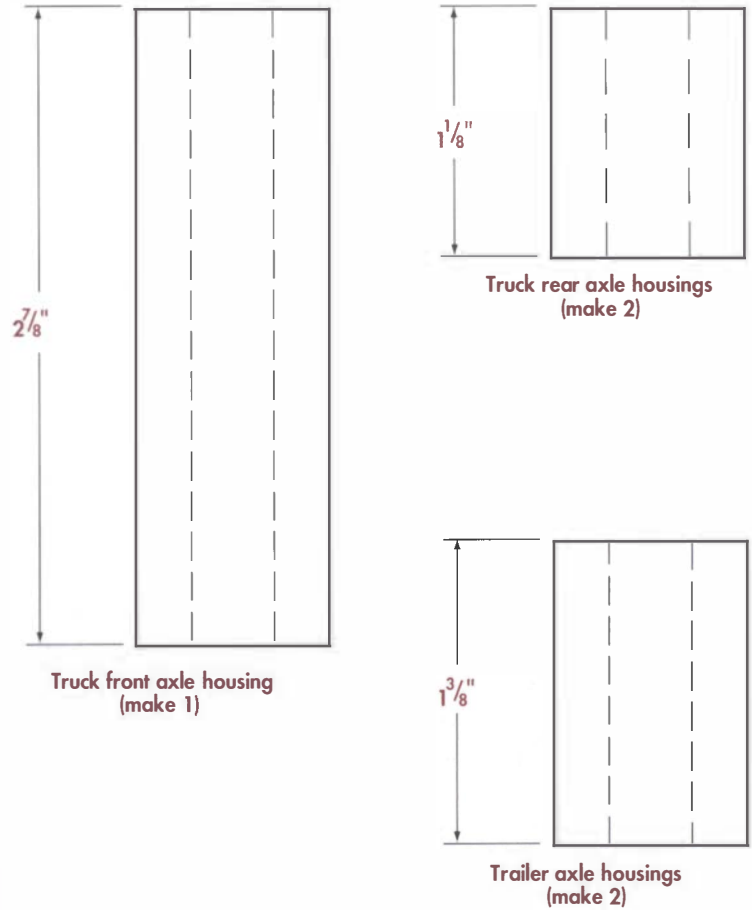
Bunks

Bunks are the U-shaped frameworks that hold the logs. They need to swivel as the log truck turns a corner, so they are held in with pins. Make the crosspieces, drill three holes in each, then glue in the dowels from the top and the axle pin from the bottom to attach the bunks to the frames.

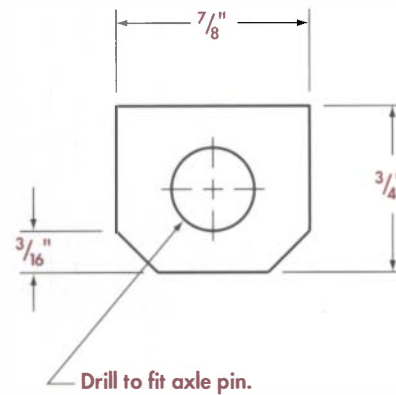
1. Cut the $\frac{5}{8}$ -in.-sq. crosspieces for both bunks (one each for the truck and trailer).

AXLE HOUSINGS

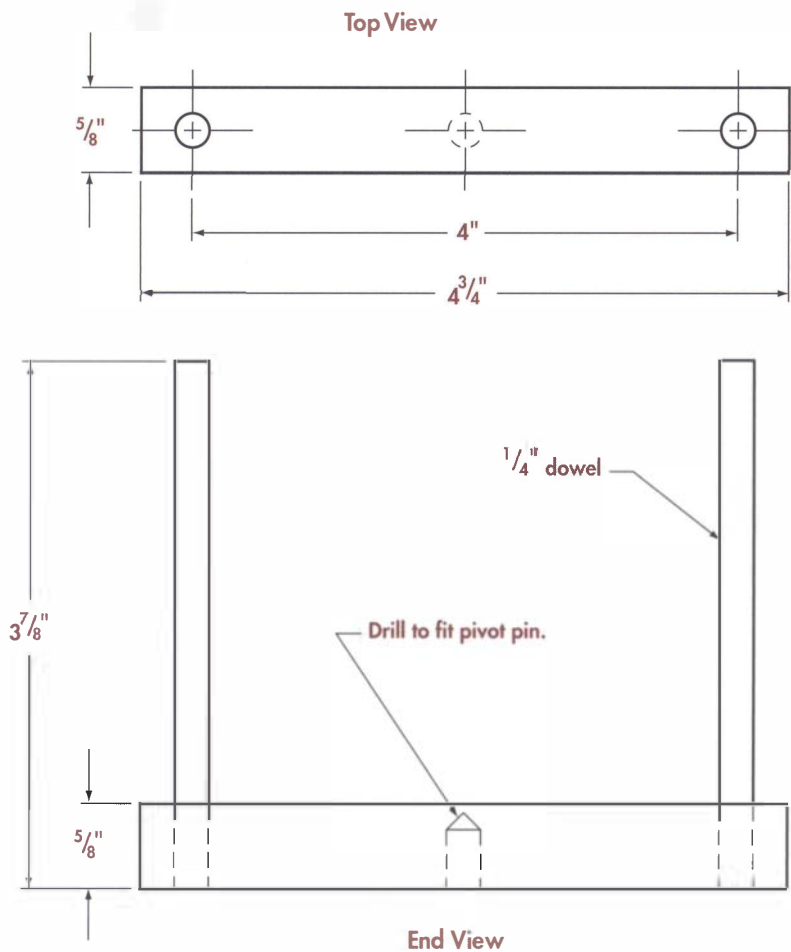
Top View



End View



BUNKS



2. Drill the pivot holes, from the bottom side, but try to keep from drilling the center holes all the way through. The axle pin will be glued into this pivot hole, so drill it the same size as the pin—with no clearance.

3. Drill the end holes, which are dowel size ($\frac{1}{4}$ in.). Drill a bit oversized if you need to.

4. Cut the dowel to length, all four pieces. Sand the ends and bevel the corners slightly.

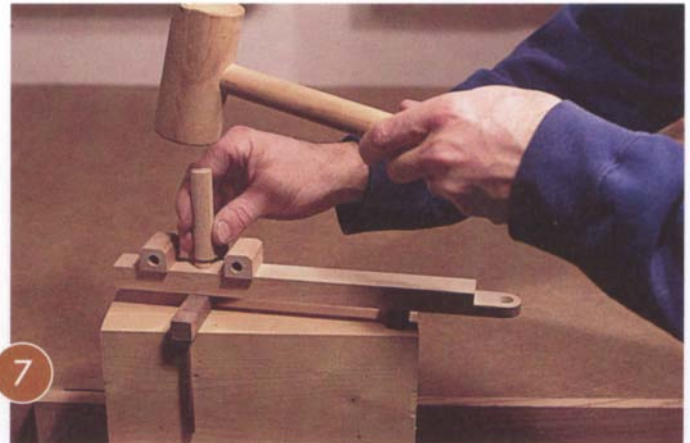
5. Glue the dowels into the end holes. Put glue in the holes only.

6. Sand the bottoms flat, if the dowel protrudes slightly.



7. Attach the bunks to the truck and trailer, using axle pins for pivot pins. You will need to cut the pins to length.

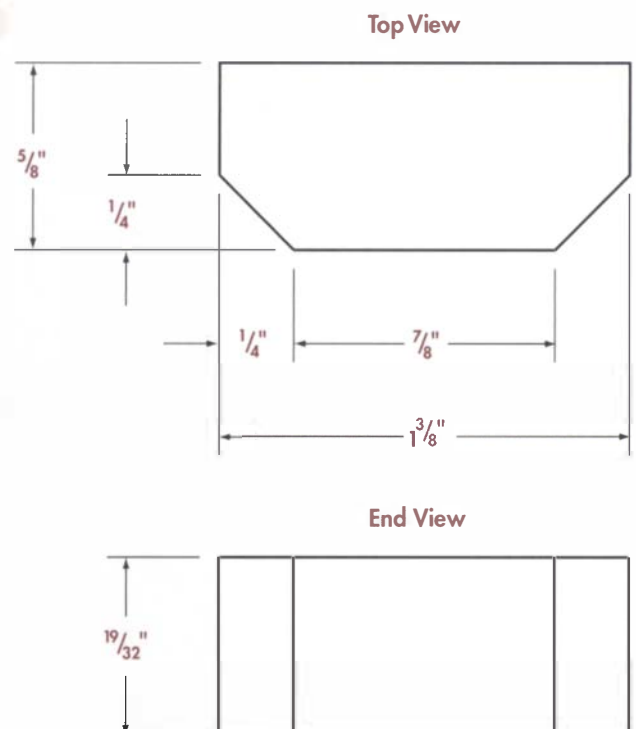
Put glue in the center holes of the bunks and tap the pivot pins into place, leaving the bunks loose enough to pivot on the truck and trailer frames.



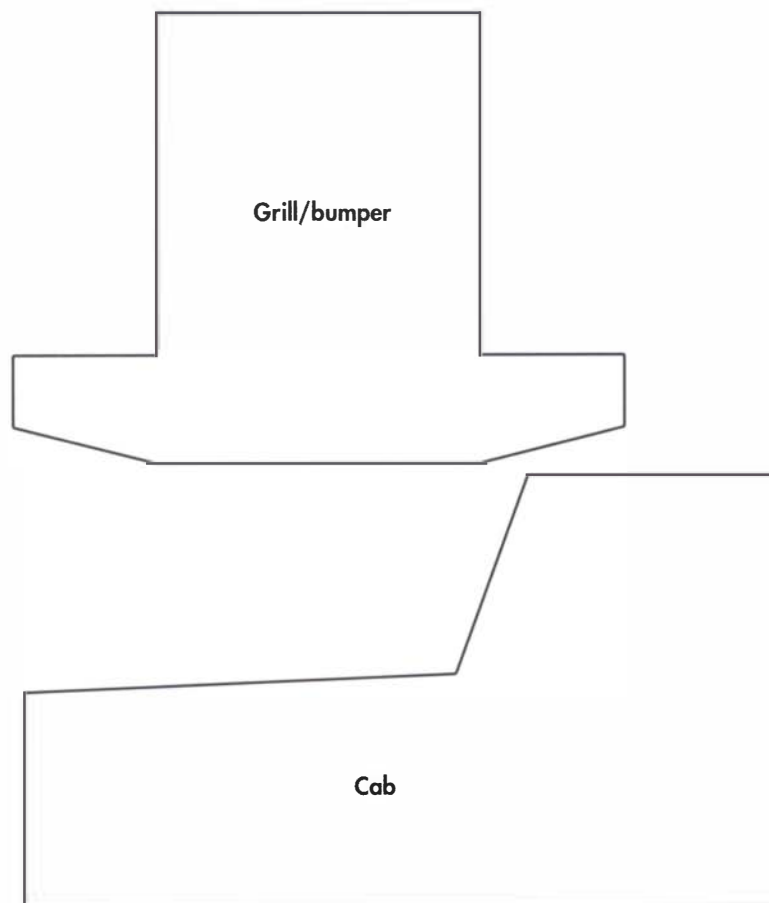
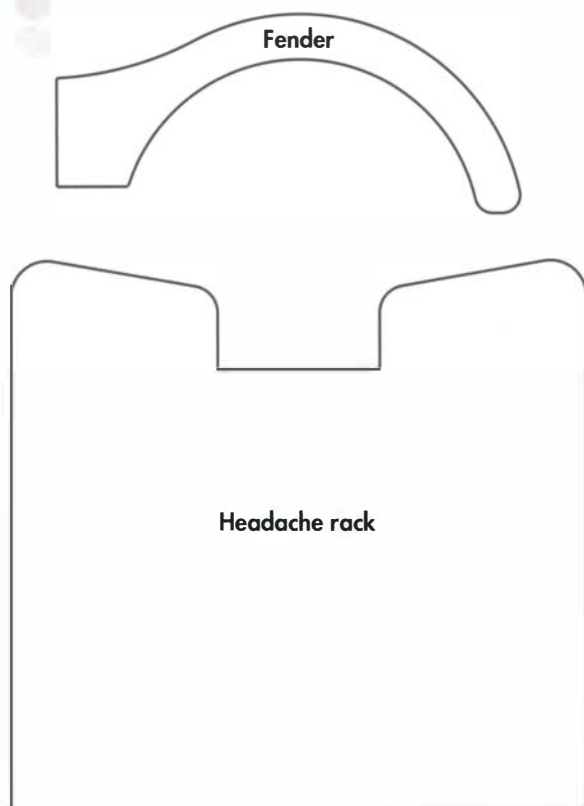
Wheels

See the dump-truck instructions on p. 56 for putting on the wheels.

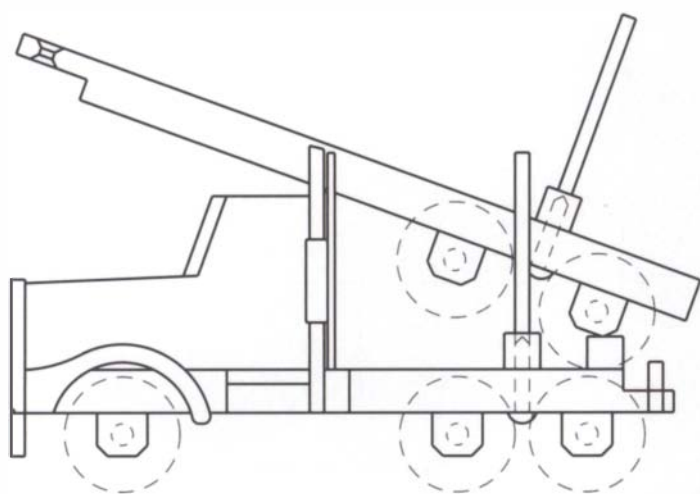
PIGGYBACK SPACER



TEMPLATES



For full-size templates, enlarge by 134%.



Trailer being piggybacked.

Piggyback Spacer

This is a little block that is glued to the back part of the truck frame. Its job is to keep the trailer centered when it is being piggybacked.

1. Lay out the spacer on $\frac{5}{8}$ -in.-thick stock. Cut using a bandsaw, and sand as needed.

The spacer should fit between the rear wheels of the trailer, with between $\frac{1}{32}$ -in. and $\frac{1}{16}$ -in. clearance. Adjust the $1\frac{3}{8}$ -in. length to suit.

The spacer thickness should be a little thinner than the bunk so that the logs do not touch the spacer when they are loaded onto the bunks. Sand the spacer down to $\frac{1}{32}$ in. thinner than the bunks.

2. Glue the spacer to the truck frame. Check that you have the correct location for your truck, by trying the trailer in the piggyback position before the glue is dry or even before applying the glue at all.

Finish

As desired. You may want to read the appendix on finishing on p. 172.

Chapter 7

Skidder

This skidder pulls logs using a traditional cable and winch.

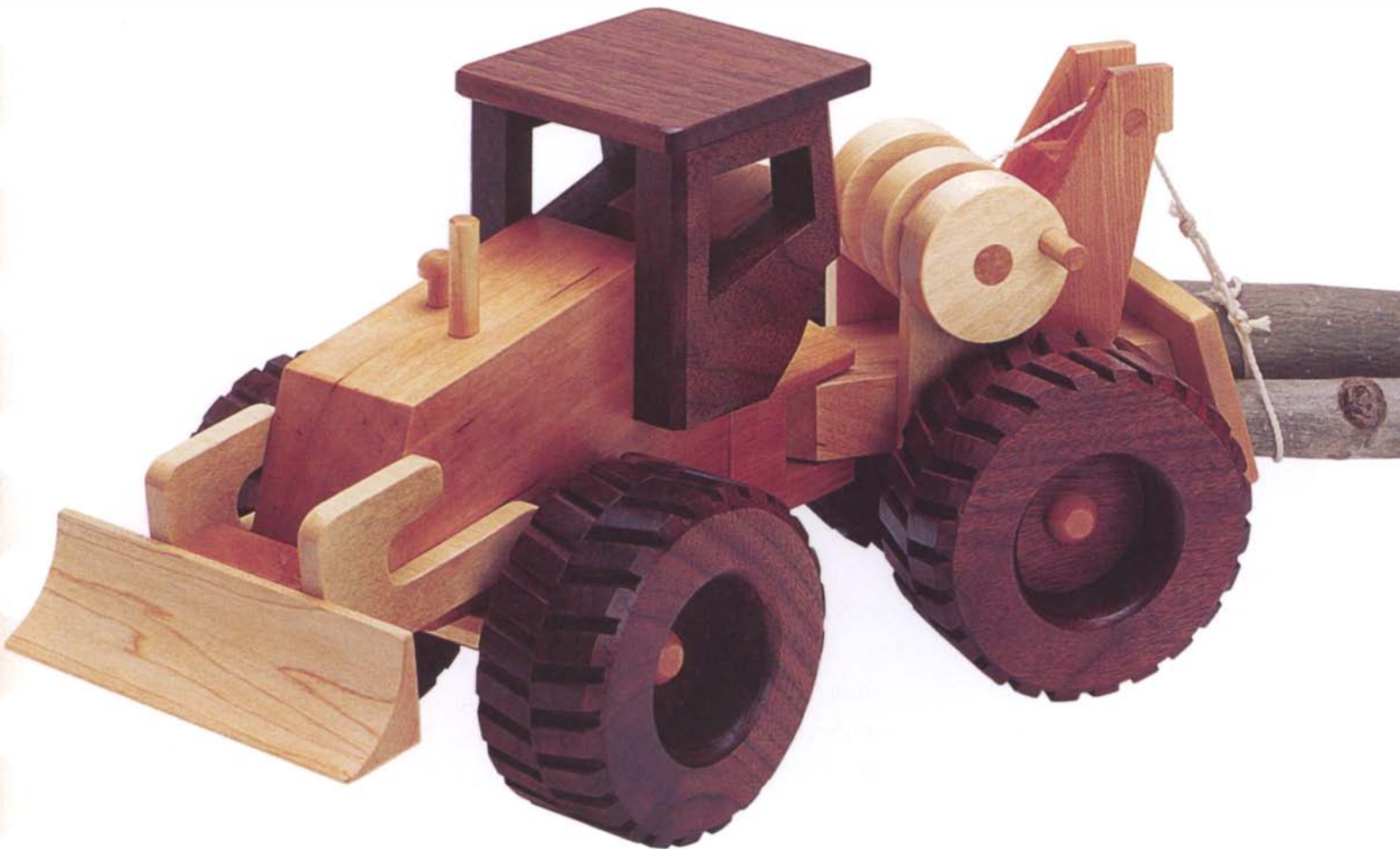
While grapple skidders (ones with hydraulic pinchers mounted on the rear) are very common in today's logging industry, I found that there was no real way to hold the grapple arms tight on the logs. As a result, my children didn't play with the toy very much. When I switched to a cable-and-winch type of skidder, suddenly it was fun to play with.

The strings (cables) have slipknots that act as chokers to slip around the logs. The winch is the same one used in the tow truck, with a cam design so that it will not unwind unless

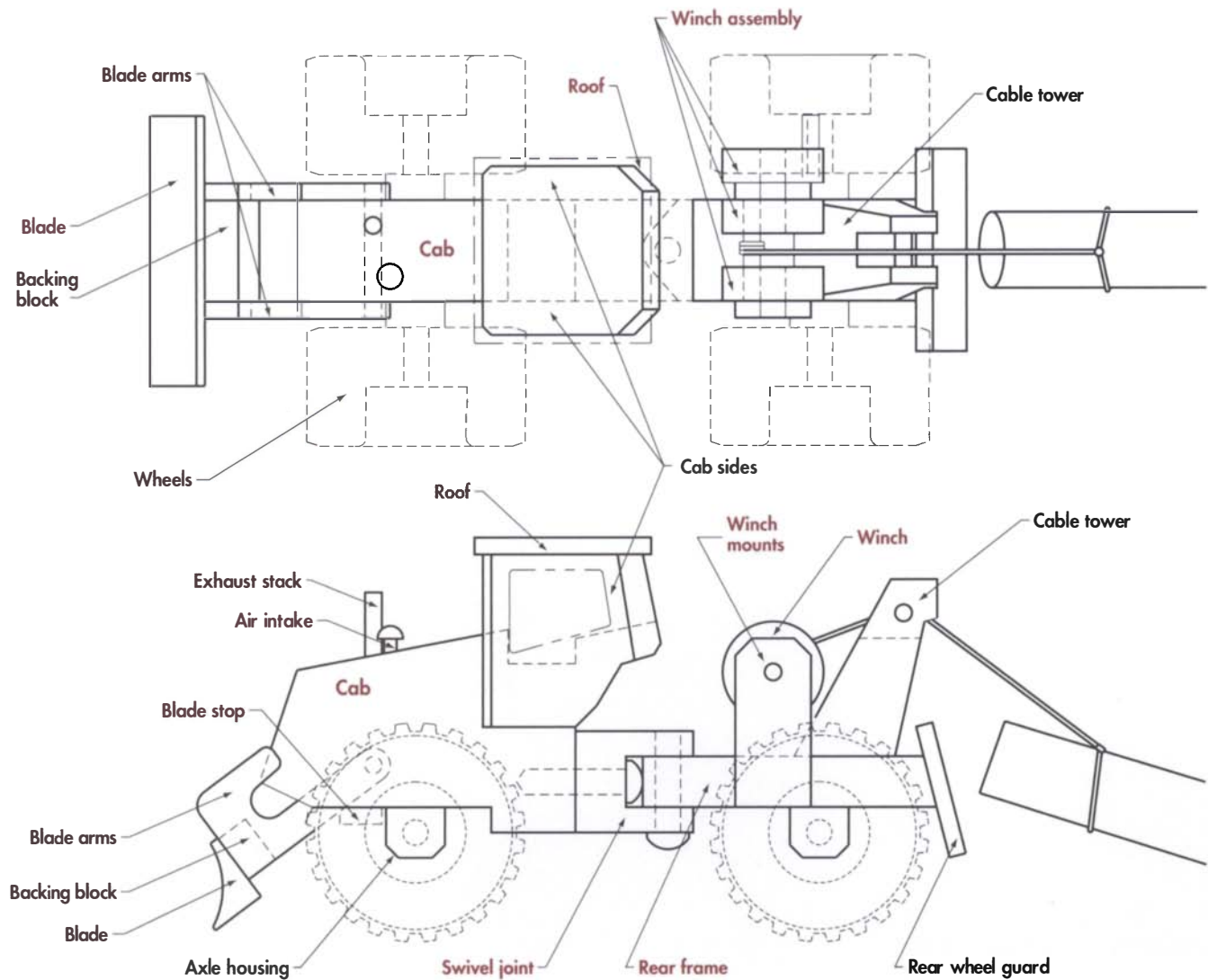
the operator turns the handle. The skidder articulates and twists in the center, so that all four wheels stay on the ground even in rough terrain, just like a real skidder.

The small blade in the front is used to push logs around, as well as to move debris. It is not really intended as a road-making tool. The steep down angle is realistic, but the blade has a stop so it remains just above the floor surface even when down.

The wheels are identical to the wheels used in the monster truck. Skidders often have these wide tires as



SKIDDER PLAN



a purchase option for use on soft terrain. I used them because my 10-year-old son Kevin and his friends were unanimous in choosing wide over narrow treads.

The skidder consists of two main blocks, pinned together. Mounted to the front block are two wheels, the cab, and the blade. Mounted to the rear block are two wheels and the winch.

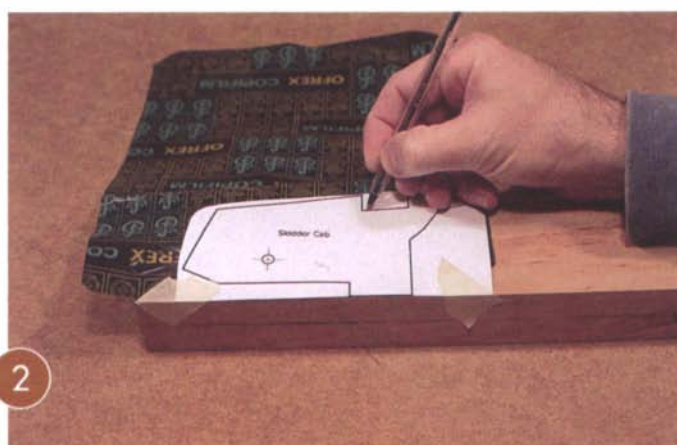
Cab

The cab and the engine are made from a single block. The cab sides define and widen the cab, and the blade and the swivel joint are attached later.

1. Laminate a block, if needed. The final thickness should be pretty close to $1\frac{1}{2}$ in.; even $\frac{1}{8}$ in. either way won't matter, except that you will need to adjust other measurements, such as the blade backing-block length.

SKIDDER

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Cab	6 x 3 ³ / ₁₆ x 1 ¹ / ₂	1	
Cab sides	2 ¹ / ₁₆ x 2 ⁹ / ₁₆ x 1/2	2	Mirror images
Roof	2 ³ / ₄ x 2 ⁵ / ₈ x 1/4	1	Note grain direction
Air-intake pin	7/32 axle pin	1	Factory made; can substitute 1/4-in. dowel
Exhaust stack	1/4 dowel x 1 1/2 long	1	
Rear frame	4 ³ / ₈ x 1 1/2 x 3/4	1	
Axle housings	2 1/4 x 7/8 x 3/4	2	
Winch mounts	2 1/2 x 1 1/8 x 1/4	2	
Winch-handle disk	1 1/2 dia. x 1/2 thick	1	May be cut from 1 1/2-in. dowel
Winch-drum side disks	1 1/2 dia. x 1/2 thick	2	May be cut from 1 1/2-in. dowel
Winch-axle dowel	3/8 dowel x 1 ¹³ / ₁₆ long	1	
Winch-handle side axle	3/8 dowel x 1 ⁵ / ₁₆ long	1	
Winch handle	1/4 dowel x 1 long	1	
Winch-drum dowel	1/4 dowel x 1 ⁷ / ₁₆ long	1	
Cable tower	2 ⁵ / ₈ x 2 ¹ / ₁₆ x 1 1/2	1	
Cable-guide dowel	1/4 dowel x 1 1/8 long	1	Cut about 1 1/4 in. long; trim after installing
Rear wheel guard	3 x 2 x 1/4	1	
Blade	4 x 1 x 7/8	1	See instructions before cutting
Blade backing block	1 1/2 x 3/4 x 1/2	1	Note grain direction
Blade stop	2 x 5/8 x 1/4	1	
Blade arms	2 ³ / ₄ x 1 ⁷ / ₁₆ x 1/4	2	
Swivel joint	1 ³ / ₄ x 1 1/2 x 1 1/2	1	Use strong wood (oak, maple)
Wheels	3 1/4 dia. x 1 1/2 thick	4	Cut eight halves, 3 1/4 in. dia. x 3/4 in. thick
Axle pins	1 ¹ / ₃₂ dia.	6	Factory made (two for swivel joint)
String	Strong; max. 1/16 dia.	3 ft.	See instructions



2. Lay out the shape, using the drawing or the template provided (see the notes on template use on p. 3). Also lay out for the blade-mount hole at this time.

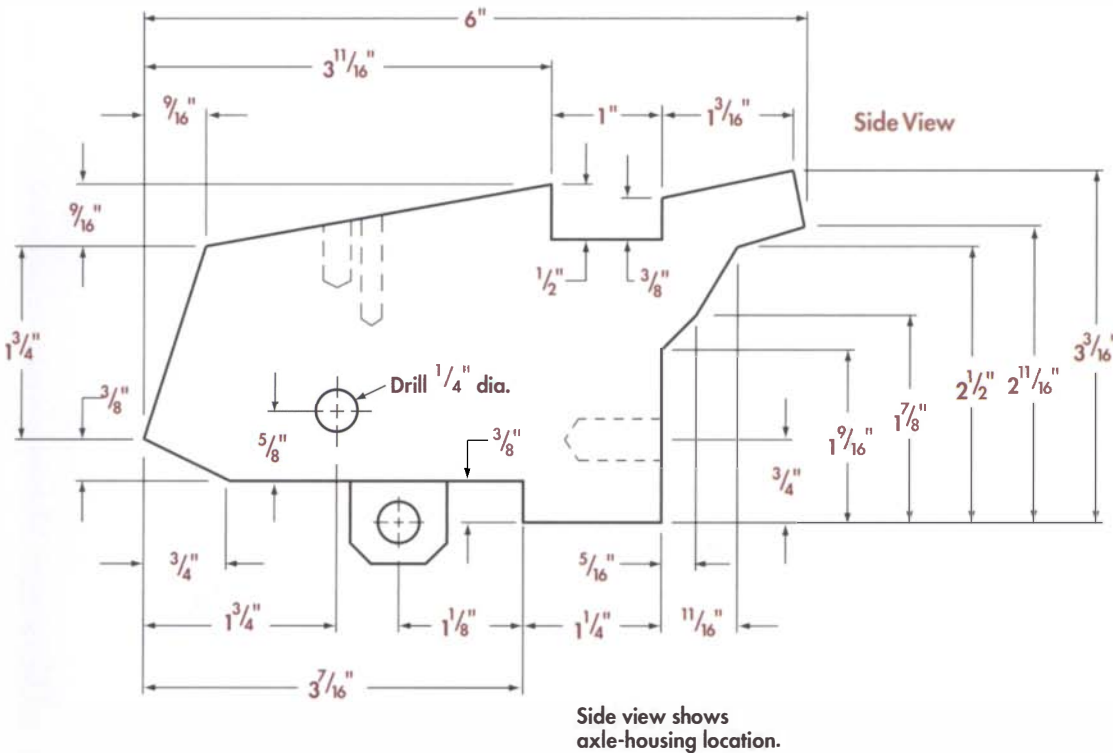
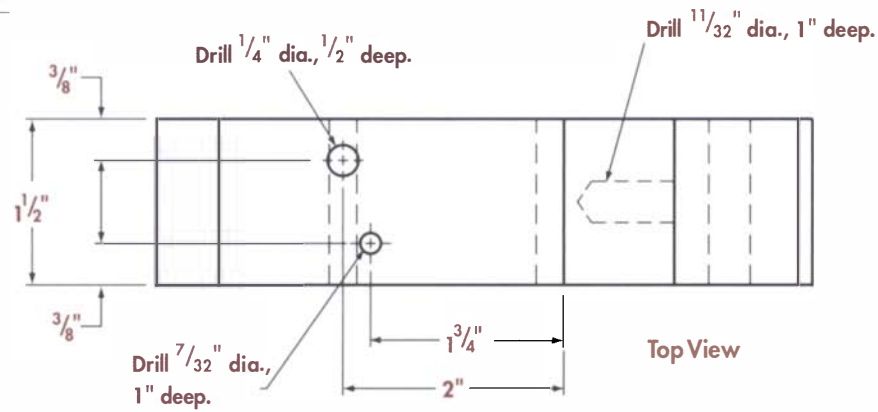
3. Cut to shape using the bandsaw. Save the scraps, at least one large enough for the blade backing block, 1/2 in.



by 3/4 in. by 2 in. wide (check the drawing on p. 99 for grain direction).



4. Drill the blade-mount hole; this should be a size that allows the 1/4-in. dowel to slide in but not rattle around. While this is probably 1/4 in. or 17/64 in., you should try a test



hole on some scrap because even good-quality doweling varies in size.

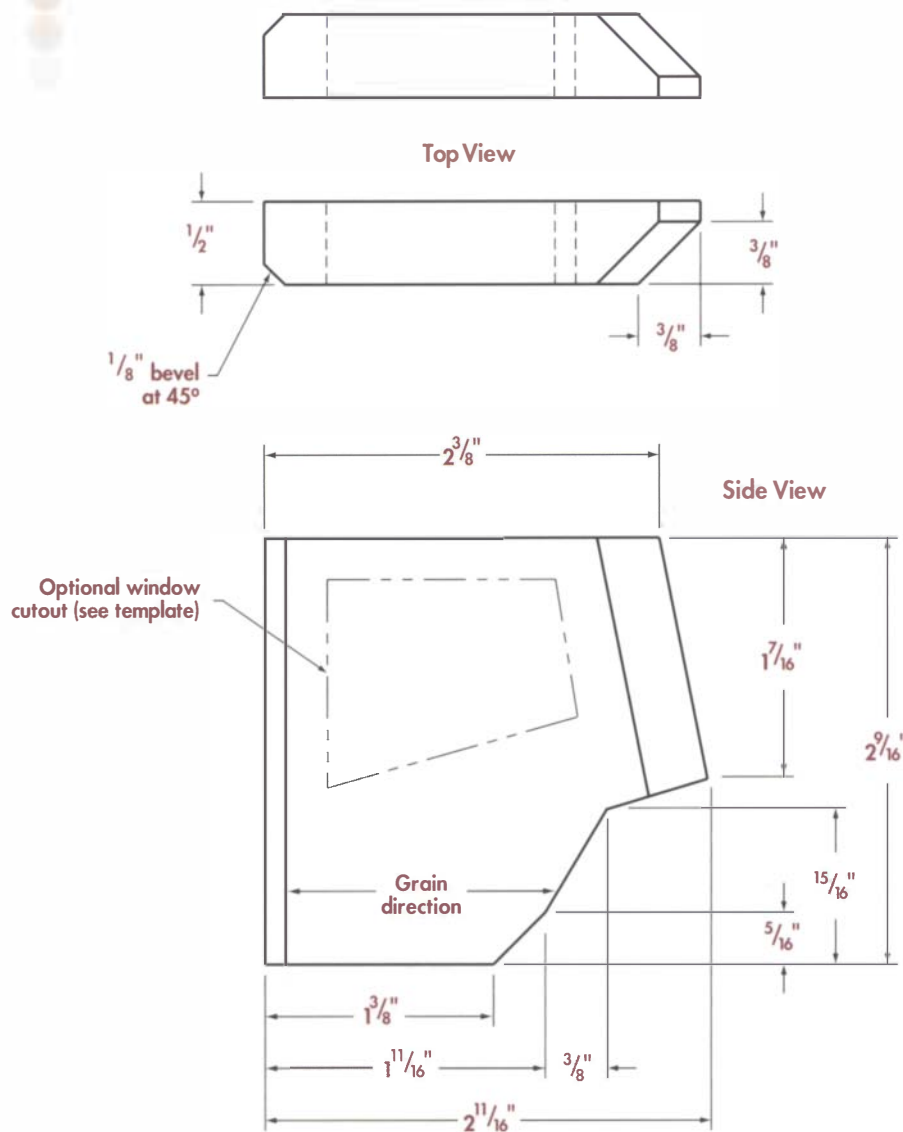
5. Drill two holes in the top of the hood: one for the $\frac{1}{4}$ -in. exhaust stack and one for the $\frac{7}{32}$ -in. air-intake pin. Although I use a standard small axle pin as the intake, you can also use a short $\frac{1}{4}$ -in. dowel in a $\frac{1}{4}$ -in. hole.



6. Drill the frame pivot hole to the size of your axle pins. A standard-size hole would be $\frac{1}{32}$ in.

7. File and sand as needed. I use a small smooth file for the end-grain windshield area and a fine-grit belt for the rest, although hand-sanding may be needed, too. Round or bevel all sharp corners.

CAB SIDES

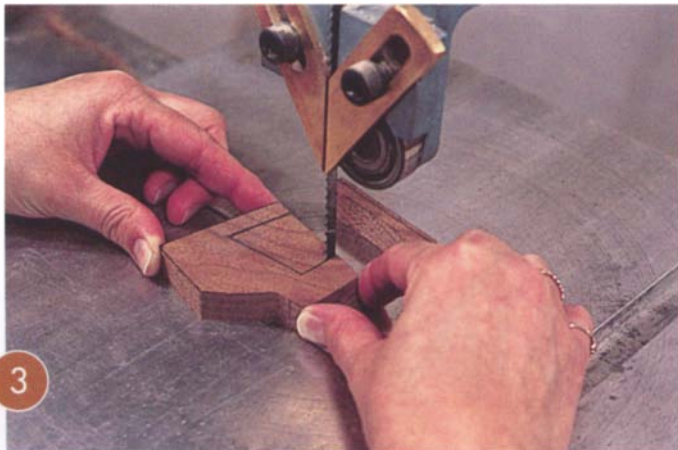


Cab Sides

These sides are cut out to rough size and glued to the side of the cab in order to give the cab its width in the area where the driver sits. The windows are included in this chapter, although you don't have to put them in.

- 1.** Lay out the cab sides on a piece of $\frac{1}{2}$ -in.-thick wood. The pieces are mirror images of each other. If your wood has a bad side that you want against the cab, you will need to lay out one with the template cut out and facedown.
- 2.** Bandsaw to shape. Leave the outside just a little over-size, so that you can trim the sides after they are glued onto the cab. Leave a little extra at the top, because you will lose some when you cut out the window in step 3.





3. There are several ways to cut out a window in these parts. You could drill a hole and cut around with a coping saw, scrollsaw, or jigsaw, but I prefer a bandsaw.

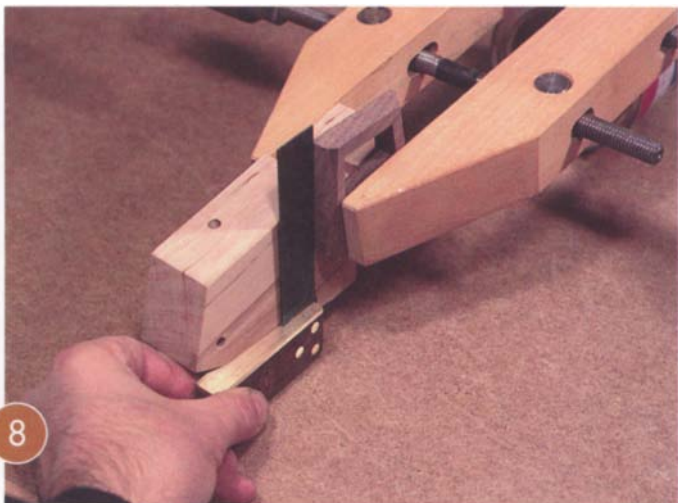
Using a bandsaw, cut a strip from the top and then saw out the window. After cutting, glue the strip back on. The cut and grain should match up, making the cut line nearly invisible.

4. File and sand the window edges, and bevel the corners slightly.

5. Sand the bottom and front edges square. Sand the bevel on the front and back corners now, before gluing to the cab. Do the finish-sanding on the cab sides, but don't worry about the back surfaces that match up with the back of the cab. Those are sanded together, after assembly.

6. Do the finish-sanding on the cab now, since it is a little more awkward once the cab sides are on.

7. Hold the cab sides in place, aligning as closely as possible the back edges of the cab and cab sides. Check that the interior of the cab does not protrude up into the window area. Sand the cab interior down a little if needed.



8. Glue the cab sides onto the cab, leaving the sides slightly overhanging on the back of the cab. The front of the cab sides should be square to the bottom of the cab, as shown.

9. File and sand to trim the sides flush with the cab.

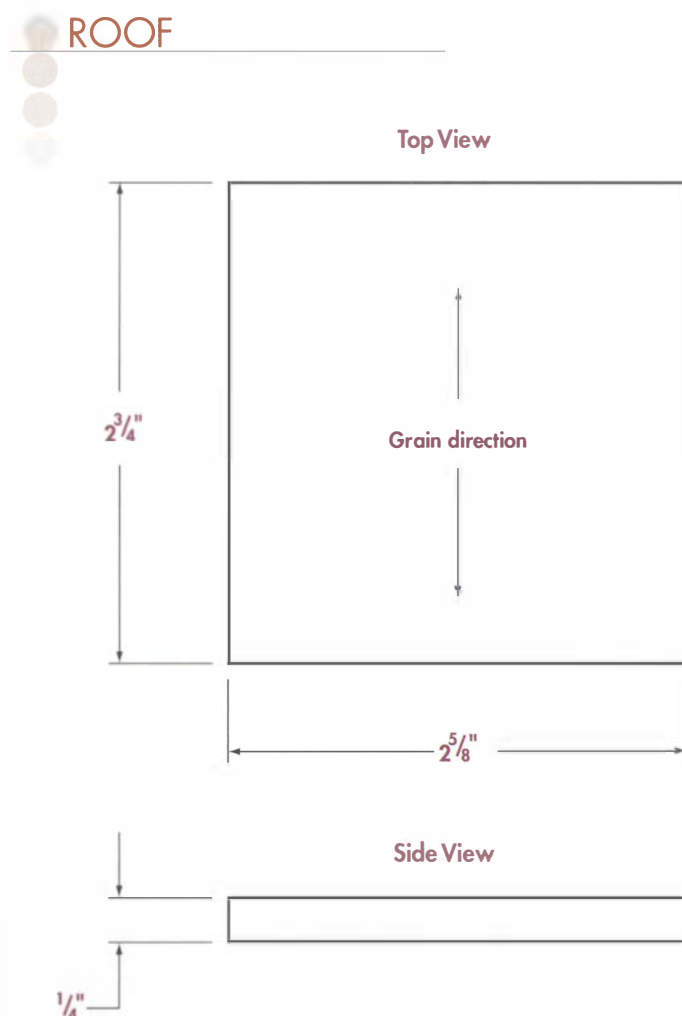
10. Disk-sand or hand-finish the top edges so they form a flat surface, ready for the roof.

Roof, Exhaust Stack, and Air Intake

1. Cut the roof, and sand all surfaces. Have the grain running crossways to the skidder, for strength.

2. Glue the roof to the cab, having the edges overhang evenly on each side.

3. Cut a 1½-in.-long piece of ¼-in. dowel for the exhaust stack. Sand and bevel the ends.



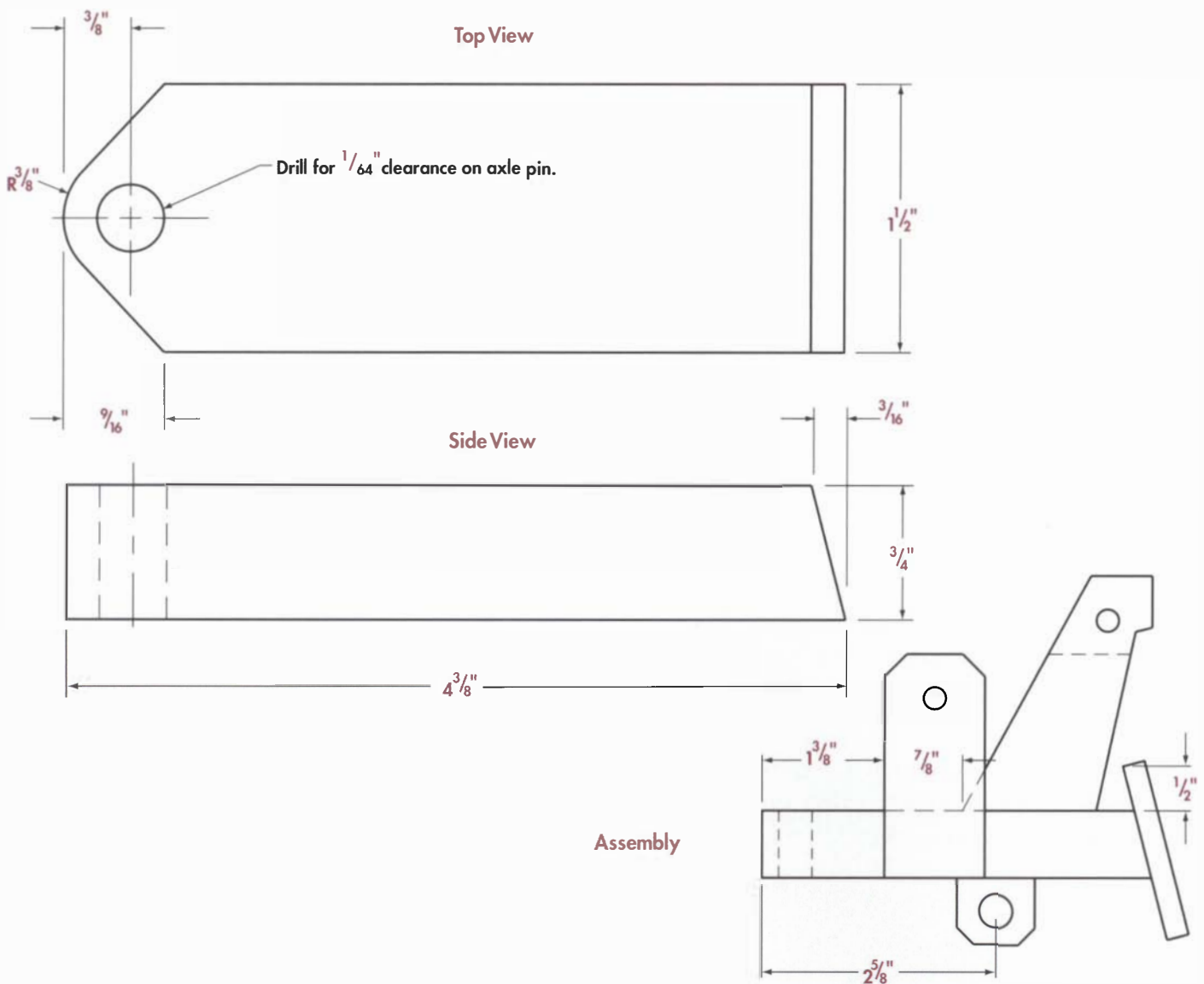


4. Put glue in the holes on the hood, and glue the exhaust stack and the air intake (standard $\frac{7}{32}$ -in.-dia. axle pin) in place.

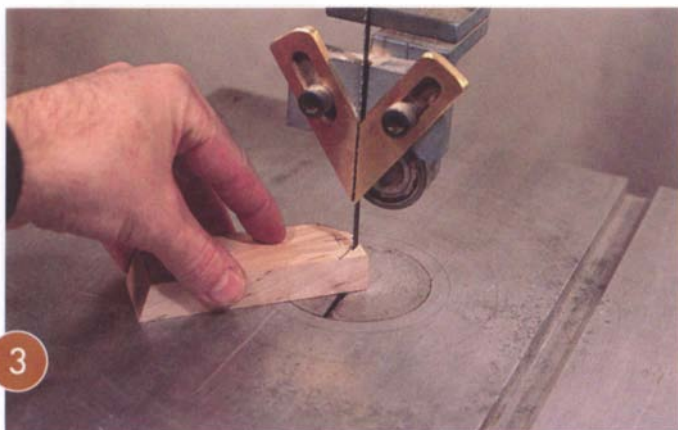
Rear Frame

Most of the skidder mechanisms are attached to the rear frame. The frame is little more than a small board, but you attach the winch and the cable tower to the top, the wheel guard to the back, the axle to the bottom, and the swivel joint to the front of the frame.

REAR FRAME



1. Cut a block of hardwood to size.
2. Saw and sand the angle at the back end. The exact angle is not too important, but the angled surface should end up flat, not rounded, because you glue the wheel guards to this surface.



3. Saw and sand the angles and curve at the front. Keep this fairly accurate because it will affect how far the skidder can turn.

4. Drill the pivot hole. This hole should be about $\frac{1}{64}$ in. larger than the axle pin for the swivel joint—or approximately $\frac{23}{64}$ in. dia.

5. Finish-sand, and bevel all corners except around the rear angle, where the wheel guard will be attached later.



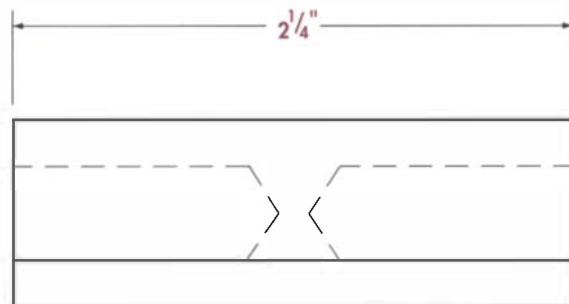
Axle Housings

The axle housings space the wheels out from the frame and provide the mount for the axle pins. I use standard factory-made axle pins and drill the housings and the wheels to fit these pins.

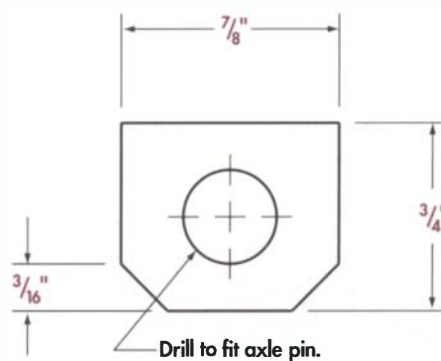
1. See the dump-truck instructions for making the axle housings (on p. 50), but note that both housings for the skidder are the same length, $2\frac{1}{4}$ in. long.

AXLE HOUSINGS

Front View



End View

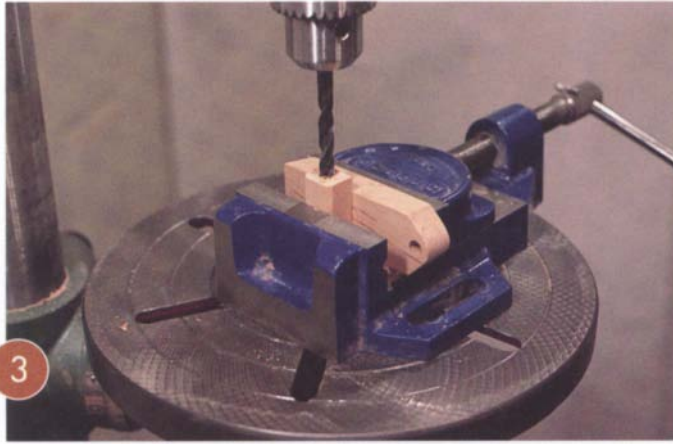


2. Once the two axle housings are complete, glue them to the front and rear frames of the skidder.

You may want to drill them before attaching them to the skidder, but generally it is easier to hold them after they are glued to the larger parts.

The axle housing on the rear-frame section can be clamped easily enough, but the axle housing on the front-cab section is difficult to clamp, so I don't. Use a thin film of glue, and press the housing firmly into place. This joint will be more than strong enough. (For a discussion on clamping small parts, see p. 2.)

3. Lay out and drill the housings, in the center of each end of the housing. With the other vehicles in this book, the accuracy of these holes is critical if you want all the wheels to turn. In this case it is not as important because the skidder has a center pivot design, which guarantees that all wheels will contact the floor at all times.

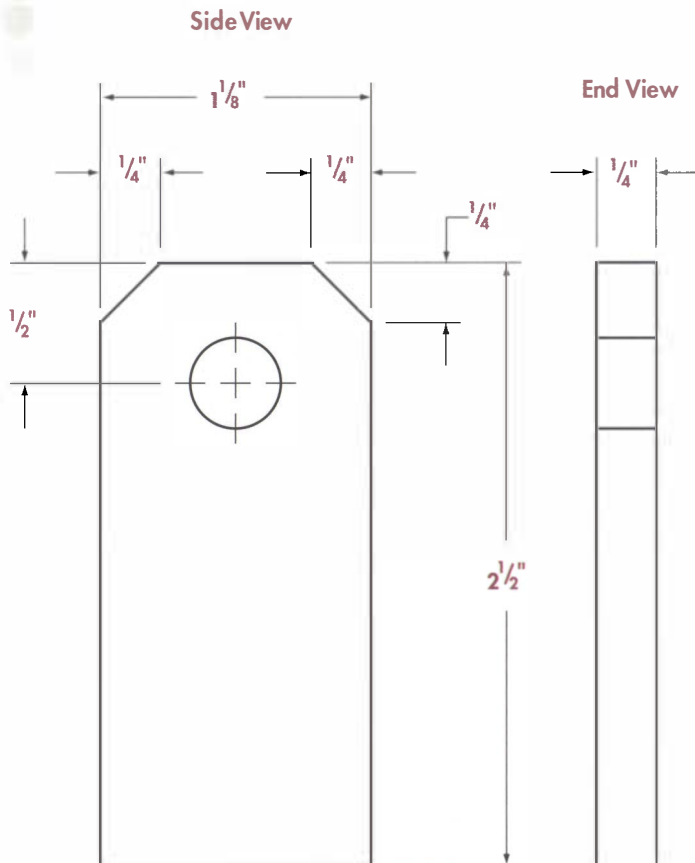


Use a vise to hold the rear frame for drilling, but clamp the cab to the table (with a wood spacer underneath).

Winch Mounts

These simple mounts are glued to the sides of the frame. Drill the winch axle holes after the mounts are glued on, to make alignment a little easier.

WINCH MOUNTS



1. Cut the two pieces of wood, using $\frac{1}{4}$ -in. material.
2. Sand as needed.
3. Glue the mounts to the frame. Check that they are square to the frame.
4. Drill the winch axle holes. These holes should be large enough so that a $\frac{3}{8}$ -in. dowel spins freely in the hole. As dowel is often a little oversize, you may need to drill as large as $\frac{13}{32}$ in.



Drill these on the drill press, right through both sides to ensure alignment.

Cable Tower

To make the tower I rough out a block, then drill the dowel hole. After the hole is done, I saw the string notch, then all the angles. The tower is attached to the top surface of the frame.

1. Square up a block for the tower ($1\frac{1}{2}$ in. thick by $2\frac{5}{8}$ in. by $2\frac{1}{16}$ in. or wider).
2. Lay out the angles and the cable-guide hole. A template is provided.
3. Drill the hole now, before cutting the angle. It's a little easier to drill accurately on a flat surface than on an angled one.

Choose a drill size that allows the $\frac{1}{4}$ -in. dowel to just slide in. This will likely be $\frac{1}{4}$ in. or $\frac{17}{64}$ in., depending on the exact size of your dowel. You might want to drill a hole in a piece of scrap to check the fit.



4. Cut the cable-guide notch. Again, it is easier to do this while the block is still square.

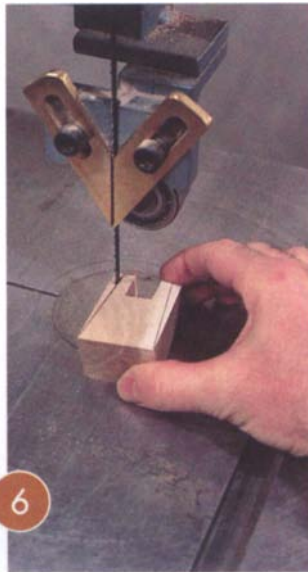
5. Saw the side profile, and sand as needed.

6. Saw the end profile ($1\frac{1}{2}$ in. wide at the bottom, 1 in. wide at the top).

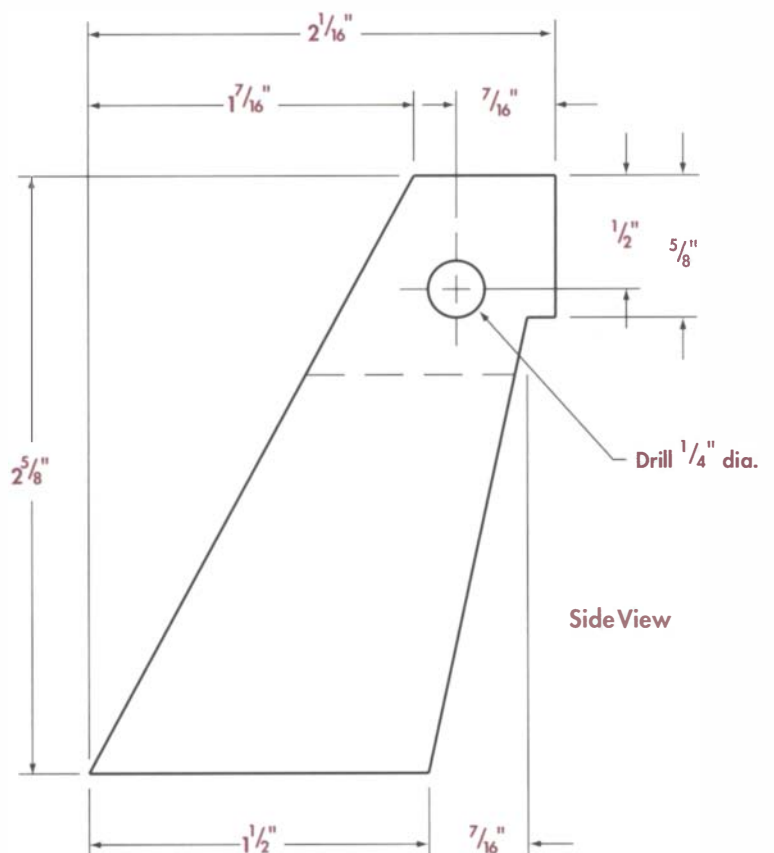
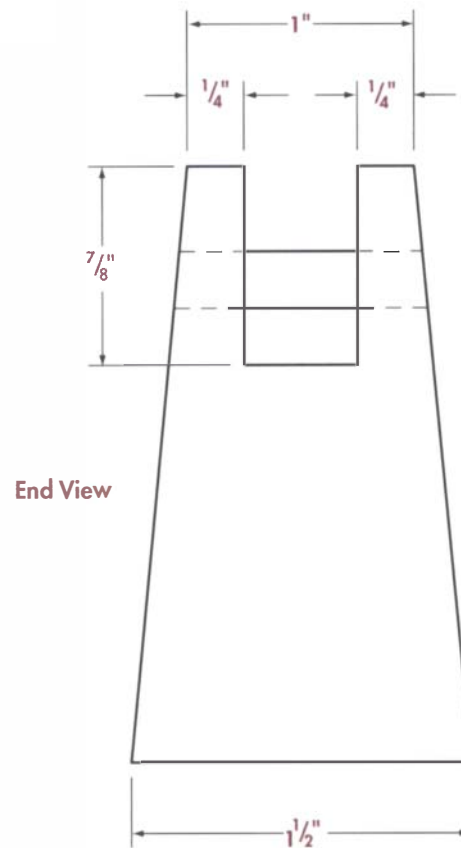
7. Glue the dowel in place by putting glue in one side of the dowel hole. Install the dowel until there is only about $\frac{1}{4}$ in. to go, and put a little glue around the part of the dowel that still protrudes. Slide the dowel in the rest of the way.

8. When the glue is hard, sand the ends flush with the tower.

9. Glue the tower in place (no clamping should be needed).



CABLE TOWER



Wheel Guard

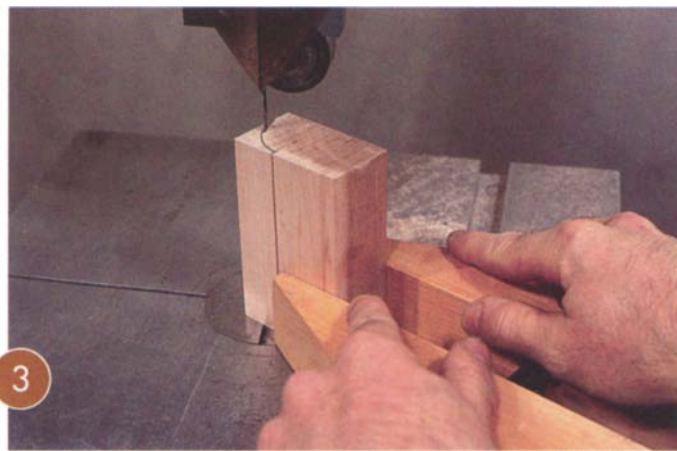
When a skidder pulls logs, the logs can bump against the rear wheels or the rear of the skidder. To prevent this, guards of some sort are attached, similar to the one on this toy. Take a small rectangle of $\frac{1}{4}$ -in.-thick wood, and glue it directly to the back of the frame (see the top right photo on p. 102).

1. Cut the guard to size.
2. Sand as needed, rounding all corners slightly.
3. Glue to the frame. Although you are gluing to end grain, the end of the frame is a fairly large surface and holds quite well. Clamping should not be needed if both surfaces are flat.

Blade

Watch the grain directions when making the blade, in order to have strong glue joints. Make the blade, then glue on the backing block. Glue the two arms to the backing block and then attach them to the cab with a dowel.

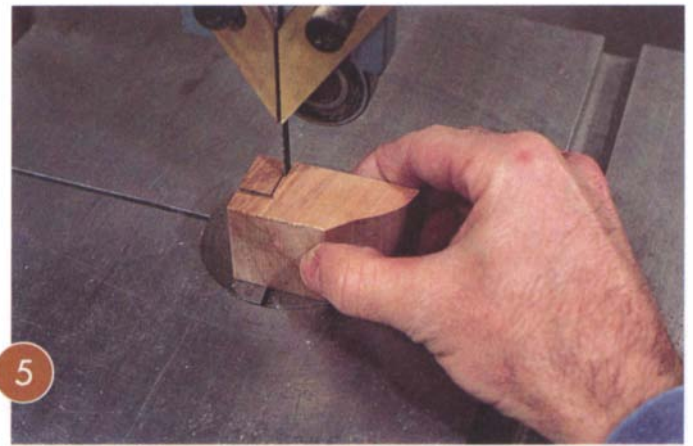
1. Use a larger block for the blade so that cutting out the curve on the bandsaw is reasonably safe and successful. Cut a block 4 in. long, at least 1 in. thick, and at least $1\frac{1}{2}$ in. wide. The extra is to allow the wood to be held safely (with a clamp) when sawing out the arc.
2. Square the ends of this 4-in.-long block.
3. Lay out for the curve on the end grain, and saw to shape. It is a good idea to use a clamp as a “handle” when sawing small or awkward pieces.



4. Sand as needed.

5. Cut the backing block from the wood left over from the cab. Note the grain direction. The ends of this block will be glued to the arms, and this needs to be a strong joint, so end grain is not what you are looking for here. The end grain of this piece will end up on the top and bottom of the block.

Use a cab scrap because it is exactly the same width as the cab, having been cut from the cab. If you don't have a leftover scrap because you got carried away with your shop cleanup, just make the backing block the same width as the cab.



6. Glue the block to the blade, having the top of the block flush with the top of the blade.

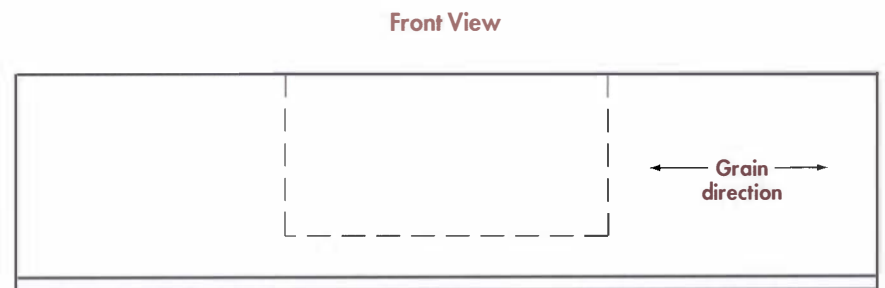
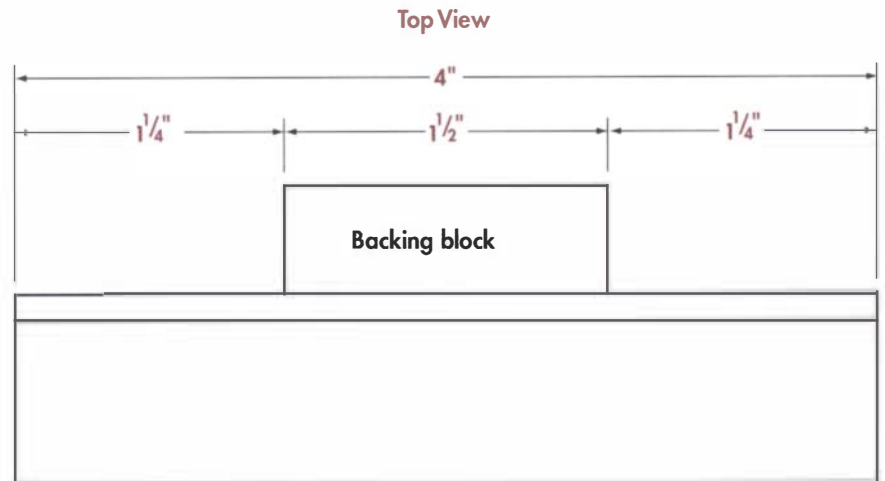
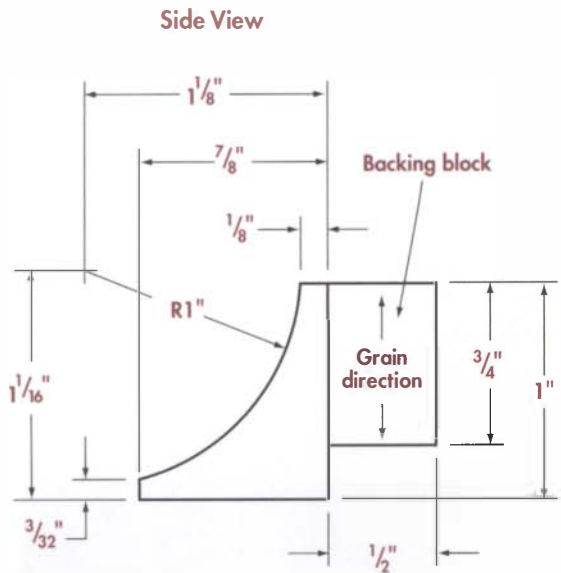
7. Lay out the blade arms, using either the template provided or the drawing as a guide.

8. Drill the holes before you bandsaw the parts to shape, since the wood is much easier to hold when it is a larger block.

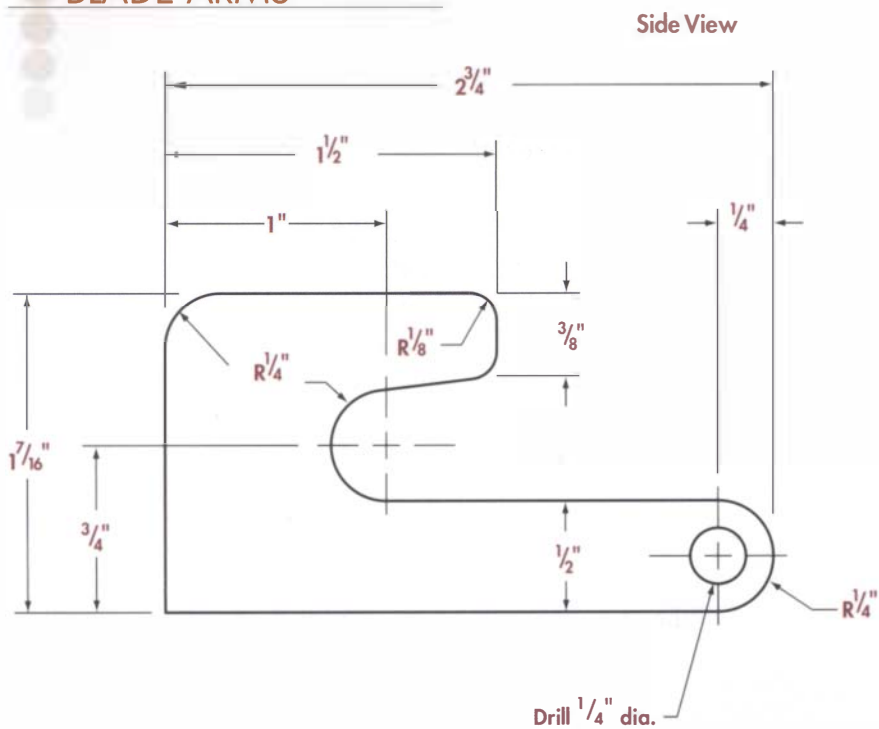
Drill the $\frac{1}{2}$ -in. hole that will form the $\frac{1}{4}$ -in. radius, as well as the $\frac{1}{4}$ -in. hole for the dowel that the blade arms will pivot on.

Check that your $\frac{1}{4}$ -in. dowel will fit in a $\frac{1}{4}$ -in. hole. You may need a hole that is $\frac{1}{64}$ in. oversize to keep slightly oversize dowel from splitting the arms. This is the voice of experience.

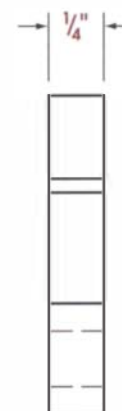




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Edge View



9. Cut the arms to shape, using the bandsaw.

10. Sand as needed. Pin the parts together with a short piece of 1/4-in. dowel, and sand the ends even, so the distance from the dowel to the end is the same for both arms. This way the blade will be square to the skidder when you assemble it.

11. Cut the blade-arm pivot dowel a little over 2½ in. long. Slide it into the hole in the cab front.

12. Have the blade assembly handy, and put some glue in the holes in the blade arms and some glue on the ends of the backing block.

Slip the arms over the pivot dowel, leaving a little bit of dowel protruding from each side. Immediately put the fronts of the arms onto the backing block, and clamp.

The blade-arm pivot should be a little stiff if anything, so don't worry that it may not pivot freely.

13. When the glue is hard, sand the ends of the dowel so they are flush with the arms.



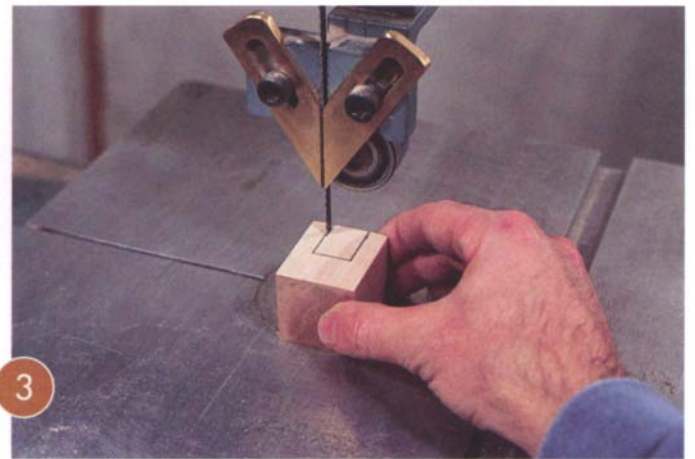
Make the part, then pin it to the front section of the skidder. When this is done, pin the rear section of the skidder in place, and then you'll have a fully-articulating skidder.

1. Cut the block from good, strong hardwood (oak, maple, etc.).

2. Lay out the notch. This notch should be the same size as the thickness of the rear frame because the frame fits into the notch. You may want to add washers for this kind of swivel; if so, you need to allow for that thickness as well. Without the washers, the joint occasionally becomes a little stiff after prolonged play.

Make the washers out of some slippery plastic; the lid of a margarine container will do—not too high tech but it works well. For information about these washers, see the wheel-installation section of the monster truck on p. 22. For the skidder, make seven washers.

3. Cut the notch using a bandsaw. Get it very close to its finished size, to reduce filing and fitting later.



4. File and sand the notch to fit the frame (and washers).

5. Saw, sand, or plane bevels on the top of the block. These allow the block to pivot without immediately hitting the underside of the cab.

Swivel Joint

This U-shaped part is a sort of universal joint. It allows the skidder to articulate or steer, and it also allows the two halves of the skidder to pivot so all four wheels remain on the ground—even when the skidder is driving over rough terrain.

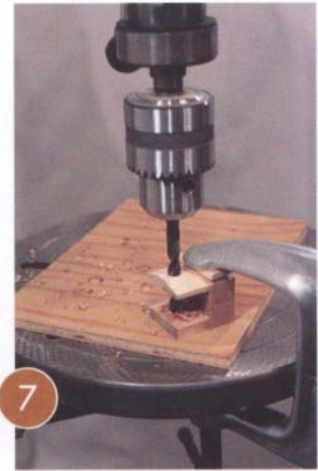
6. Drill the pivot hole. This hole should be about $\frac{1}{64}$ in. over the axle-pin size so that it can pivot freely. Lay out so that the hole will be in the center of the notch.

7. Drill the articulation hole. This hole should be the same size as the axle pin because the pin will be glued into this hole.

8. File and sand as needed.

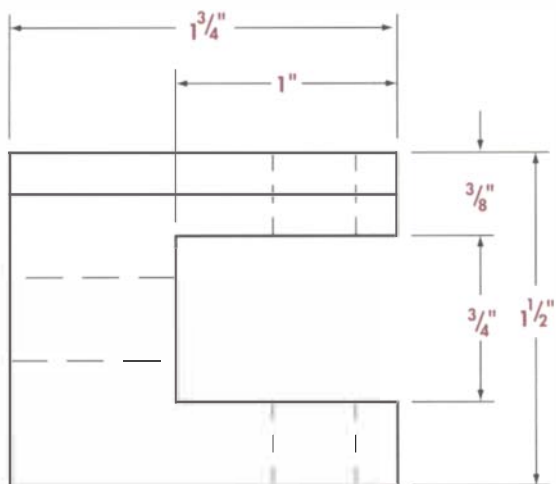
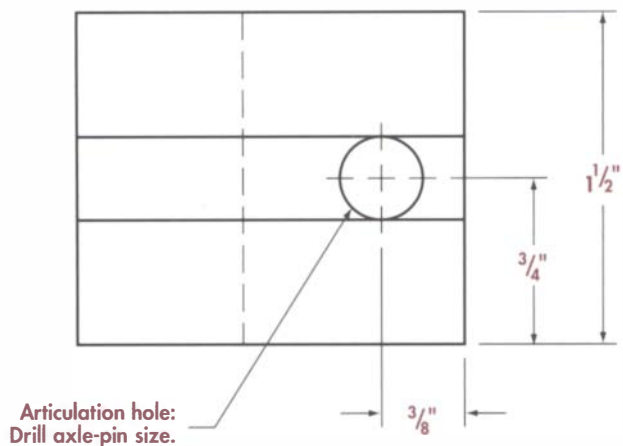
9. To assemble the swivel joint to the skidder, cut an axle pin to length.

Wax the inside of the pivot hole, and put some glue in the pivot hole in the skidder front section.

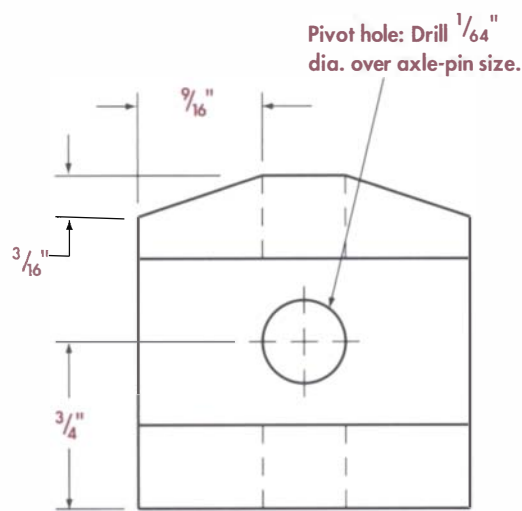


SWIVEL JOINT

Top View



Side View



End View

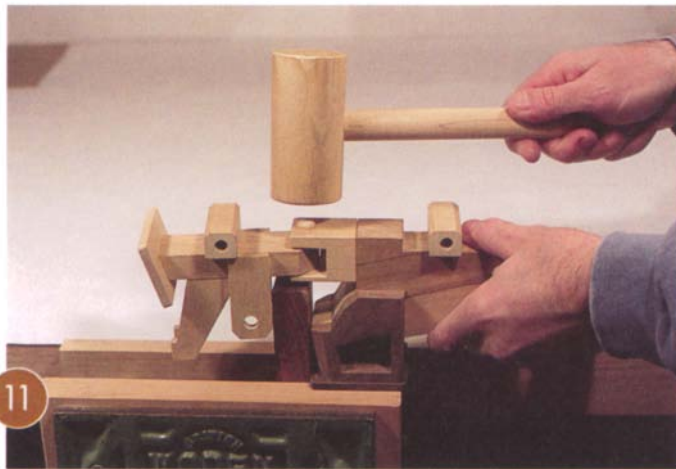
10. Slide the axle pin into the swivel joint, through the washer, and tap it into the skidder.

Ideally the joint is tight enough not to rattle but loose enough to pivot freely. A little loose is better than too tight. If you get it too tight, you may have to drill it out and try again.



11. Assemble the rear section of the skidder to the swivel joint. Do this without glue at first to make sure it pivots without hitting the head of the axle pin (the one that is already installed). If it doesn't pivot properly, sand a little from the offending area. When it fits, put a little glue in the top hole of the swivel joint.

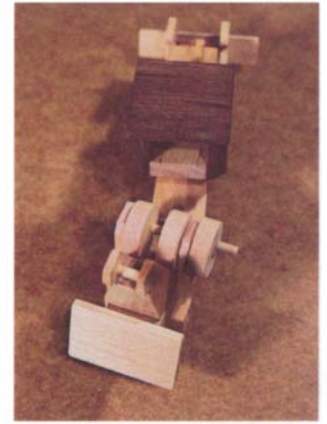
Put some paste wax in the hole in the rear frame. Assemble the parts, including the washers if you are using them. Tap the axle pin into place.



12. When the glue is hard, file the excess axle pin from the top of the joint, and sand as needed.

Winch

See the tow-truck winch drawings and instructions on pp. 64–66. Here the shape of the mount is a bit different, but the winch itself is identical.



Wheels

These wheels are identical to the ones used on the monster truck, so follow those drawings and instructions (see p. 14–18). If you want narrower wheels, just use $\frac{3}{4}$ -in. wood instead of the $\frac{7}{8}$ in. recommended. The rest of the process is the same.

For installing the wheels on the skidder, use the monster-truck instructions as well (see p. 22). You can apply a finish to the wheels before or after assembly. If you are finishing the wheels now, do not apply finish to the skidder until the blade stop is glued in place. The wheels need to be attached (permanently or temporarily) to locate the blade stop.

Blade Stop

This small part is intended to keep the blade from dragging on the floor. Make the part, move the blade to what is its lowest acceptable position, and glue the stop in place (see the plan drawing on p. 89 for location).

- 1.** Cut a small strip of wood, $\frac{1}{4}$ in. by $\frac{1}{2}$ in. by 2 in. long.
- 2.** Sand or plane a small bevel; a rounded corner would also be fine.
- 3.** If the wheels are not already glued in place, install them temporarily now, without glue. Locate the blade stop so that the blade will be held up about $\frac{1}{8}$ in. to $\frac{1}{4}$ in. above the ground. Glue the stop in place; clamping should not be needed.

String (Chokers)

Cable skidders have a single cable running from the winch, but at the end it splits into several lengths of cable, each with a mechanical slipknot at the end. A choker is set around the log, and when a few logs are set, the skidder drags them to a landing where they are loaded onto a log truck. These chokers are made of string.

Use 2 ft. or 3 ft. of strong nylon string, about $\frac{1}{16}$ in. dia. One end is attached (tied and/or glued) to the winch, and the other end has a small loop. To this loop, tie a length of string about 12 in. long. Have the knot in the center of this

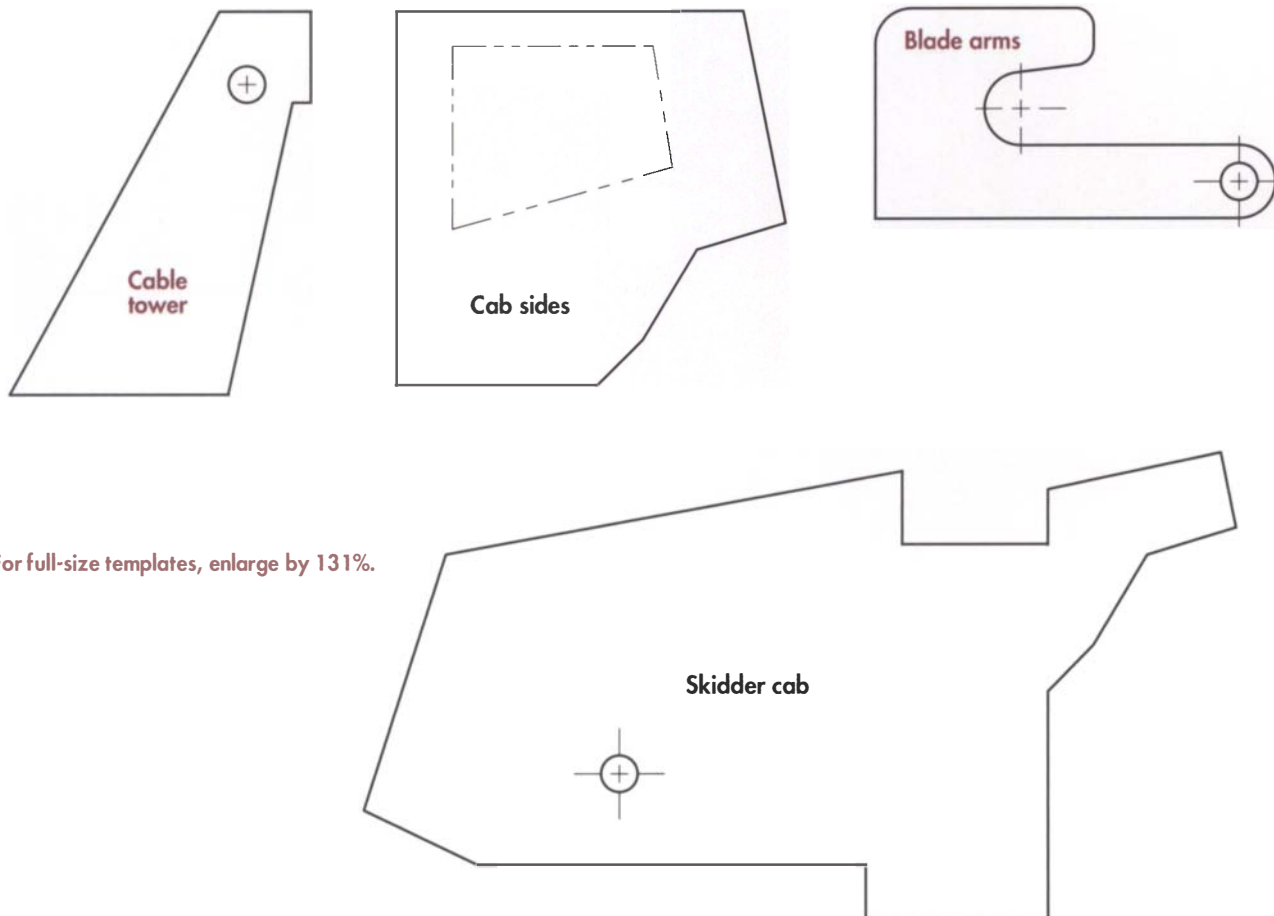
12-in. piece, so you have two 6-in. choker strings attached to the winch string. Tie a slipknot loop in each end. The choker will end about $2\frac{1}{2}$ in. to 3 in. long.

Finally, put a little carpenter's glue on each knot, so you can trim the string close to the knot.

Finish

When the final sanding is done, it is time to apply some finish. You may want to read the appendix on finishing on p. 172.

TEMPLATES



Chapter 8 Log Loader



The log loader is the third toy of the three

logging machines, the other two being the log truck (chapter 6) and the skidder (chapter 7). It is designed to grasp and lift logs from a landing and load them onto the log truck. Similarly, it is also used to unload the log truck.

The wheels are the same as those on the monster truck and skidder, although slightly narrower. The fork-and-grapple assembly that grips the logs is mounted to a parallel-arm mechanism. This keeps the forks level while

raising or lowering the logs. The forks lift high enough to allow the logs to clear the bunks on the log truck. The grapple clamps the logs onto the forks, which are spaced widely apart to balance the logs while the log truck is loaded. The loader articulates to steer.

In a nutshell, the loader consists of two shaped blocks of wood: a larger rear block with the cab on top and a smaller front block holding the fork assembly. Each block has two large wheels pinned to the sides.

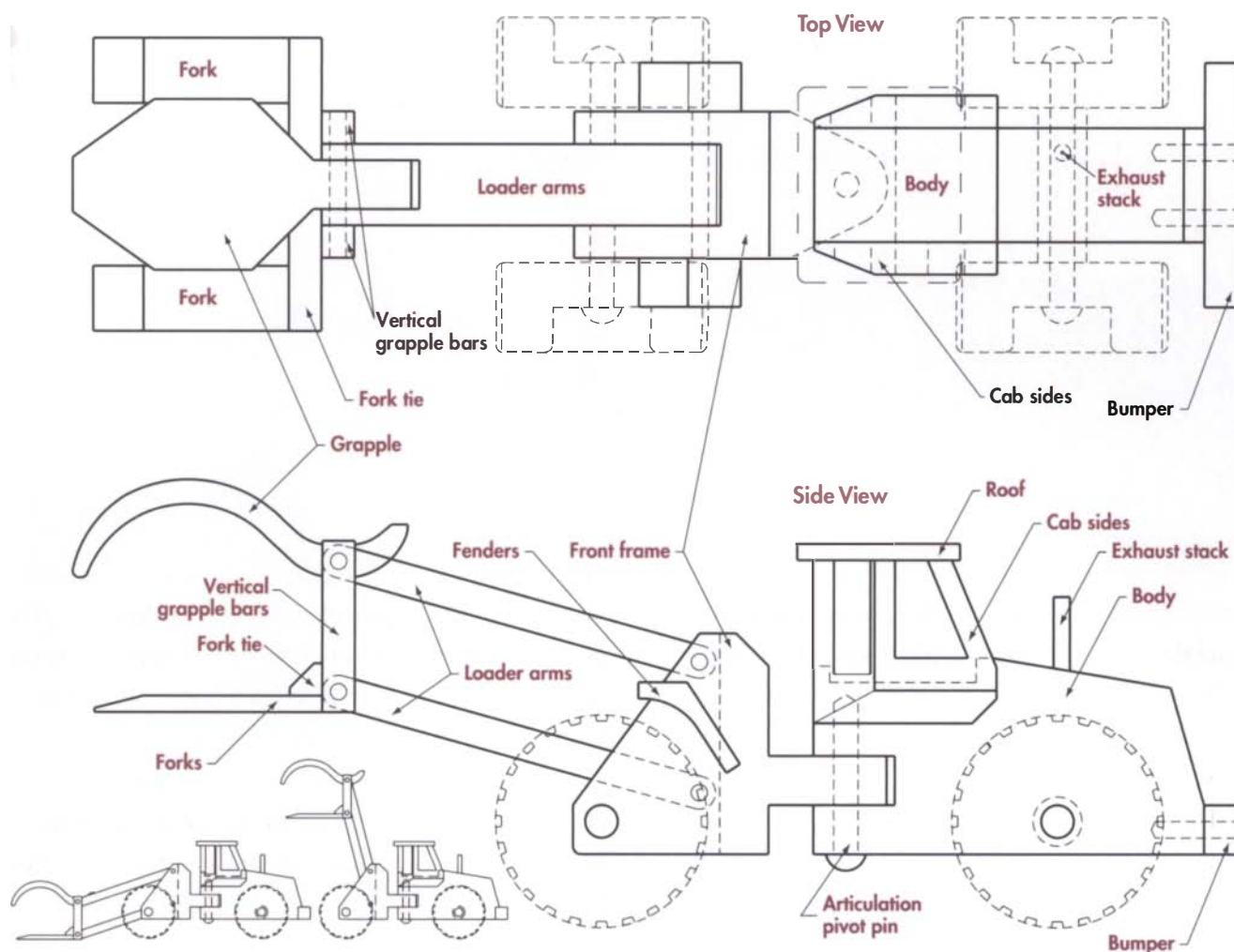


Body

This is the main block for the loader. After cutting the block to shape, the holes for the articulation pivot and for the exhaust pipe are drilled. Sides are attached to the cab section to widen it. The bumper, roof, and axle housing are attached later.

- 1.** Laminate wood as needed or use 1 3/4-in.-thick solid wood.
- 2.** Lay out for the side profile, by measuring it out or by photocopying the template on p. 117.

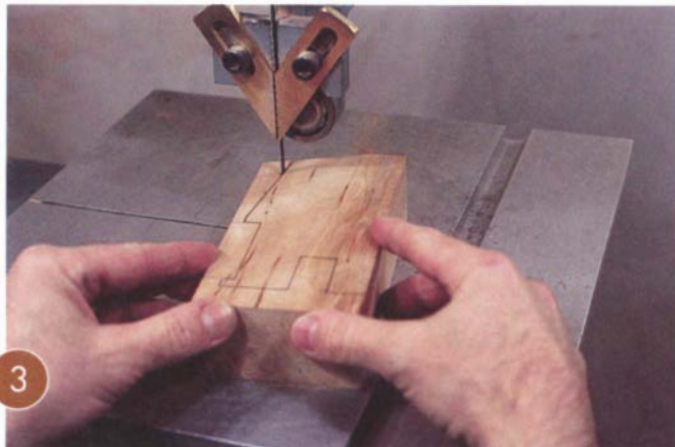
LOG LOADER PLAN



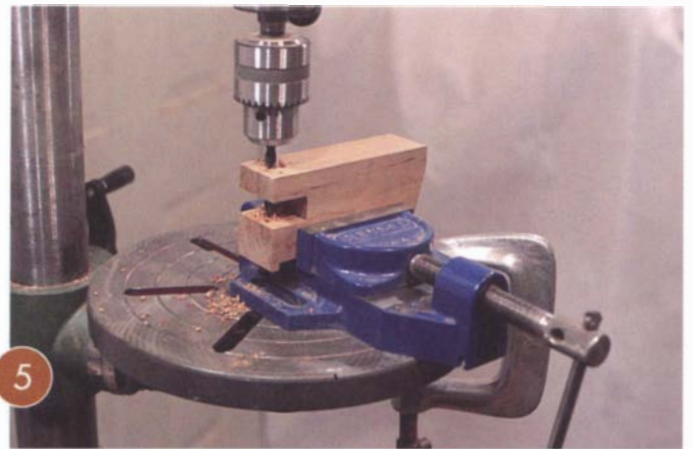
LOG LOADER

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Body	6 1/4 x 3 x 1 3/4	1	
Cab sides	2 1/2 x 2 13/16 x 1/2	2	Note grain direction
Roof	2 1/2 x 3 x 1/4	1	Note grain direction
Bumper	3 3/4 x 3/4 x 1/2	1	
Bumper dowels	1/4 dowel x 1 1/4 long	2	
Exhaust stack	1/4 dowel x 1 1/2 long	1	
Front frame	4 13/16 x 3 3/8 x 2 1/4	1	
Loader arms	6 1/4 x 1 1/4 x 1/2	2	Adjust 1 1/4 in. width to fit front frame
Grapple bars	2 5/8 x 1/2 x 1/2	2	
Forks	3 1/2 x 1 x 1/4	2	
Fork tie	4 1/2 x 1/2 x 1/2	1	
Grapple	5 1/8 x 2 5/8 x 1 1/2	1	If possible, cut about 7 in. long; trim later
Loader-arm dowels	1/4 dowel x 2 1/4 long	4	Cut 2 1/2 in. long; trim later
Wheels	3 1/4 dia. x 1 1/2 thick	4	Cut eight halves, 3 1/4 in. dia. x 3/4 in. thick
Fenders	1 9/16 x 1 3/8 x 3/4	2	
Axle housing	3/4 dowel x 2 1/4 long	1	
Axle pins	1 1/32 dia.	5	Factory made (one for articulation pin)

3. Cut the shape using the bandsaw. Cut the 3/4-in.-wide articulation notch a little oversize because you will be using small washers for friction and wear reduction. These washers are made of thin plastic (see the monster-truck instructions on p. 22) but need to be accounted for in the sizing of the articulation joint.



4. Sand as needed. I use a disk sander and belt sander, both with fine-grit abrasive, to do most of the sanding.



5. Drill the pivot hole, from the bottom. The standard axle-pin diameter is 1 1/32 in. You could also use 3/8-in. dowel, and drill for a snug fit on that dowel. Make sure the cab bottom is parallel to the drill-press table.

6. Drill the hole for the $\frac{3}{4}$ -in. axle housing (for use with a $\frac{3}{4}$ -in. dowel). You may want to try a hole in some scrap wood to ensure that the dowel is a reasonably snug fit in the hole.

7. Cut the axle housing from $\frac{3}{4}$ -in. dowel. Sand the ends, and bevel the corners slightly.

8. Finish-sand the sides of the cab.

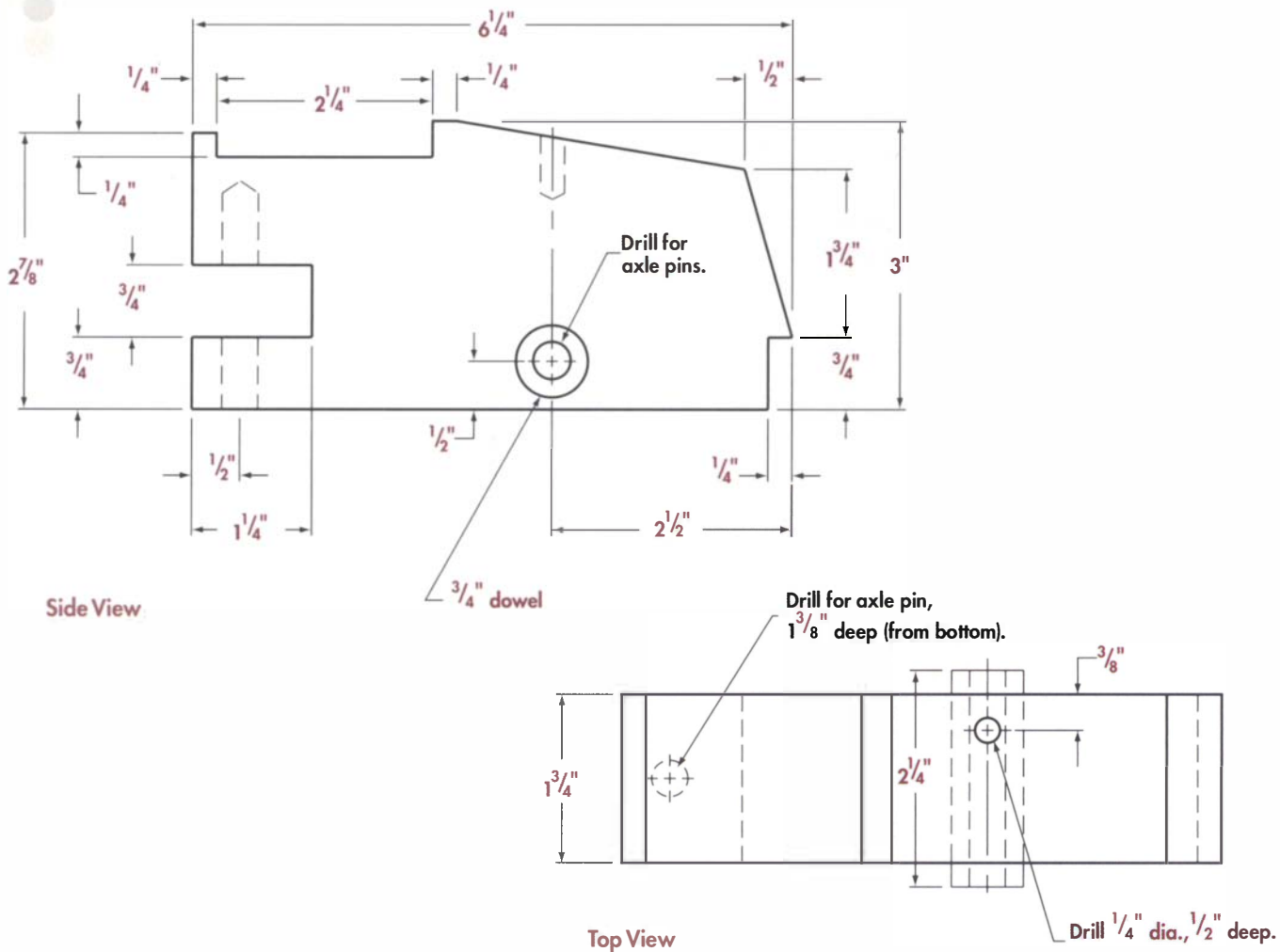
9. Glue the axle housing into the cab.



10. Drill the axle-pin hole. Again, this is usually $1\frac{1}{32}$ in. You want this hole to be exactly parallel to the bottom of the cab. This way the wheels will be the same distance off the ground. If the hole is slightly angled, one wheel will not touch the floor (unless it is on carpet). I usually drill from each side, after a careful layout—especially if I think irregular grain may make the drill wander a little.



BODY

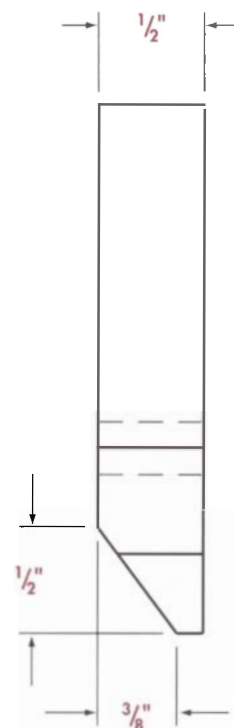
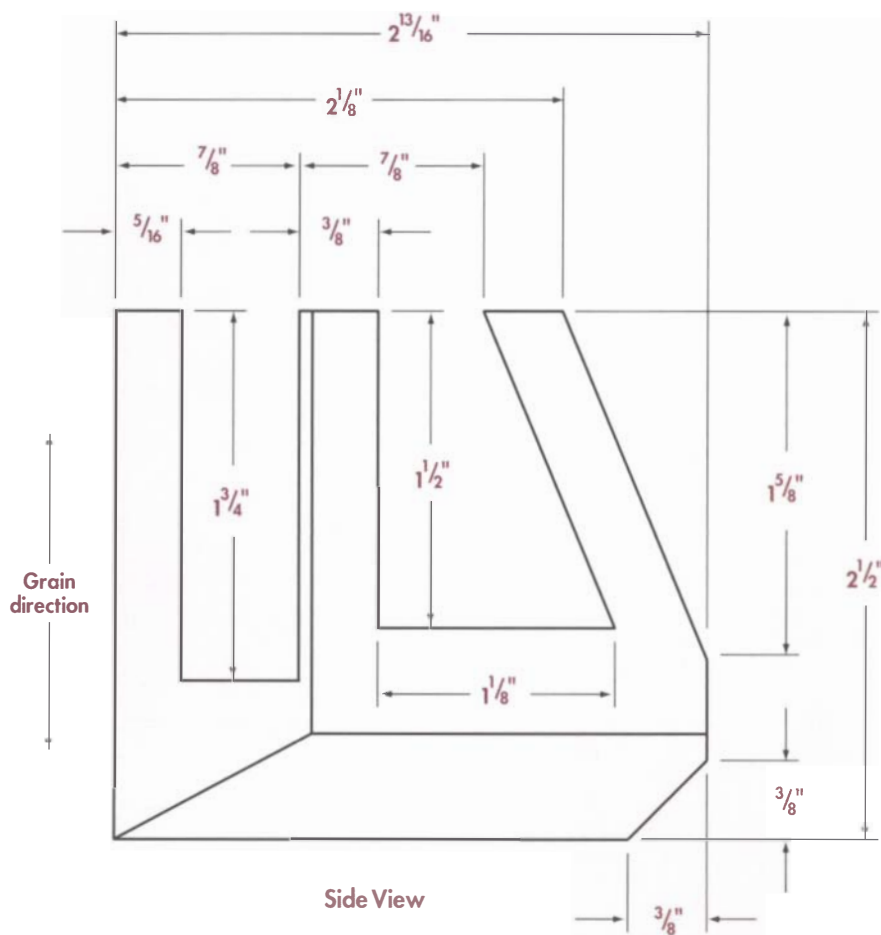
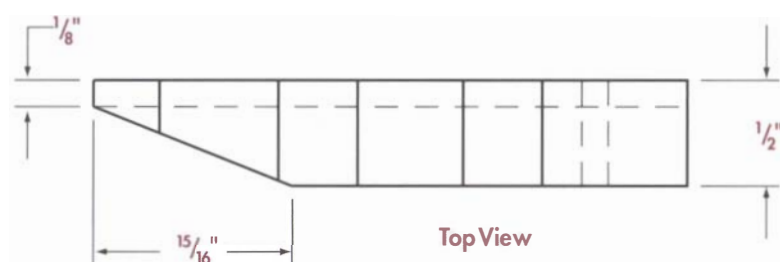


- 11.** Drill the exhaust-pipe hole. The exact location is not important nor is the depth.
- 12.** Cut the exhaust dowel to about $1\frac{3}{4}$ in. long. Sand a small bevel on the corners.
- 13.** Put a little glue in the hole with a toothpick, and tap the dowel in place.

Cab Sides

The cab sides are intended to widen the cab a little, as is the case on some full-size loaders. The roof is glued to the top of these sides and is a structural member to give the window posts additional strength.

CAB SIDES



1. Lay out the cab sides on $\frac{1}{2}$ -in.-thick wood, using the template provided. Note the grain direction, which is needed to provide strength for the window posts. The roof is glued to end grain but holds surprisingly well. You can always drill and install small reinforcing dowels if necessary.

Mark the corners with an awl, and join the “dots” on the wood using a pencil.



2. Cut out the parts using a bandsaw.

3. File and sand the window openings, putting a small bevel or rounded edge on the corners. Sand the bottoms flat, then sand or plane the angle on the front edge. This angle is mostly for appearance but also allows the loader to pivot to a little greater angle when turning. If you think it will be easier, you could shape this angle after gluing the cab sides to the cab.

4. Glue the sides to the cab.

5. File and sand as needed. On the front and back surfaces, where the grain is likely end grain, you may want to use a small file, such as a 6-in. smooth double-cut file. This creates a nice flat surface, it's quick, and sanding is generally not required after filing.

Bevel or round all sharp corners, except those where the bumper goes.

Don't worry about the $\frac{3}{4}$ -in.-wide notch where the articulation joint is. File and fit that after the front frame is made.

Roof

- 1.** Cut the roof to shape, having the grain run crossways to the loader.
- 2.** Sand all the surfaces, and round the corners a little.
- 3.** Sand the top of the cab sides flat, so the roof will sit on a flat surface.
- 4.** Glue the roof in place. You can place a weight on the roof to hold it down firmly if needed.

Bumper

Bumpers on loaders are large because they act as counterweights as well as bumpers. The bumper for this loader is just a length of square wood, glued to the back of the loader.

- 1.** Cut the bumper material to size.
- 2.** Sand as needed.
- 3.** Glue the bumper into place. Clamping is not usually needed.

4. When the glue is hard, drill for two $\frac{1}{4}$ -in. dowels, 1 in. apart and centered. The loader can stand on end in the drill press. You can use a parallel clamp and C-clamp to make sure it does not move.

5. Put glue in the holes, and tap in the two dowels. Sand flush when the glue is hard.



Front Frame

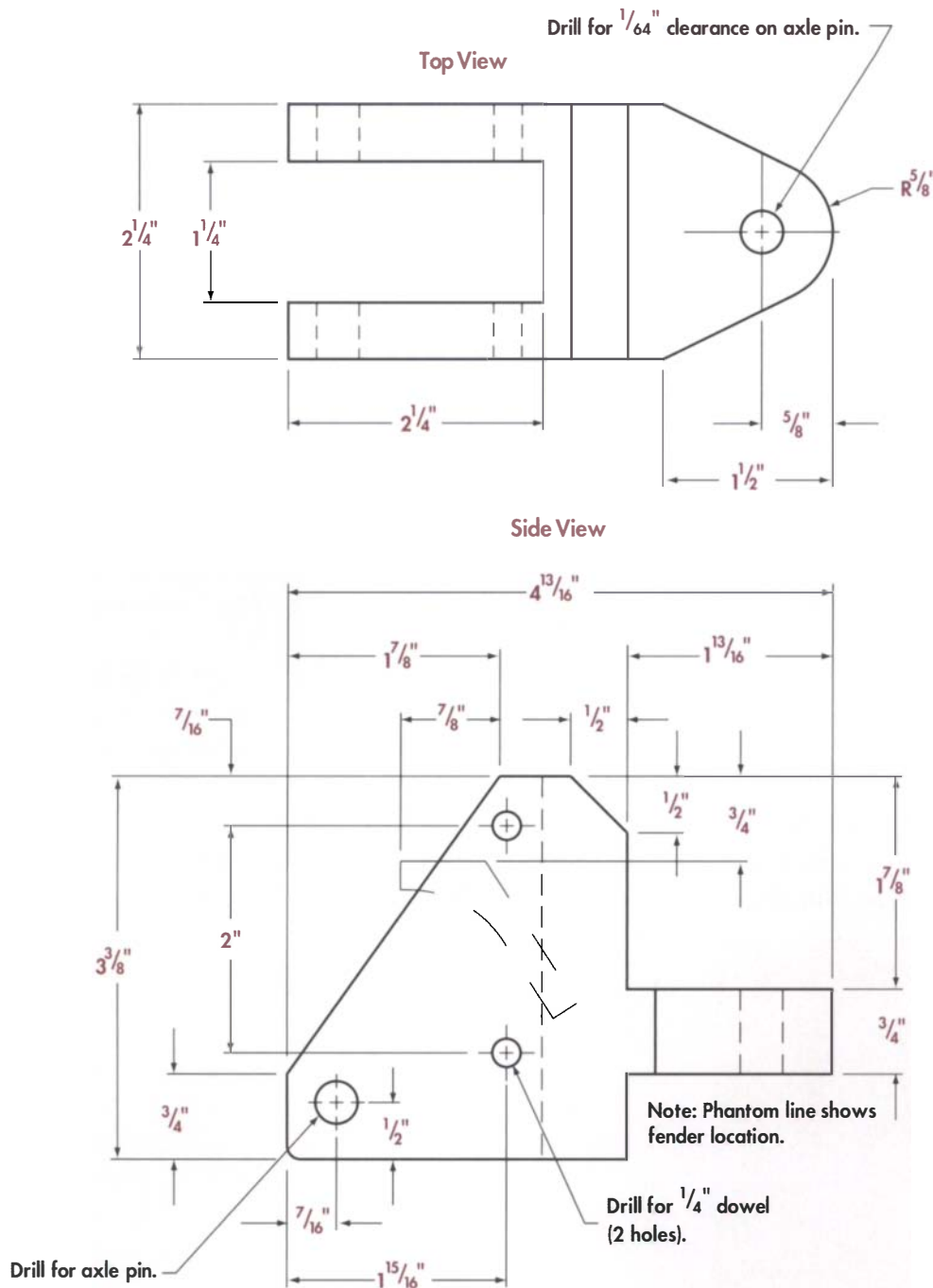
The loader arms attach to the front of the frame, and the axle and wheels attach to the bottom. The rear of the front frame attaches to the cab with a pivot pin.

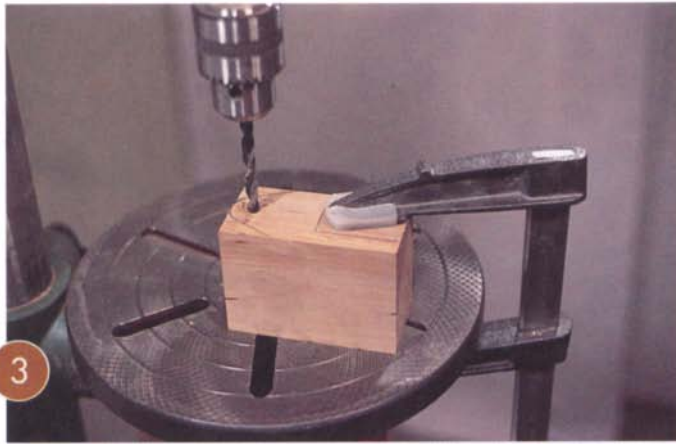
Cut the block to shape, drill all the holes, and then fit the articulation joint to the rear half of the loader. The other parts are attached as they are made.

1. Laminate the wood if needed, and square up the block to the outside dimensions ($4\frac{13}{16}$ in. by $3\frac{3}{8}$ in. by $2\frac{1}{4}$ in.).
2. Lay out the profile as shown on the top view, using the template or the drawing dimensions. Lay it out on the bottom of the block so you can mark for the pivot hole as well.

3. Drill the pivot hole about 2 in. deep. Use a $\frac{23}{64}$ -in. drill ($\frac{1}{64}$ in. over the size of the $\frac{1}{32}$ -in. pivot pin). A $\frac{3}{8}$ -in. dowel would work fine here as well, in which case a $\frac{25}{64}$ -in. hole would likely be best.

FRONT FRAME





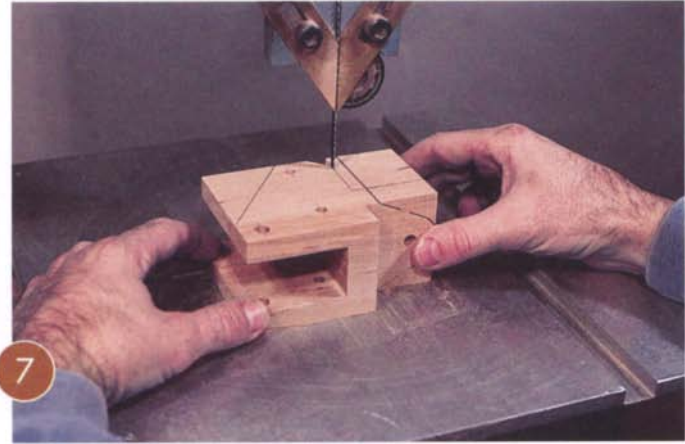
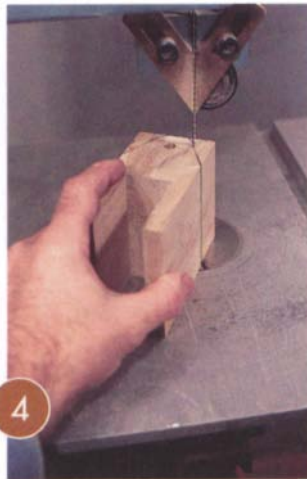
3. Cut most of the profile using the bandsaw. You can cut this out with the bottom up just as well as you can right side up; the end result is the same. Cut the notch for the loader arms carefully, since a good cut will save a fair bit of filing and shaping. Do not cut the corners completely. It is easier to cut the side profile, then finish cutting off the corners.

File the inside of the notch, taking care to keep the sides parallel. The exact dimension is less important because you can cut the loader arms to fit the notch.

4. Trace out the side profile using the template, or measure it out using the drawing dimensions. Lay out for the holes as well. Don't cut this profile until the holes are drilled.

5. Drill the three holes in the side. Two are for $\frac{1}{4}$ -in. dowel and are pivot holes for the loader arms. These holes should be sized to provide a snug sliding fit on $\frac{1}{4}$ -in. dowel. Dowel varies a little in size, so sometimes I use a $\frac{1}{4}$ -in. drill, sometimes an F drill, and sometimes a $\frac{17}{64}$ -in. drill, depending on the exact size of the $\frac{1}{4}$ -in. dowel.

The third hole is for the axle pins for the front wheels. Drill this hole $\frac{11}{32}$ in. to match standard axle pins.



7. Cut to shape using a bandsaw. The $\frac{3}{4}$ -in.-thick section (that fits into the steering pivot notch) should be left a little oversize, and later fitted carefully to the rear section of the loader. Allow for the washers, as previously mentioned (see the monster-truck instructions on p. 22). These washers make the steering a little smoother and more durable, especially if the loader gets a lot of use. Cut two washers for the steering and four more for the wheels.

Saw off the corners.

8. Sand as needed. Sand or file all the corners to ensure no sharp edges remain.

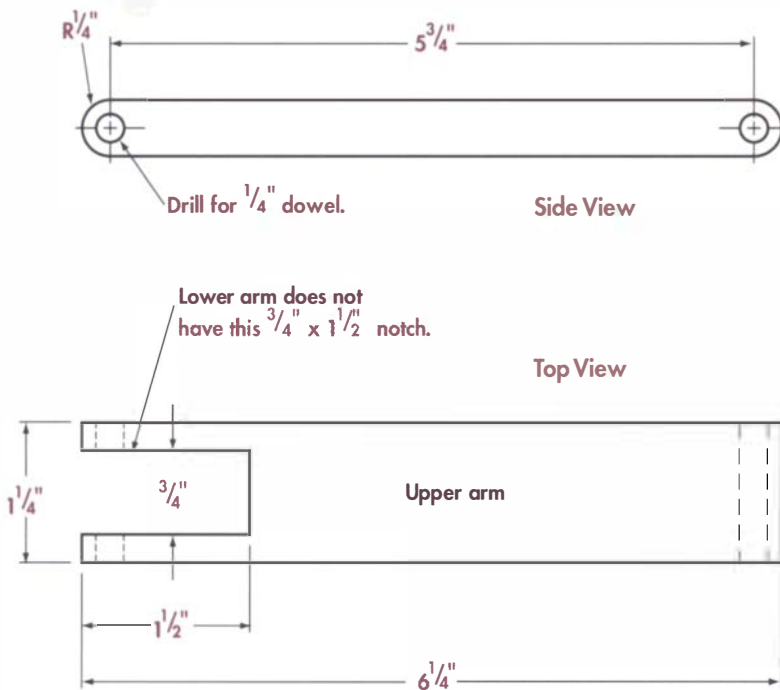
9. Fit the articulation steering joint. The $\frac{3}{4}$ -in. "tenon" should fit into the $\frac{3}{4}$ -in. articulation notch in the cab. File the tenon and the notch until you have a good sliding fit, allowing for the washers as well.

If you have too much to file, take a little off the tenon using the bandsaw. If it gets a little loose, you may have to add another washer. Ideally, the parts pivot freely with virtually no extra wobble.

Do not glue the parts together yet.

Make sure the loader articulates. If it binds on the cab, you may have to bandsaw a little off the offending areas of the front frame, as needed.

LOADER ARMS

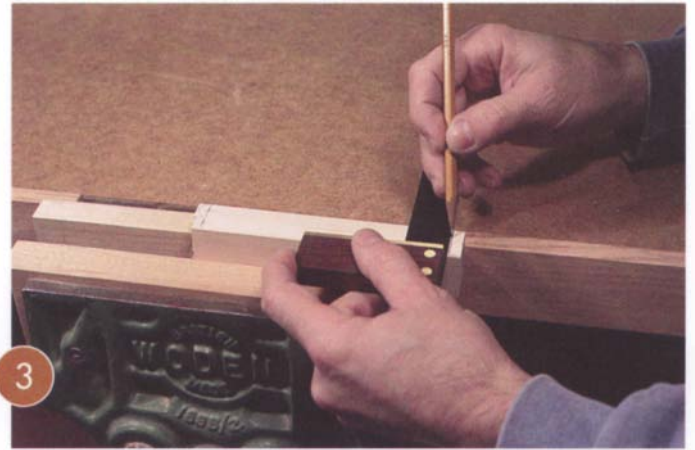


Loader Arms

One end of each loader arm pivots at the loader frame; the other end pivots at the fork assembly. The distance between these two pivot holes should be the same on each arm so that the mechanism does not bind at the top of its travel.

There are two arms, identical except that the upper arm has a $\frac{3}{4}$ -in. by $1\frac{1}{2}$ -in. notch (for the grapple) and the lower arm does not have this notch.

1. Measure the exact width needed for the loader arm to fit the front-frame slot (about $1\frac{1}{4}$ in.).
2. Cut two pieces of $\frac{1}{2}$ -in.-thick wood to size. The exact length is not critical, but the two should be the same.
3. Lay out for the hole at each end. Again, the distance between the holes may vary a little from the drawing, but the holes should be spaced exactly the same on both arms. Lay them out together.



4. Drill the holes. Use a drill that provides a snug sliding fit on $\frac{1}{4}$ -in. dowel.



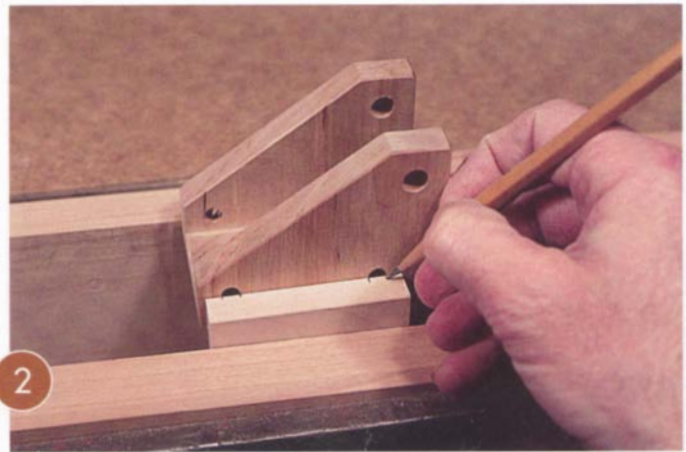
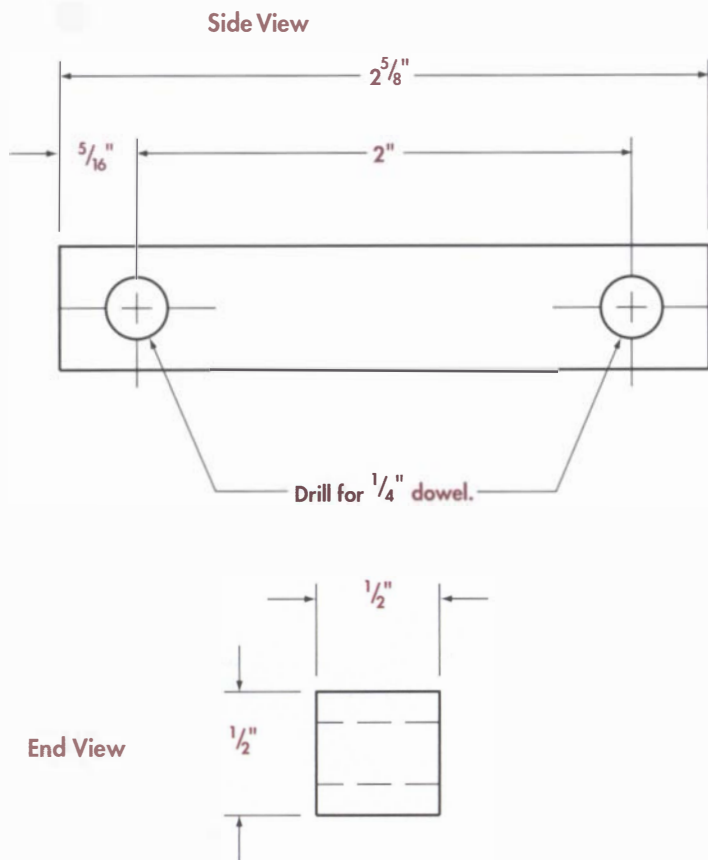
5. Round the ends. The arms will bind if the radius is not accurate.
6. Cut the $\frac{3}{4}$ -in. by $1\frac{1}{2}$ -in. notch in *one* of the arms. Fit the grapple to this notch later.
7. Sand as needed, and set the arms aside for the moment.

Grapple Bars

These small bars hold the fork assembly together. The grapple and the upper loader arm pivot on the top holes in the grapple bars, and the forks and the lower loader arm pivot on the bottom holes. The grapple bars are glued to the fork tie later.

1. Cut the $\frac{1}{2}$ -in. material, wide enough for both square bars. Drill first, then saw the wood into two pieces. This way the holes will be spaced exactly the same in each bar.

GRAPPLE BARS



2. Lay out the holes to match the holes in the front frame. Get this spacing as close as possible so the loader arms do not bind.

3. Drill the holes. The $\frac{1}{4}$ -in. dowel will be glued into them later.

4. Cut the part into two bars, and sand as needed.

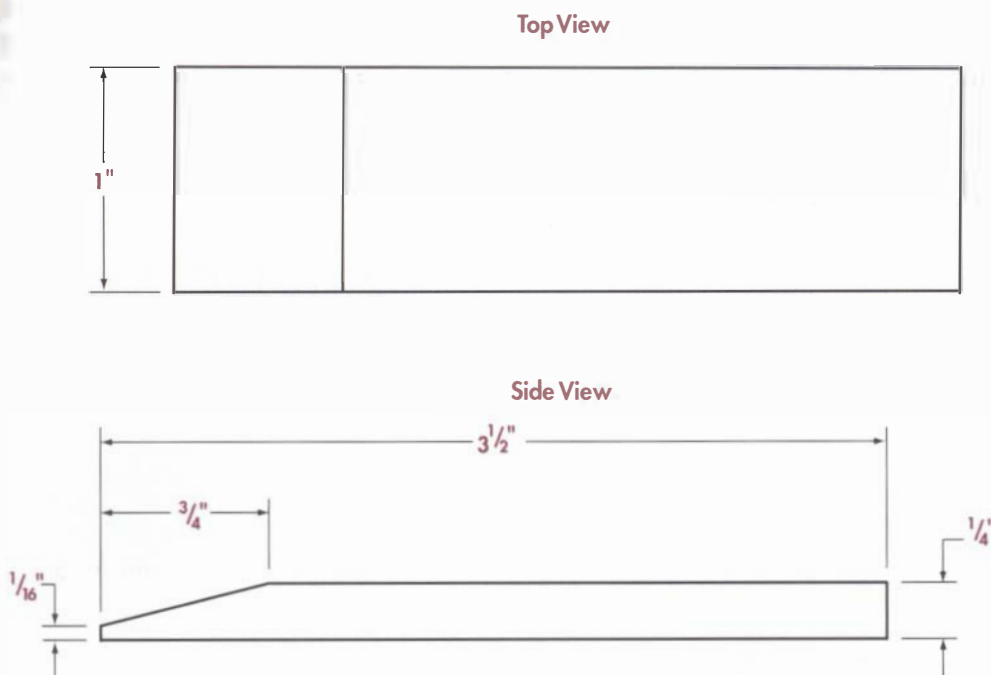
Forks and Fork Tie

The forks are very simple pieces. They are glued to the horizontal fork tie, one on each end.

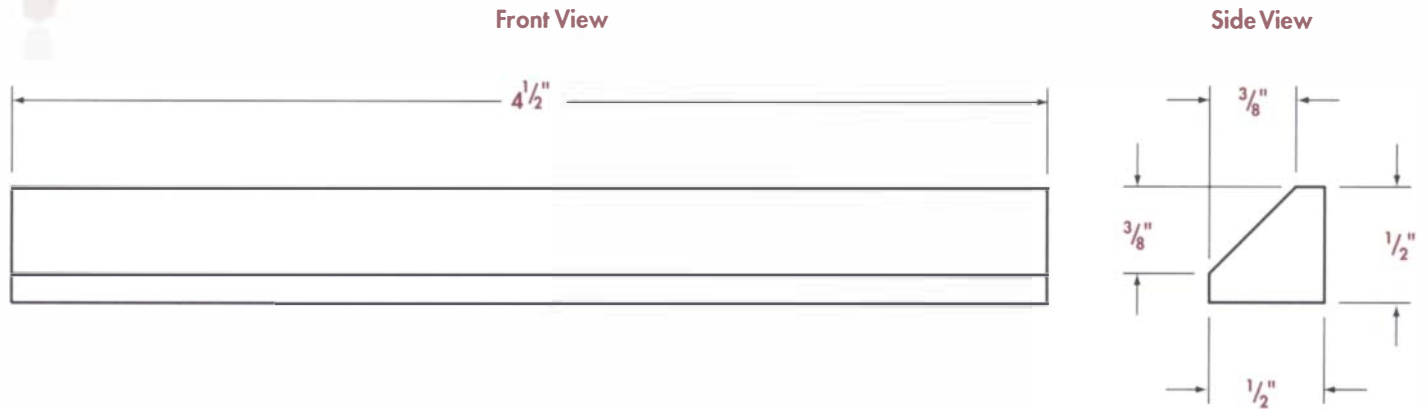
1. Cut forks from $\frac{1}{4}$ -in. stock.

2. Sand or plane the taper on the end.

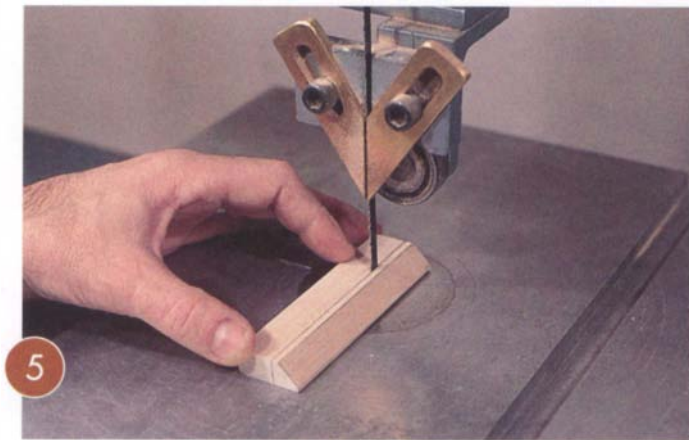
FORKS



FORK TIE



- 3.** Cut the fork tie from $\frac{1}{2}$ -in. stock, leaving it a bit wide. It is easier to plane the angle this way.
- 4.** Plane the angle on the fork tie. The exact angle is not important here; it is just a bevel that makes the part look better and allows a little more room for the logs. The bevel can be smaller than indicated, if you want.
- 5.** Cut to the $\frac{1}{2}$ -in. by $\frac{1}{2}$ -in. size.

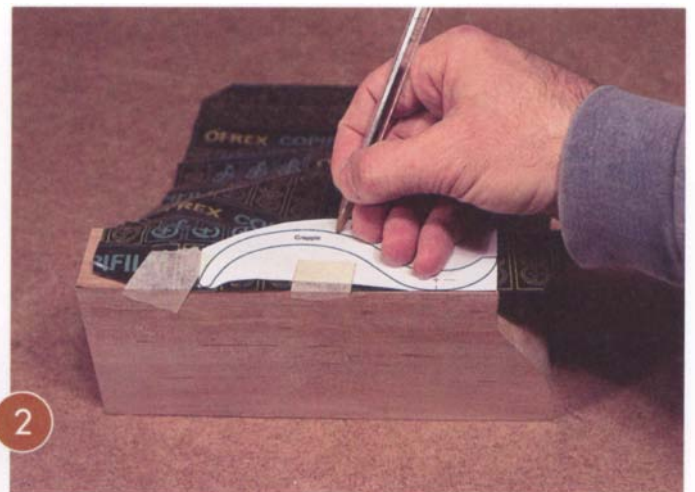


- 6.** Glue the forks in place. Locate them at the ends of the tie, and check that they are square to the tie.

Grapple

The grapple is the clamp that pins the logs in place. Make it from a piece of $\frac{1}{2}$ -in.-thick hardwood, preferably maple or equally strong wood.

- 1.** Cut a block of hardwood $2\frac{5}{8}$ in. by $1\frac{1}{2}$ in. by $5\frac{1}{8}$ in. or a little longer. A couple extra inches makes it easier to saw the contour.



- 2.** Lay out the side profile of the grapple, using the template. Use an awl to mark the center of the hole.

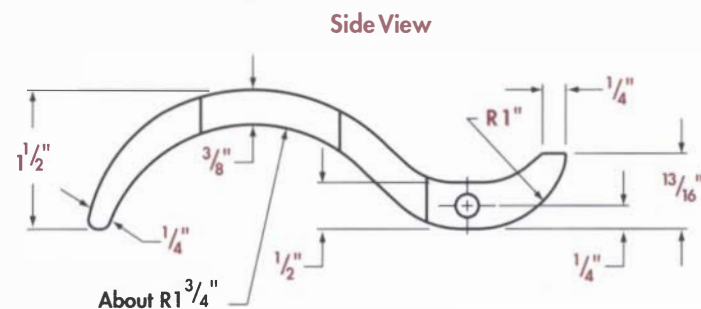
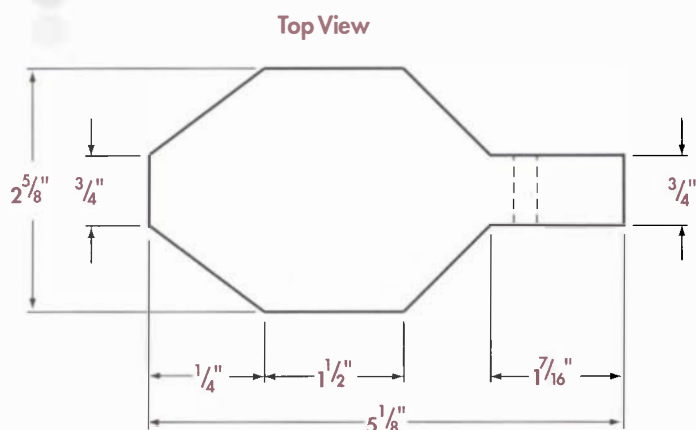
- 3.** Drill the hole to fit a $\frac{1}{4}$ -in. dowel. The grapple will pivot on the dowel that goes in this hole.

- 4.** Cut the side profile using a bandsaw.

- 5.** Sand with a disk sander and drum sander, or by hand.



GRAPPLE



6. Lay out the top contour, and saw it to shape using the bandsaw. The layout of the angle is approximate only because of all the curves. The $\frac{3}{4}$ -in. width is to fit the notch in the upper loader arm.

7. Fit the $\frac{3}{4}$ -in.-wide section to the notch in the upper loader arm. The grapple should move freely in the slot, with a $\frac{1}{4}$ -in. dowel in place pinning the grapple to the loader arm (don't apply any glue yet).

8. Round off all the sharp edges of the grapple to make it a little more comfortable for the operator to use.

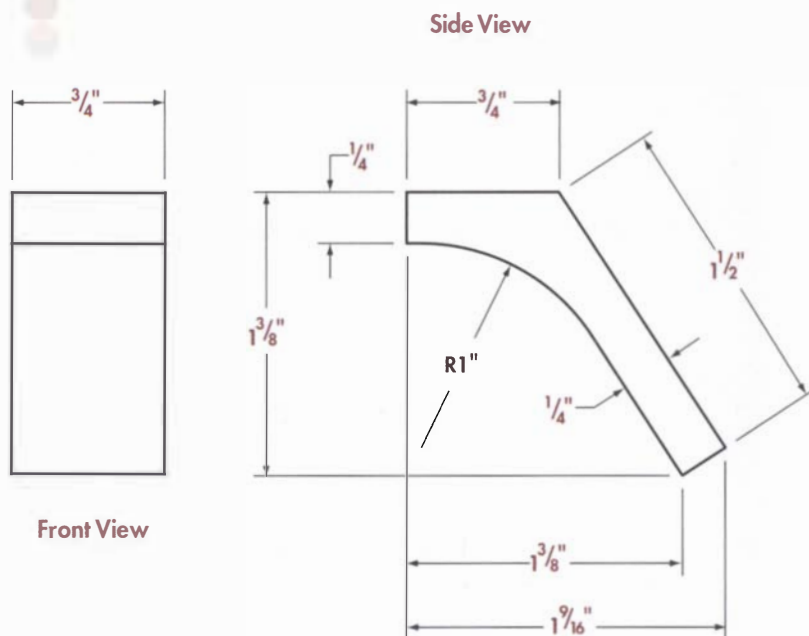
Wheels

These wheels are the same as the monster-truck wheels, except that you may want to make these narrower, using $\frac{1}{2}$ -in.-wide to $\frac{3}{4}$ -in.-wide material for the wheel halves. Finished wheel width will then be between 1 in. and $1\frac{1}{2}$ in.. (The wheels shown ended up about $1\frac{3}{8}$ in. wide).

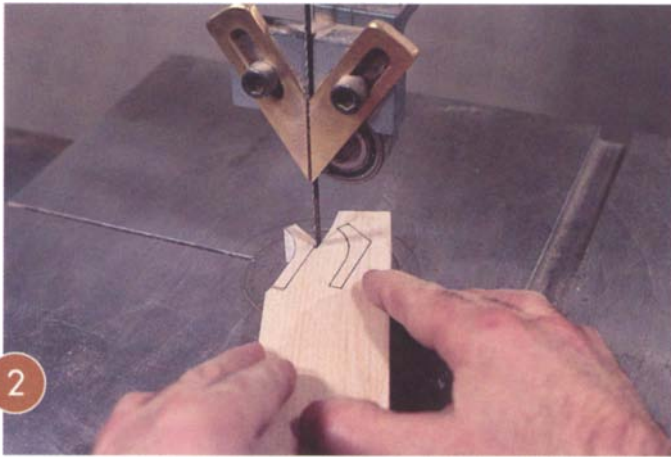
Fenders

These small fenders are attached just behind the front wheels.

FENDERS



1. Lay out the fenders using the template.
2. Saw to shape, and sand. Don't glue on the fenders yet or installing the loader arms will be awkward.



Assembly

1. First, assemble the grapple bars, loader arms, and grapple.

Cut the two $\frac{1}{4}$ -in. dowels needed, leaving them at least $\frac{1}{8}$ in. too long ($2\frac{3}{8}$ in. to $2\frac{1}{2}$ in. long). If they are overly tight, sand them down a little using the drill-press chuck to spin the dowel as you sand (see the top photo on p. 54).

You do not want glue in either the grapple or the loader arms, so put a little glue in the holes on the grapple bars only. Then press those bars on from each side.

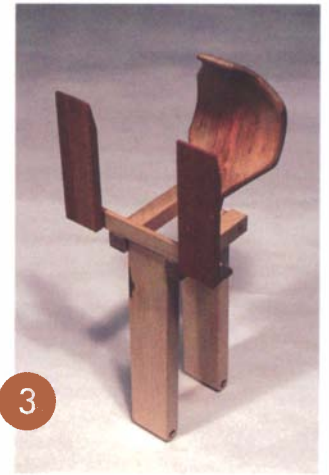
2. When the glue is hard, sand off the excess $\frac{1}{4}$ -in. dowel.



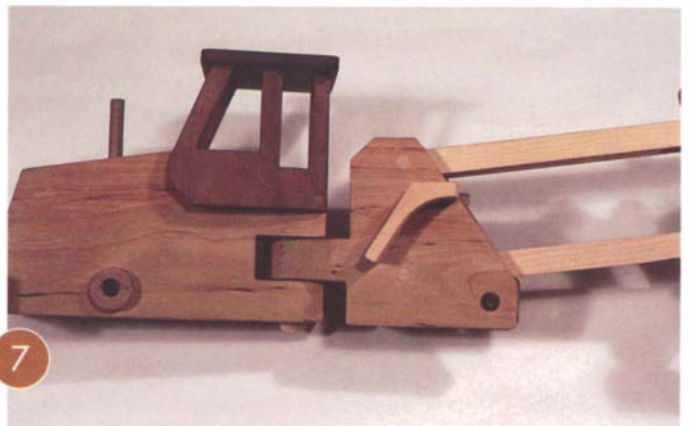
3. Glue the fork assembly to the grapple bars. There is no good way to clamp this, so be a bit generous with the glue, and press the parts into place.

4. Assemble the loader arms to the front frame. Cut the two dowels needed, leaving them at least $\frac{1}{8}$ in. too long.

Put glue in the $\frac{1}{4}$ -in. holes on one side of the front frame. Install each dowel from the other side (the "no glue" side). When there is about $\frac{1}{4}$ in. to go, put some glue on the part of each dowel that still protrudes. Tap both dowels in the rest of the way. By assembling it this way, there is glue at each end but not in the arms.



5. When the glue is hard, sand off the excess dowel.
6. Finish-sand.
7. Locate the fenders (hold the wheels in place for a visual check). Glue them in place.



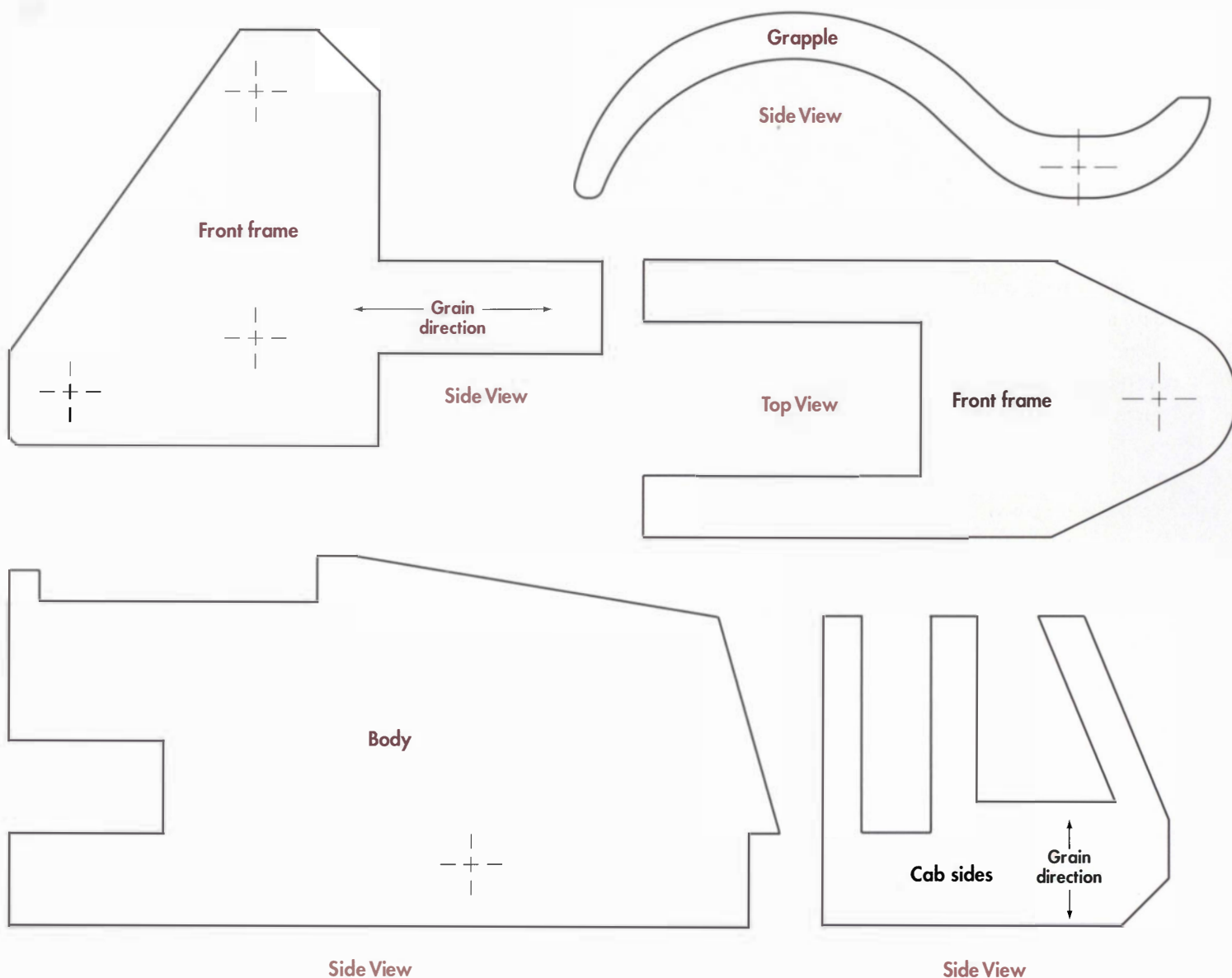
8. Put some paste wax in the steering pivot hole in the front frame, using a Q-tip.
9. Assemble the two main parts by gluing the articulation pin in place. Carefully put glue in only the upper part of the hole. Don't forget to put the plastic washers in place while assembling.

10. If you want to finish the wheels separately, do the finishing now. If you are waiting till the assembly is complete, attach the wheels now (see the monster-truck instructions on installing wheels on p. 22).

Finish

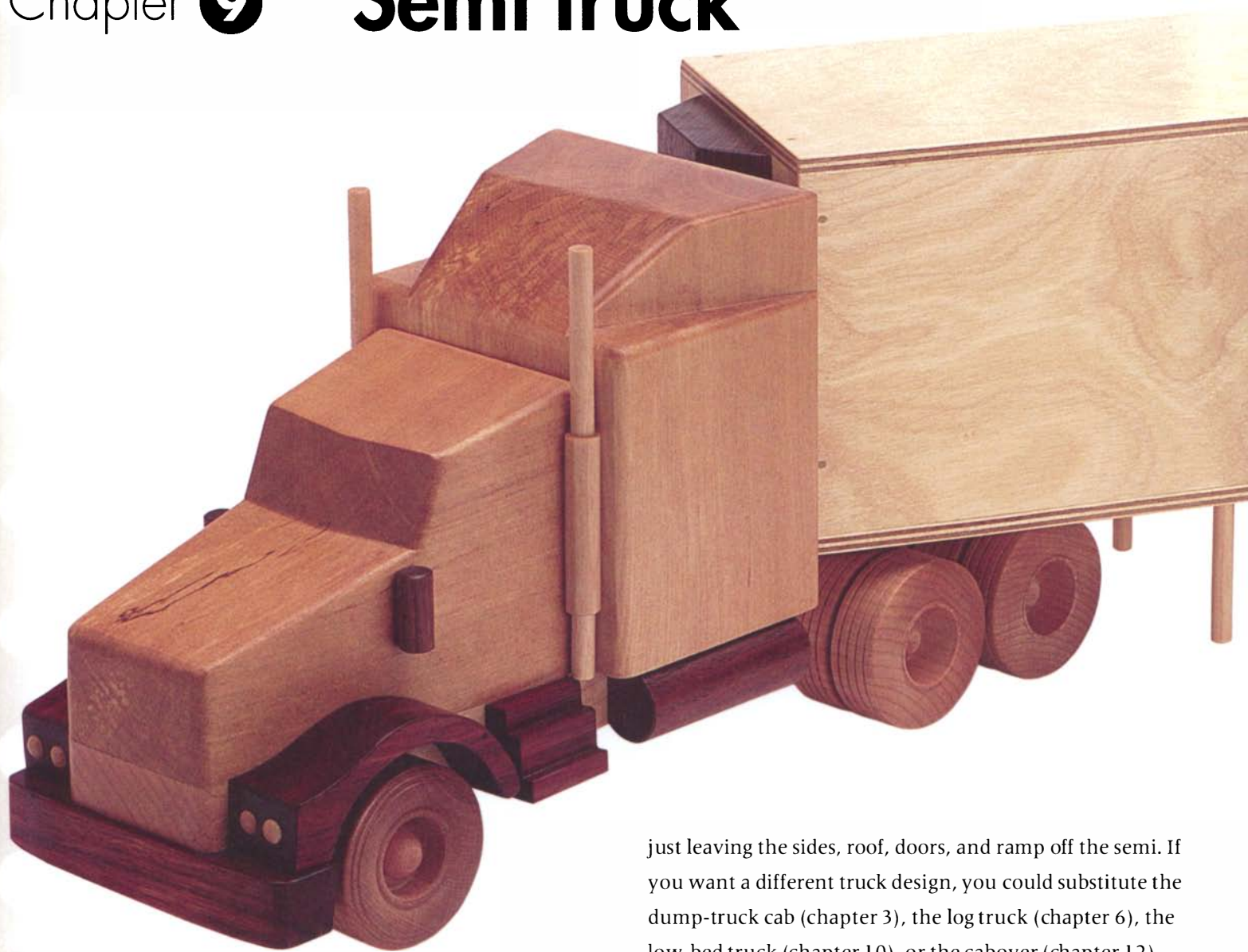
As desired. You may want to read the appendix on finishing on p. 172.

TEMPLATES



For full size template enlarge by 128%.

Chapter 9 Semi Truck



You can't spend much time on the highway

without seeing a semi. The word semi has come to refer not only to a type of trailer but has become a sort of generic name for a highway truck.

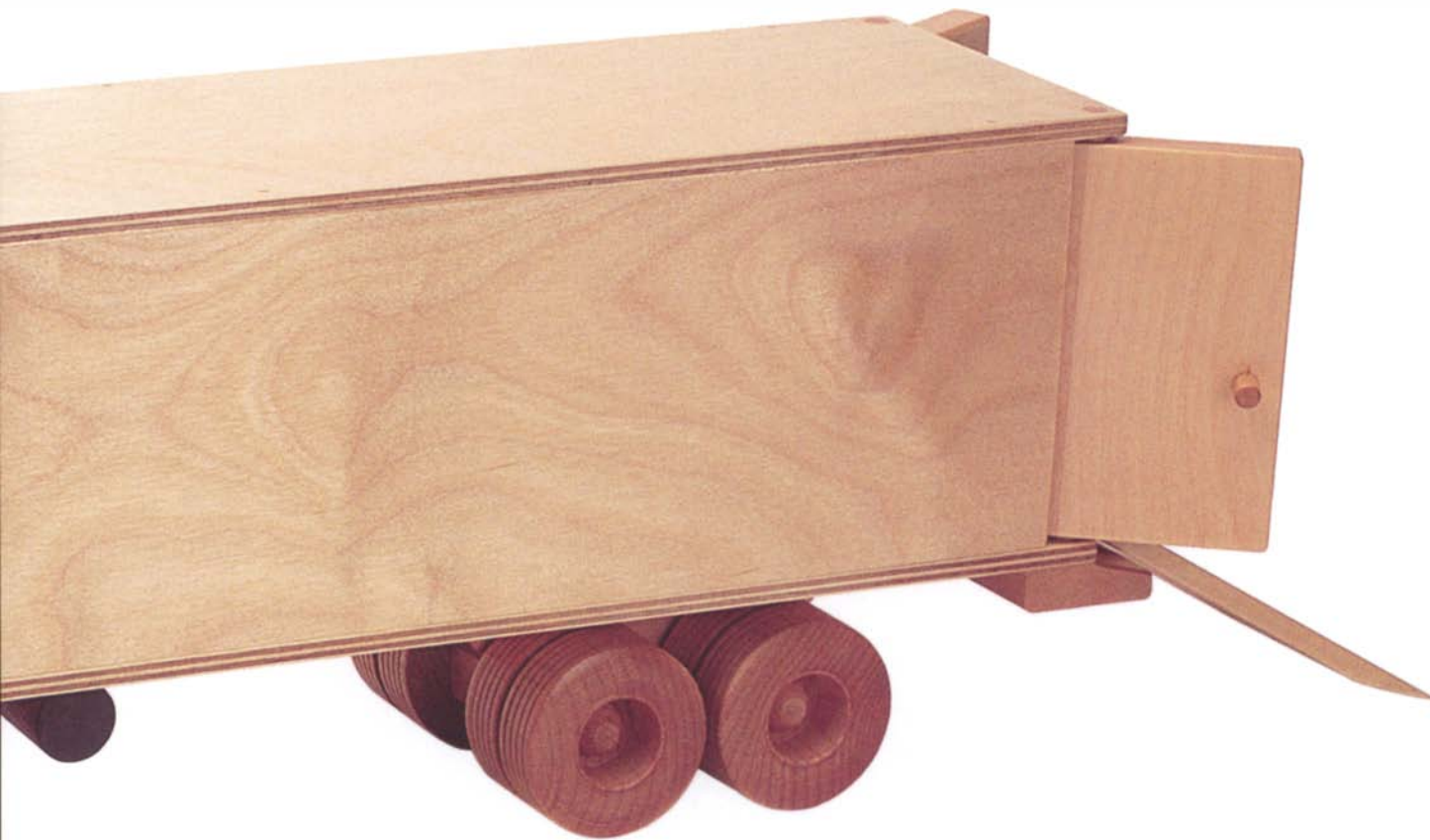
The semitrailer has doors that open at the back and a ramp to assist loading and unloading. Children can haul a great variety of things in this trailer, from race cars to pallets of wooden barrels to stuffed animals.

As an option, you could easily make a flat-deck trailer instead of, or in addition to, the semitrailer. I made one by

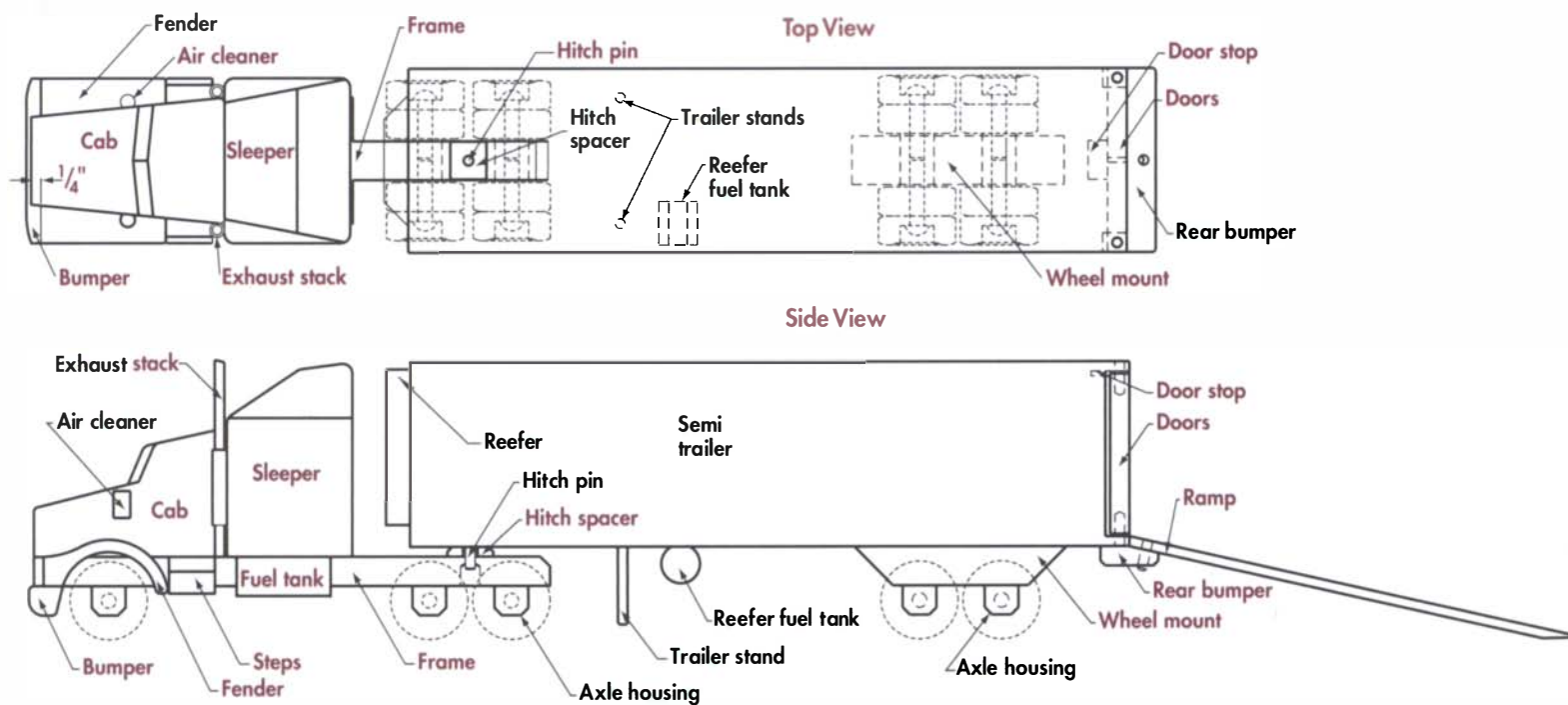
just leaving the sides, roof, doors, and ramp off the semi. If you want a different truck design, you could substitute the dump-truck cab (chapter 3), the log truck (chapter 6), the low-bed truck (chapter 10), or the cabover (chapter 12).

Some of the parts for this truck are similar to those of the dump truck in chapter 3: cab, fenders, air cleaners, steps, bumper, headlights, axle housings, and exhaust stacks. For these, the drawings of the semi parts are provided, but you will be referred to chapter 3 for instructions and illustrations.

Essentially, the truck consists of a $\frac{3}{4}$ -in. board as a frame onto which a shaped block is attached as a cab and wheels are put on below. The fenders, steps, air cleaners, and other small parts are added around the cab. The trailer is a rectangular hollow box on wheels.



SEMI TRUCK PLAN



SEMI TRUCK

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Truck frame	13 $\frac{3}{4}$ x 3 $\frac{1}{4}$ x $\frac{3}{4}$	1	
Cab	5 x 3 $\frac{1}{4}$ x 3 $\frac{3}{8}$	1	
Fenders	3 $\frac{3}{8}$ x 1 $\frac{3}{4}$ x 1	2	Mirror images
Headlights	$\frac{1}{4}$ dowel x $\frac{3}{4}$ long	4	Round end before cutting to length
Air cleaners	$\frac{3}{8}$ dowel x $\frac{7}{8}$ long	2	
Steps	1 $\frac{1}{8}$ x 1 x $\frac{3}{8}$	2	Mirror images
Bumper	4 $\frac{1}{2}$ x $\frac{7}{8}$ x $\frac{3}{4}$	1	
Hitch spacer	$\frac{7}{8}$ x $\frac{7}{8}$ x $\frac{1}{4}$	1	
Truck front axle housing	2 $\frac{7}{8}$ x $\frac{7}{8}$ x $\frac{3}{4}$	1	Make enough for all five housings
Truck rear axle housings	1 $\frac{1}{8}$ x $\frac{7}{8}$ x $\frac{3}{4}$	2	Make enough for all five housings
Trailer axle housings	1 $\frac{3}{8}$ x $\frac{7}{8}$ x $\frac{3}{4}$	2	Make enough for all five housings
Sleeper	4 $\frac{3}{4}$ x 4 $\frac{1}{4}$ x 3 $\frac{1}{4}$	1	
Exhaust pipes (upper)	$\frac{1}{4}$ dowel x 2 $\frac{3}{4}$ long	2	
Exhaust pipes (lower)	$\frac{1}{4}$ dowel x 1 $\frac{1}{2}$ long	2	
Muffler	$\frac{3}{8}$ dowel x 2 long	2	
Truck fuel tank	$\frac{7}{8}$ dowel x 2 $\frac{1}{2}$ long	2	
Reefer fuel tank	$\frac{7}{8}$ dowel x 1 $\frac{1}{8}$ long	1	
Trailer sides	18 x 4 $\frac{1}{4}$ x $\frac{1}{2}$ (or $\frac{3}{8}$)	2	Solid wood or Baltic plywood
Trailer top and bottom	18 $\frac{3}{8}$ x 4 $\frac{3}{4}$ x $\frac{1}{4}$	2	Solid wood or Baltic plywood
Trailer front	3 $\frac{3}{4}$ x 4 $\frac{3}{4}$ x $\frac{1}{4}$	2	Solid wood or Baltic plywood
Trailer doors	4 $\frac{1}{8}$ x 2 $\frac{5}{8}$ x $\frac{1}{2}$	2	Cut 4 $\frac{1}{4}$ in. x 4 $\frac{3}{4}$ in. x $\frac{1}{2}$ in.; trim & split later
Trailer door handle	$\frac{1}{4}$ dowel x 1 long	1	Cut 1 $\frac{1}{8}$ in.; trim later
Trailer door-hinge dowels	$\frac{1}{4}$ dowel x $\frac{3}{4}$ long	4	Cut about 1 in. long; trim later
Trailer doorstop	1 x $\frac{1}{2}$ x $\frac{1}{8}$	1	
Reefer	4 x 2 $\frac{3}{4}$ x $\frac{3}{4}$	1	
Trailer hitch pin	$\frac{1}{4}$ dowel x $\frac{3}{4}$ long	1	$\frac{7}{8}$ in. long for flat deck
Trailer stands	$\frac{1}{4}$ dowel x 2 $\frac{1}{4}$ long	1	2 $\frac{3}{8}$ in. long for flat deck
Trailer wheel mount	5 $\frac{1}{2}$ x 1 $\frac{1}{4}$ x 1	1	
Trailer ramp	11 $\frac{3}{4}$ x 3 $\frac{1}{2}$ x $\frac{1}{4}$	1	
Trailer ramp pin	$\frac{1}{4}$ dowel x $\frac{3}{4}$ long	1	Cut about $\frac{7}{8}$ in. long; trim later
Trailer bumper	4 $\frac{3}{4}$ x 1 $\frac{1}{2}$ x $\frac{1}{2}$	1	
Axle pins	1 $\frac{1}{2}$ dia.	12	
Wheels—single	2 dia. (factory made)	2	
Wheels—dual	2 dia. (factory made)	8	

Frame

The frame of this toy truck has the same basic function as the frame on a full-size truck. It is the backbone to which the cab, the axles, and the semitrailer are attached.

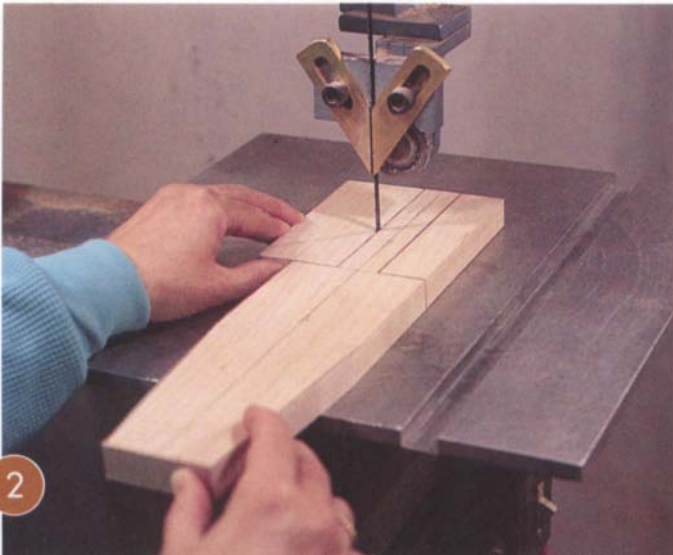
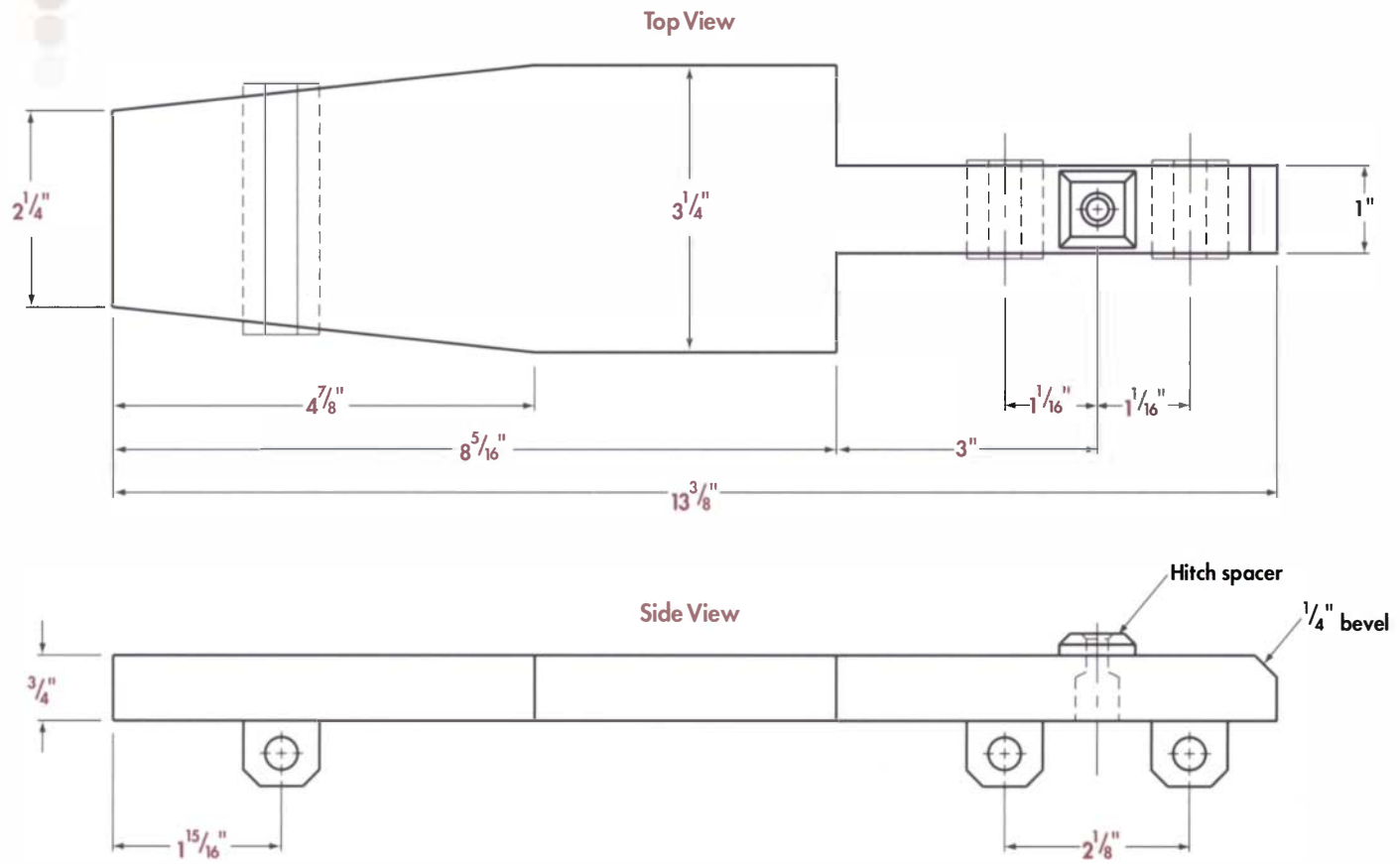
1. Lay out this frame on $\frac{3}{4}$ -in.-thick stock. Working from a centerline is probably the best system.
2. Bandsaw to shape.

3. Sand all surfaces except the long angled ones. It is better to sand them later, together with the cab, after the cab is glued on.

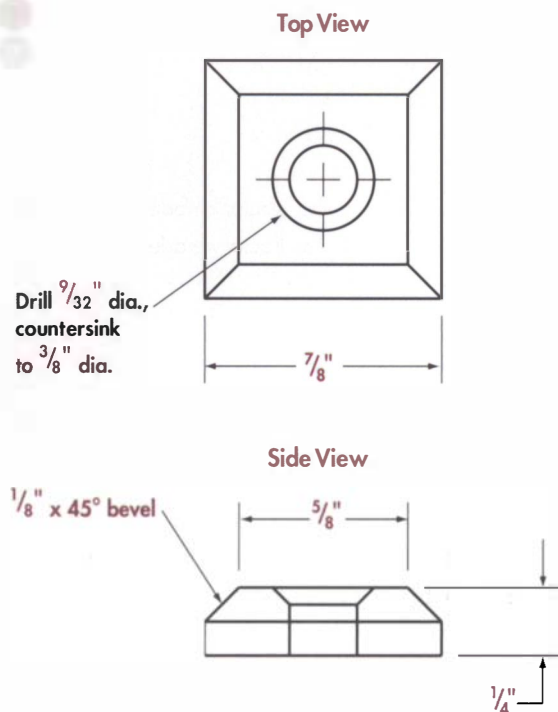
4. Make the hitch spacer by cutting a small square of $\frac{1}{4}$ -in.-thick material and beveling the edges. Do not drill yet.

5. Glue the hitch spacer in place above the indicated center on the frame.

FRAME



HITCH SPACER



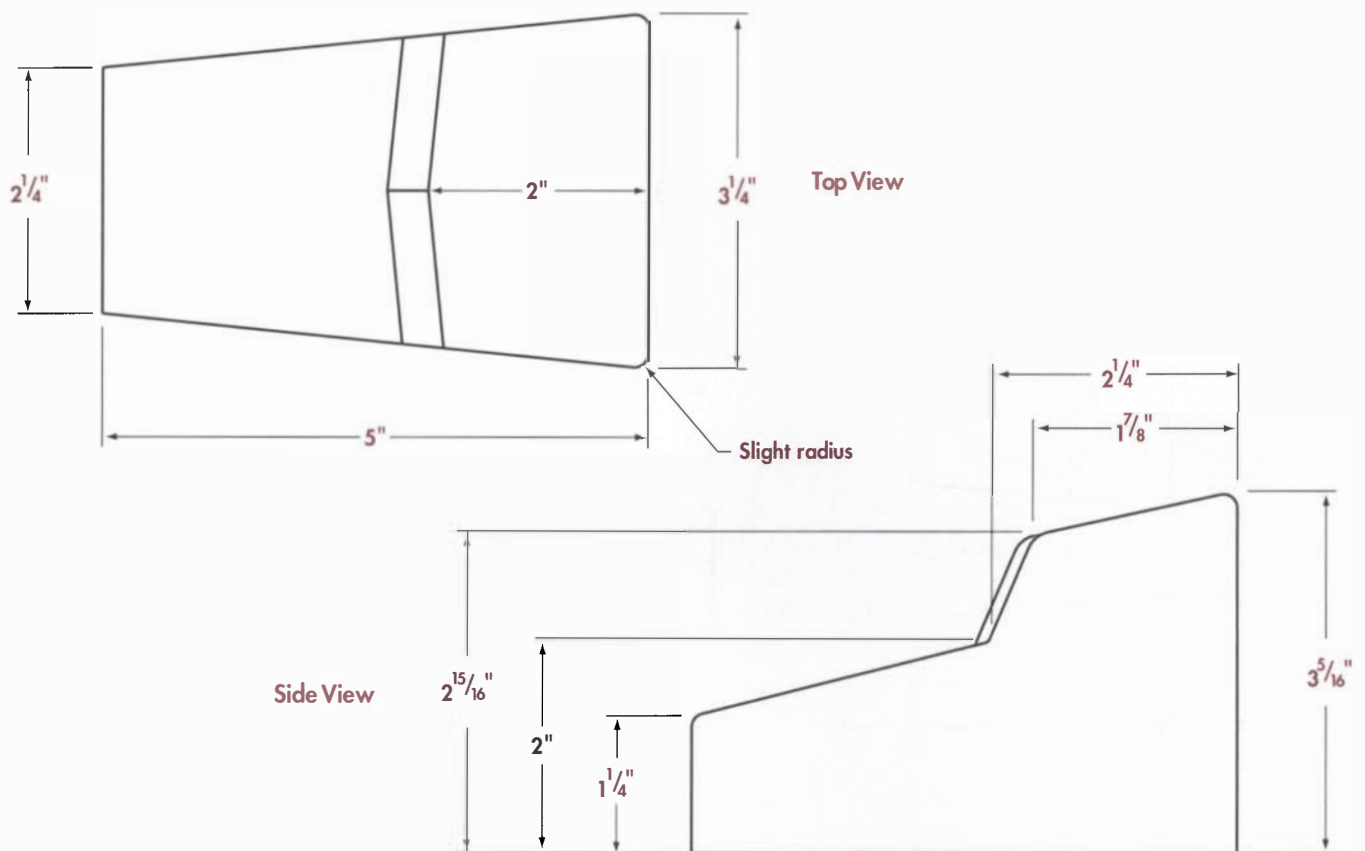
- 6.** Drill the $\frac{1}{32}$ -in. hitch-pin hole all the way through.
- 7.** Countersink the top a little, to about $\frac{3}{8}$ in. dia.
- 8.** Enlarge the hitch hole by drilling from the bottom about $\frac{1}{16}$ in. deep with a $\frac{3}{8}$ -in. drill. This leaves the top $\frac{3}{16}$ in. of the original $\frac{1}{32}$ -in. hole and provides clearance to allow the hitch pin to pivot a little, as the truck and trailer drive over dips and rises.



Cab

This cab is very similar to the dump-truck cab, although the dimensions vary a bit. Use the same process as detailed in chapter 3.

CAB



Fenders

Follow the steps shown in chapter 3. Note that these fenders have a different profile.

Finish-sand the fender fronts, and place the fenders about $\frac{1}{4}$ in. back from the front of the grill (see the plan drawing).

Headlights

Follow the sizes shown on the drawing here, but for instructions refer to chapter 3, p. 49.

Air Cleaners

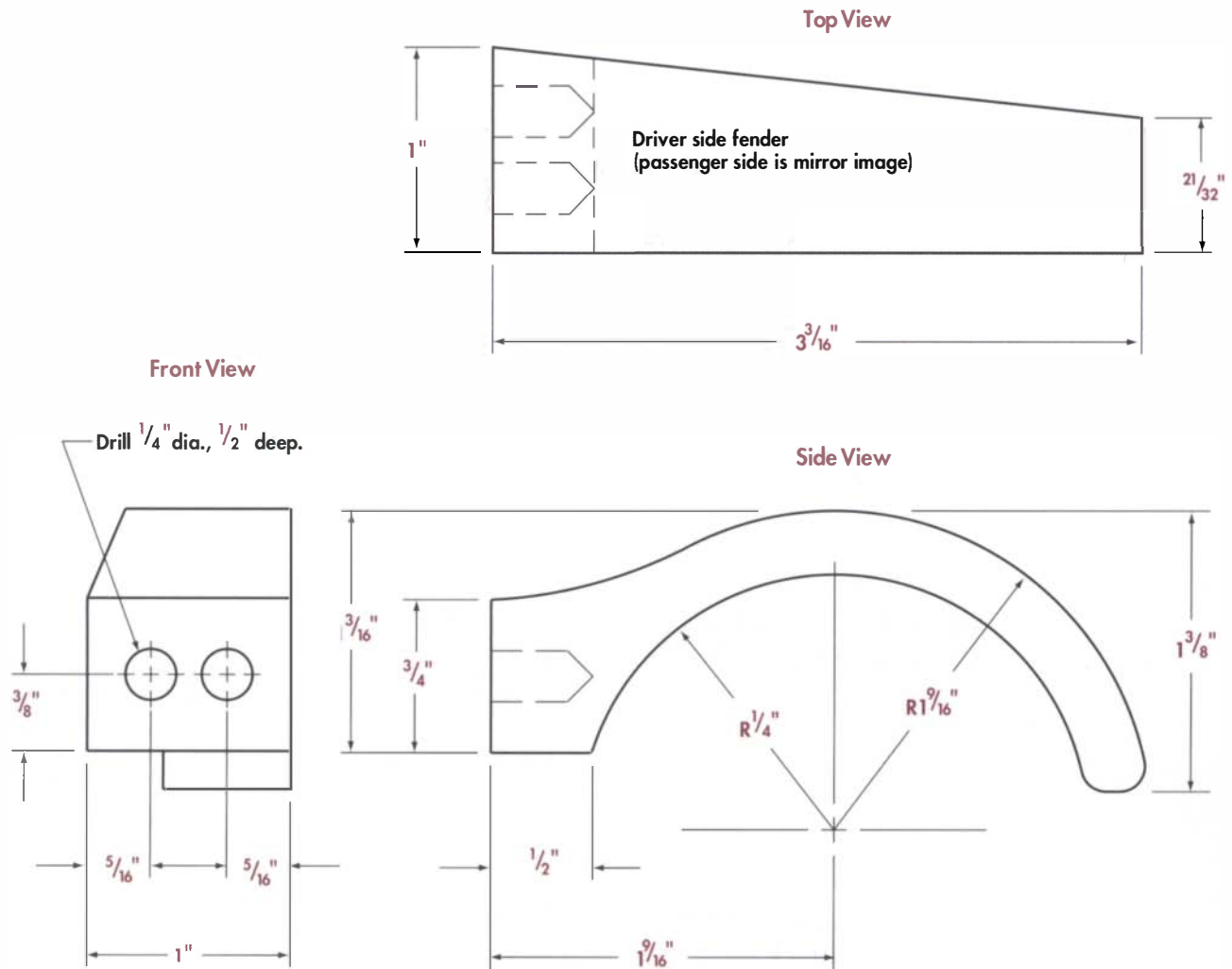
Use the drawing and the instructions in chapter 3.

Steps

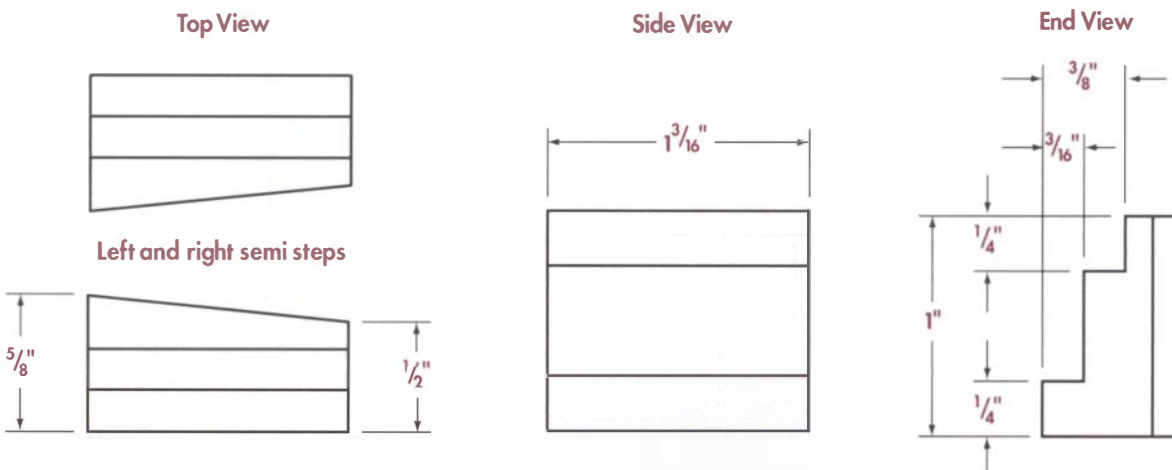
This truck has steps that are separate from the fuel tanks. A double length of step material is made, then cut into two steps, one for each side of the truck.

The steps are the same as on the dump truck in chapter 3, except that the back side is angled to match the angle of the frame (see p. 47).

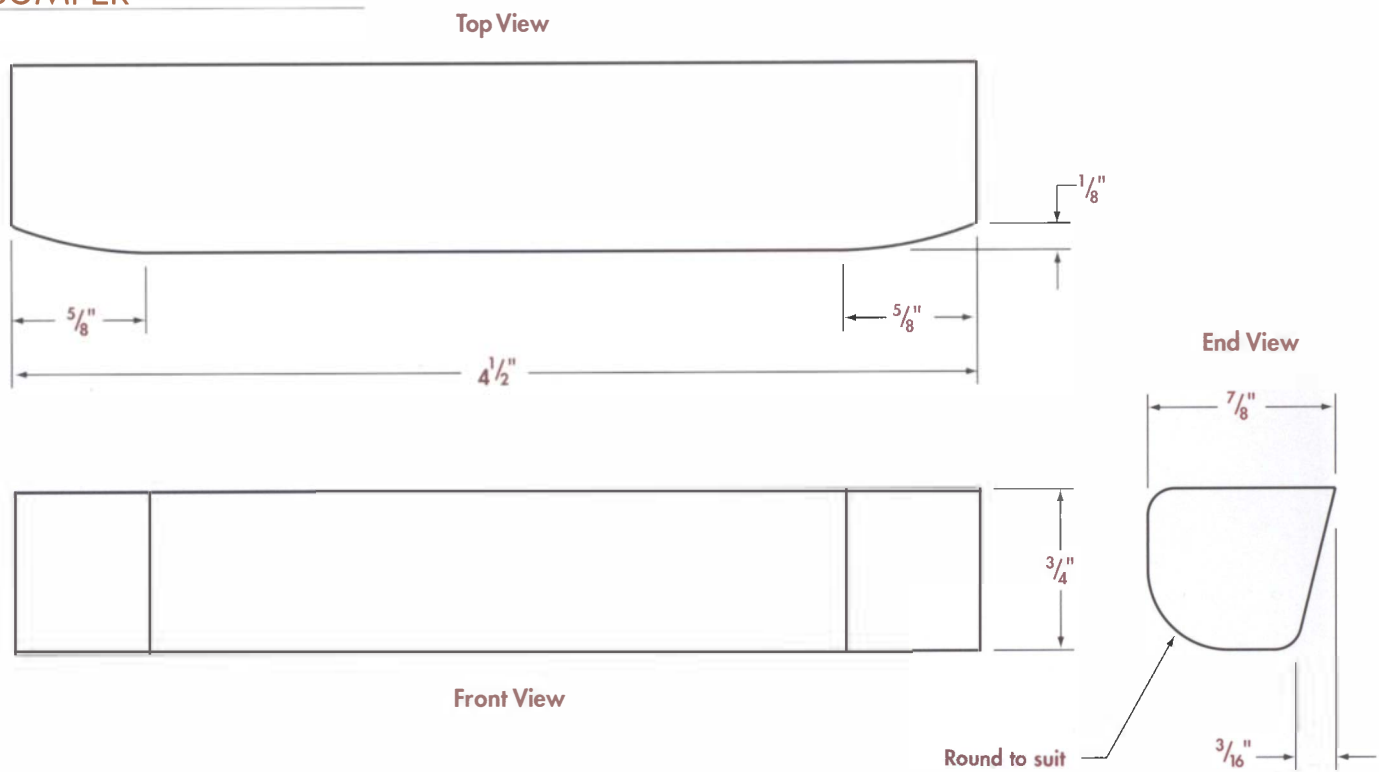
FENDERS



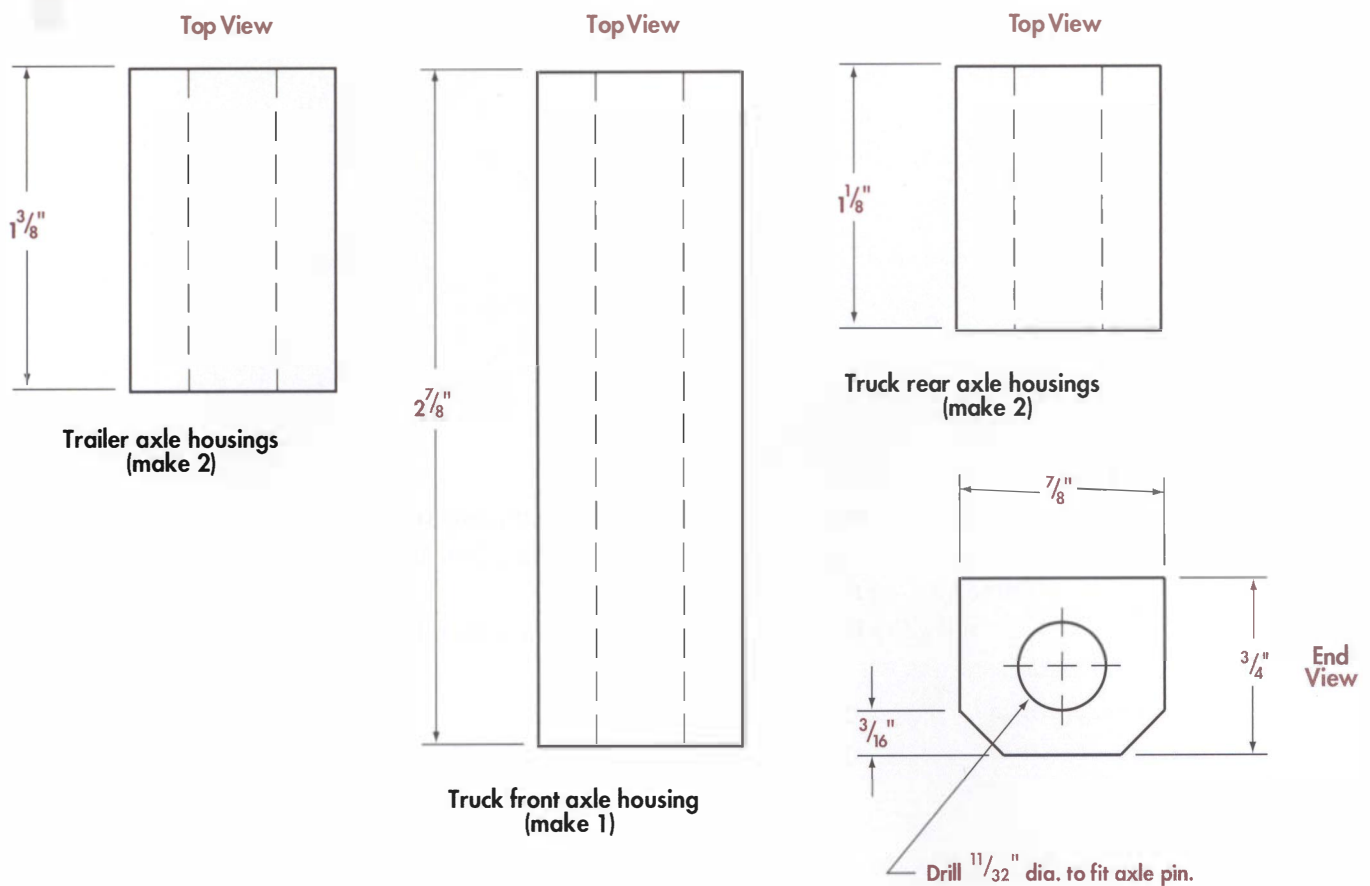
STEPS



BUMPER



AXLE HOUSINGS



Bumper

Follow the instructions in chapter 3, p. 49. This bumper's dimensions are only slightly different.

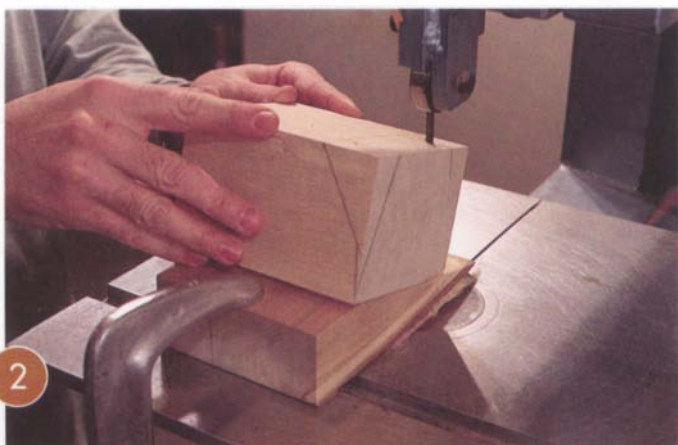
Axle Housings

See the dump-truck instructions on p. 50. Make a little more axle-housing material than indicated in those instructions because you need an extra 3 in. or so for the semi-trailer. Later, when the trailer wheel mount is attached to the trailer, glue the two trailer axle housings in place as well and then drill them.

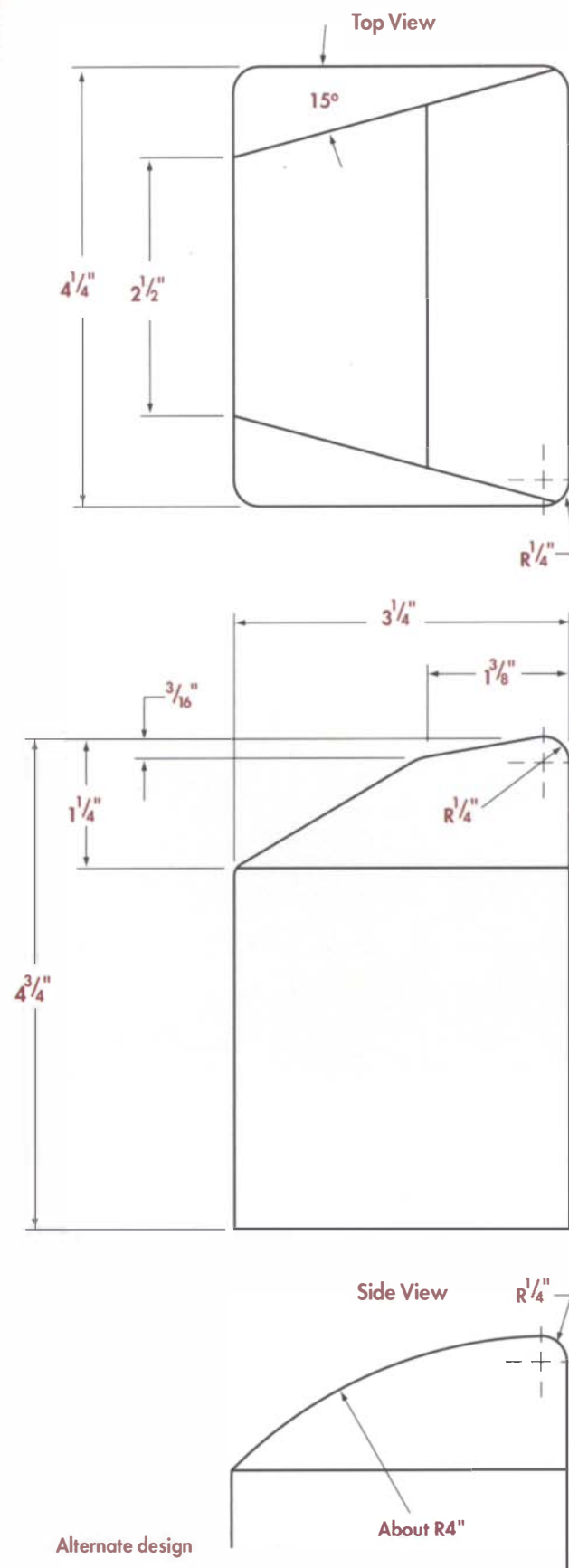
Sleeper

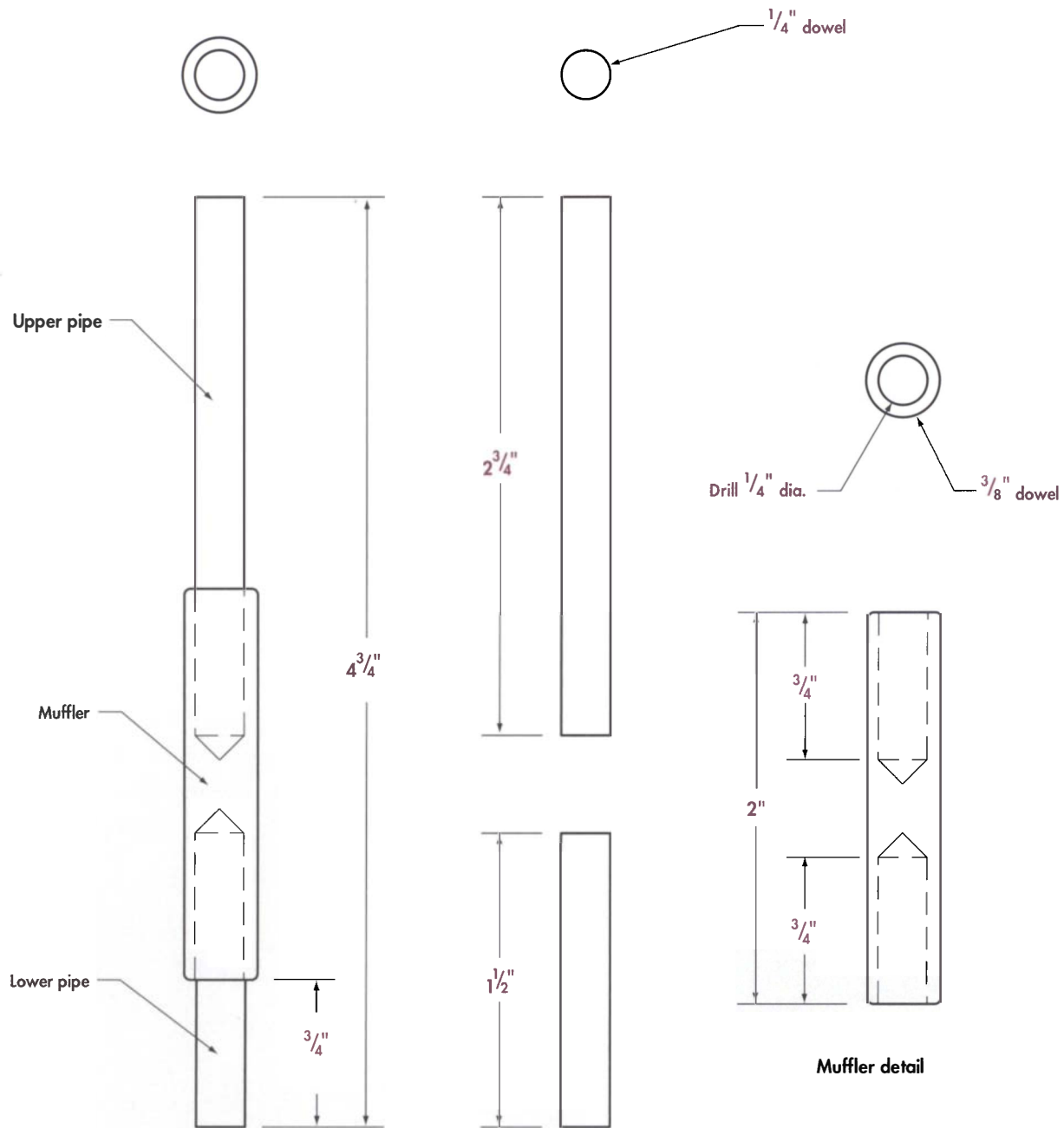
The sleeper tucks up behind the cab. The angles and slopes at the top are easily changed if you are thinking of one of the many variations that trucks have these days. You may also want to drill a few large holes in the bottom if you want to lighten it, although weight is really not a big problem.

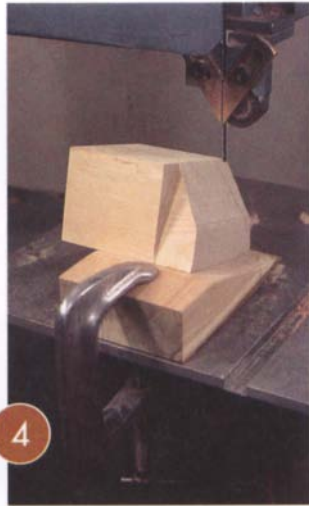
1. Laminate a block of wood if you need to. I have some large blocks of local birch and use one of those.
2. Lay out and make the end cuts of the top angled surface. You need to tilt the bandsaw table about 15 degrees to the right and to the left in order to cut both sides. If it does not go 15 degrees to the left, use the wood wedge used to cut the teeth on the monster-truck wheels (see pp. 15–16).



SLEEPER







- 3.** Lay out and cut the contour of the top angled surface.
- 4.** Cut to remove the waste wood.
- 5.** File a curve on each corner. If you are using a router table, choose a $\frac{1}{4}$ -in. roundover bit. If you are filing and sanding, a radius of $\frac{1}{8}$ in. on all rounded corners is fine.
- 6.** Fit to the cab, so that the front of the sleeper and the back of the cab do not have a gap or at least have only a minimal gap between them.
- 7.** Sand as needed.
- 8.** Glue onto the cab and frame.

Exhaust Stacks

Follow the sizes shown on the drawing here, but refer to the instructions in chapter 3 on p. 51.



Fuel Tanks

You can use factory-made barrels as fuel tanks, as with the dump truck (chapter 3). In this example, I used $\frac{7}{8}$ -in. dowel, although 1 in. would work, too. Make the reefer tank now also, and attach it later.

- 1.** Cut the dowel to length.
- 2.** Sand and bevel the ends.
- 3.** Sand to create a flat area on the fuel-tank dowel.
- 4.** Glue the two fuel tanks to the truck. Attach the reefer tank later (see p. 131).

Trailer Box

The trailer box is a simple wooden box, except that the back end is in two pieces for the doors. The box can be made of solid hardwood or of Baltic plywood. I used Baltic plywood for this example.

If you are making a flat-deck trailer instead of the trailer box, go to p. 128.

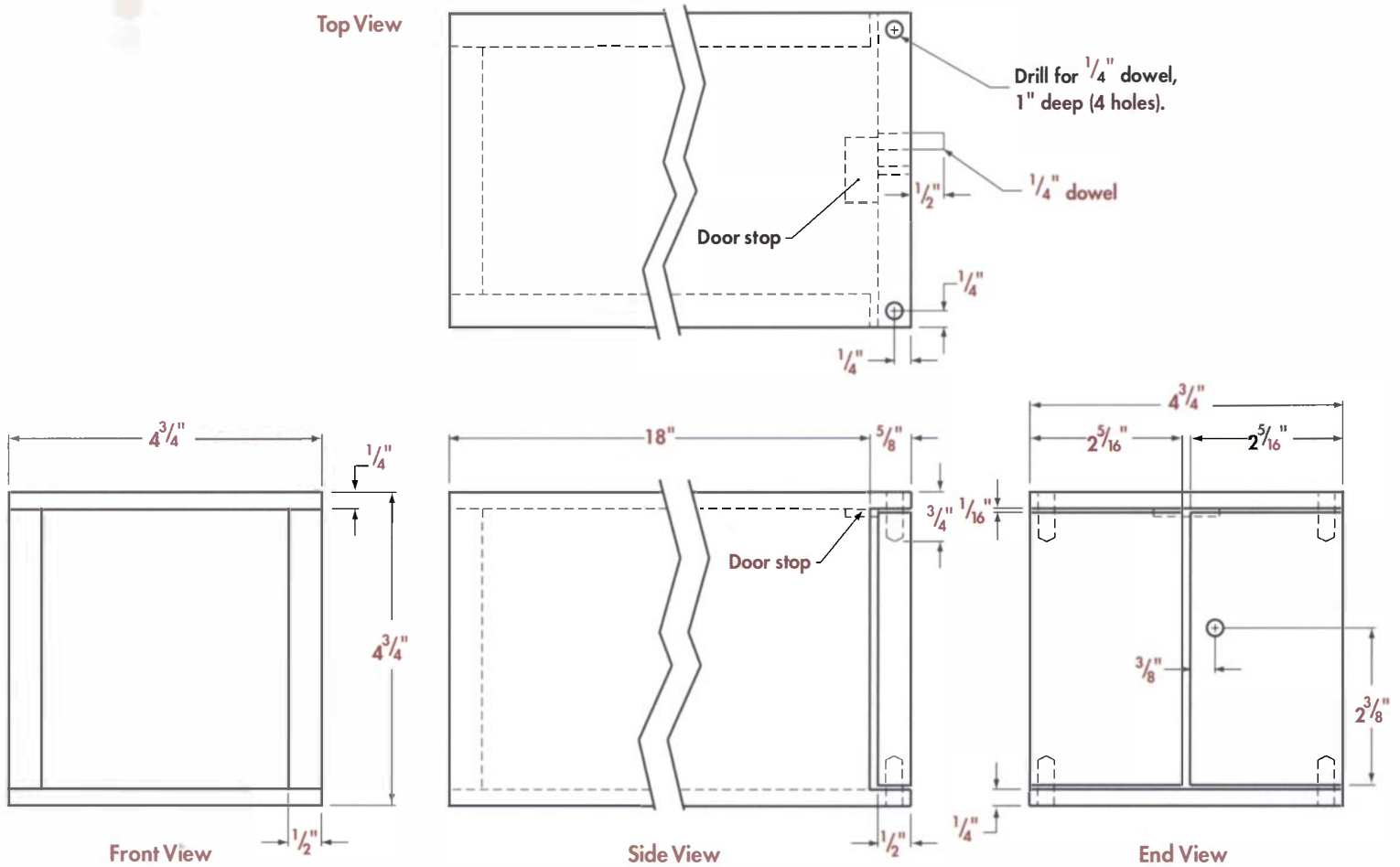
- 1.** Cut the top and bottom pieces from a strip of $4\frac{3}{4}$ -in.-wide by $\frac{1}{4}$ -in.-thick wood.
- 2.** Cut two sides and two ends from wood that is $4\frac{1}{4}$ in. wide by $\frac{1}{2}$ in. (or $\frac{3}{8}$ in.) thick. One end will be discarded but is very useful for keeping the box square when clamping. Actually, one door can be cut from this end if desired.



- 3.** Glue the trailer box together. Have the door end in place as well, but don't glue it. Remember—it is just there to help keep the box square when clamping.

It is a bit of a challenge to keep everything accurately aligned; you may want to put a few small ($\frac{3}{4}$ -in.) finishing

TRAILER BOX ASSEMBLY



nails in to hold everything in place. If it is too much out of alignment, you may have to sand through the plywood veneer before it all fits. Set and fill the nail holes when the glue is hard and the clamps are off. If you can clamp everything square without needing any nails, so much the better.

Have the top and bottom edges protruding a little past the sides, if anything. Note that the door end protrudes a little; this allows you to get a grip on it to remove it later.

4. When the glue is hard, remove the door end.

5. Scrape, plane, or sand the sides and ends flat. If you are using the Baltic plywood, planing is not your best option.

Flat-Deck Option

You can substitute a flat-deck trailer for the trailer box—just omit the sides, roof, doors, and ramp of the semitrailer.

You may want to put in tie-down dowels so that elastic bands can be hooked over the cargo. I drilled 10 holes 2 in. apart (centered along the length of the deck) and installed $\frac{3}{4}$ -in.-long dowels.

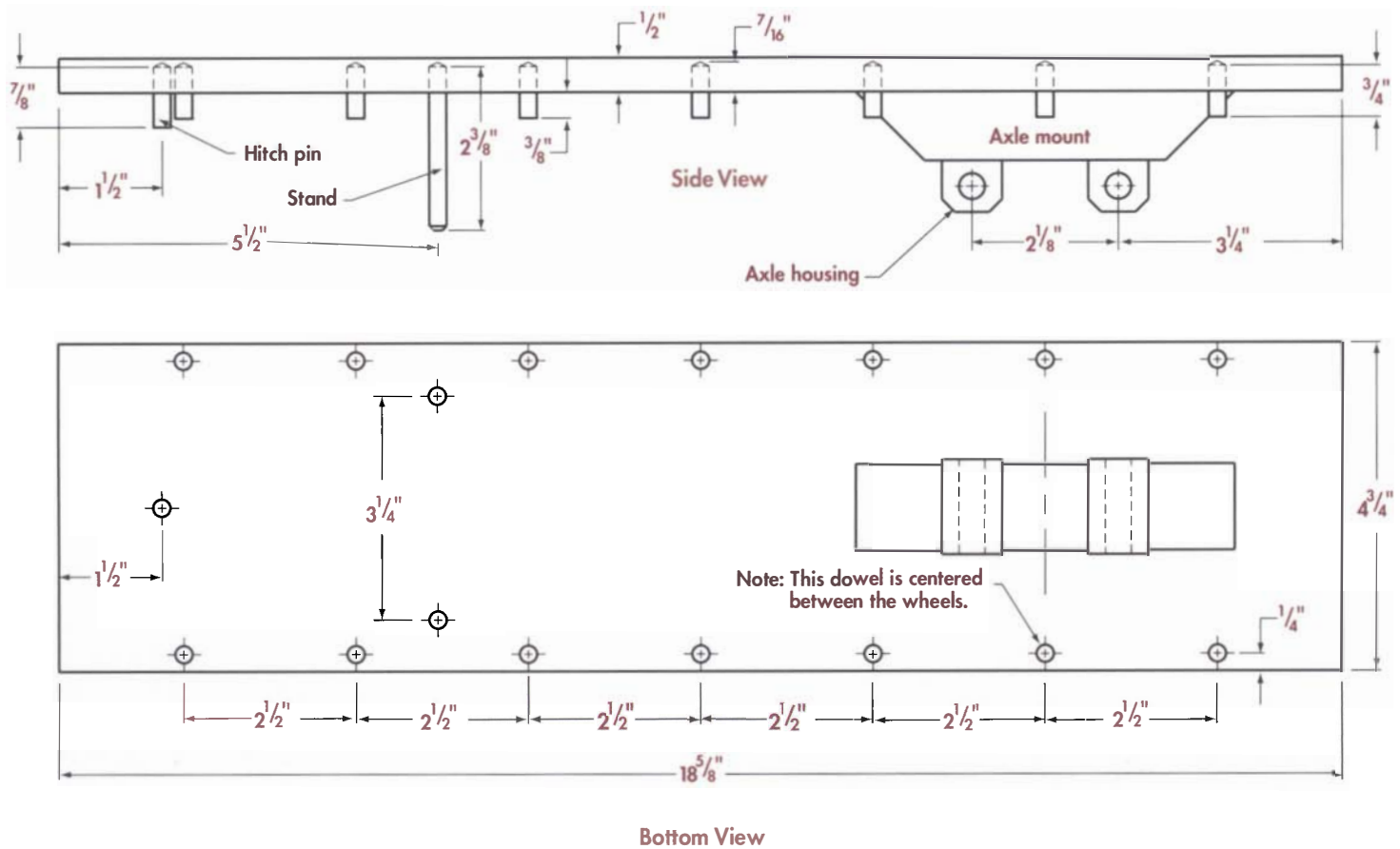
If you are making the flat-deck trailer, skip now to "Trailer Hitch and Stands" on p. 132.

Doors

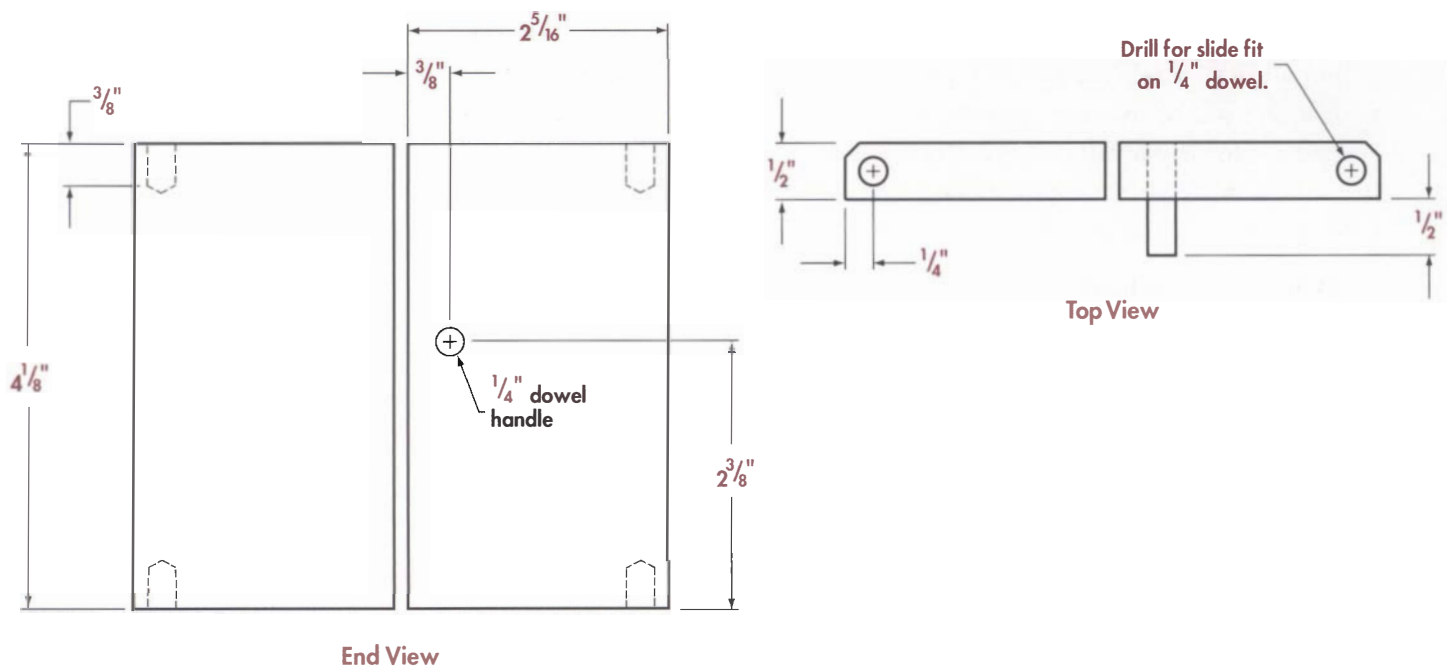
The wood for the doors is cut as one piece, drilled for hinge pins, then split into two doors and installed.

1. Make an end piece that is a snug fit in the door opening. It should be exactly the same width as the trailer box ($4\frac{3}{4}$ in.).

OPTIONAL FLAT DECK



DOORS



- 2.** Lay out the box for the hinge holes. Mark each hole's center with an awl to produce a large locating mark.
- 3.** Install the door material. It should be pretty snug, but if not, slip paper between the door edges and the box to shim it tight.

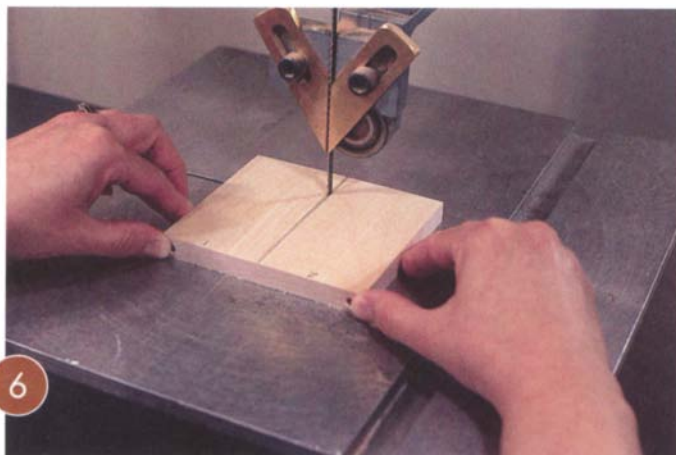
4. Clamp the box to a drill-press table, and drill for $\frac{1}{4}$ -in. dowel. I generally use an F drill, which is just over $\frac{1}{4}$ in. dia. This reduces the chance of the dowel being tight and splitting the wood. You may want to drill a sample hole and test the fit.

Drill all four holes, drilling each one $\frac{3}{4}$ in. deep. It's a good idea to set a stop so all four holes are the same depth.



5. Mark the doors so you know which one goes where, and remove the door end. Sand the top and bottom edges down a little to produce a gap top and bottom.

6. Mark out a centerline to split the end into two doors. Sand the saw-cut edge.



7. Finish-sand the doors. If the locating mark is to be sanded off, lightly pencil it on again after sanding.

8. Lay out and drill for the $\frac{1}{4}$ -in.-dowel door handle.

9. Cut the door handle; sand and bevel the edges.

10. Use a toothpick to put some glue in the hole, and install the handle. Install from the bottom, and have it protrude about $\frac{1}{8}$ in. out the top.

11. When the glue is hard, sand off the excess.

12. Cut the hinge dowels, about 1 in. long.

If needed, sand the last $\frac{3}{8}$ in. where each dowel enters the door. Sand these a little by putting the dowel in the drill press—with the chuck just tight enough to hold them—and sand with the drill running. Do just enough for a sliding fit in the door holes. If it's too loose, the doors will flop open when the truck is driven.

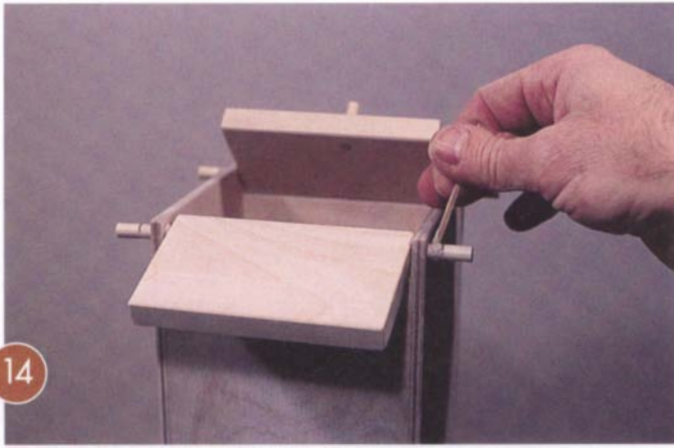


13. Finish-sand the end of the trailer before installing the doors.

Sand the $\frac{1}{8}$ -in. bevel on the inside surface. Without this bevel, it is possible to pinch your finger if you have it inside the trailer near the hinge while you swing the door.

14. When installing the doors, make sure they do not rub top or bottom. To check this, make sure each hinge dowel bottoms out in the hole in the door. Try it without glue first.

Tap these dowels in, alternating top and bottom, adjusting so the door has a tiny bit of up-and-down movement but is approximately centered in the opening. Check often



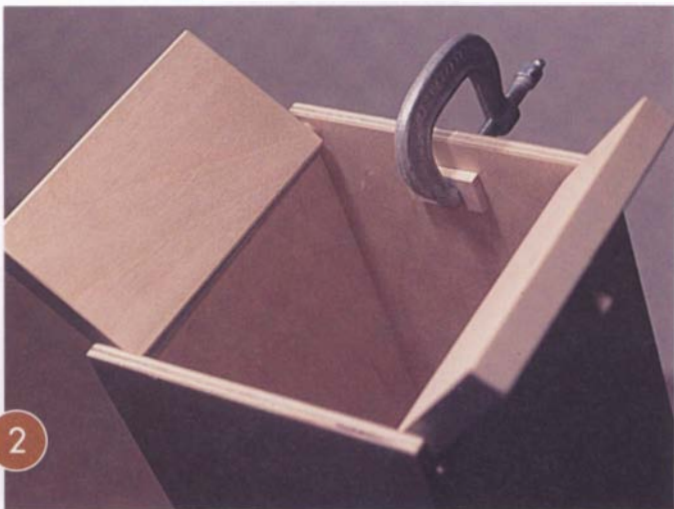
for up-and-down movement of the door as you install the dowels. Mark a line on each dowel to show how deep it goes in.

For final assembly, slide the dowels out about $\frac{1}{4}$ in., put glue on that $\frac{1}{4}$ in., and slide the dowels back in. This way no glue enters the door, but the dowel is glued to the door frame.

15. Trim the dowels to length, and file or sand them flush with the trailer.

Doorstop

1. Cut the small block of $\frac{1}{8}$ -in. wood for the doorstop. Sand as needed, and remove sharp corners.



2. Locate the stop so the doors are flush with the outside when closed. Mark the location.

3. Glue the stop in place.

Reefer Fuel Tank

The refrigeration unit at the front of the trailer, also known as a reefer, requires a separate fuel tank. This tank is usually located right behind the trailer stands (see the semi truck plan drawing on p. 119).

Take the tank you made when you made the truck fuel tanks, and glue it in place now. The exact location does not matter very much.

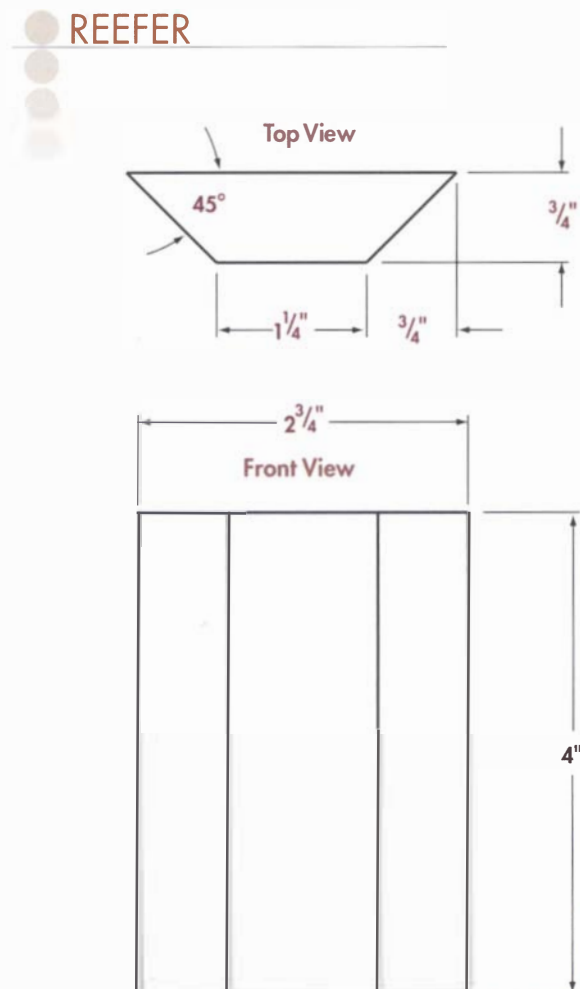
Reefer

The reefer is a simple block of wood attached to the front of the semitrailer.

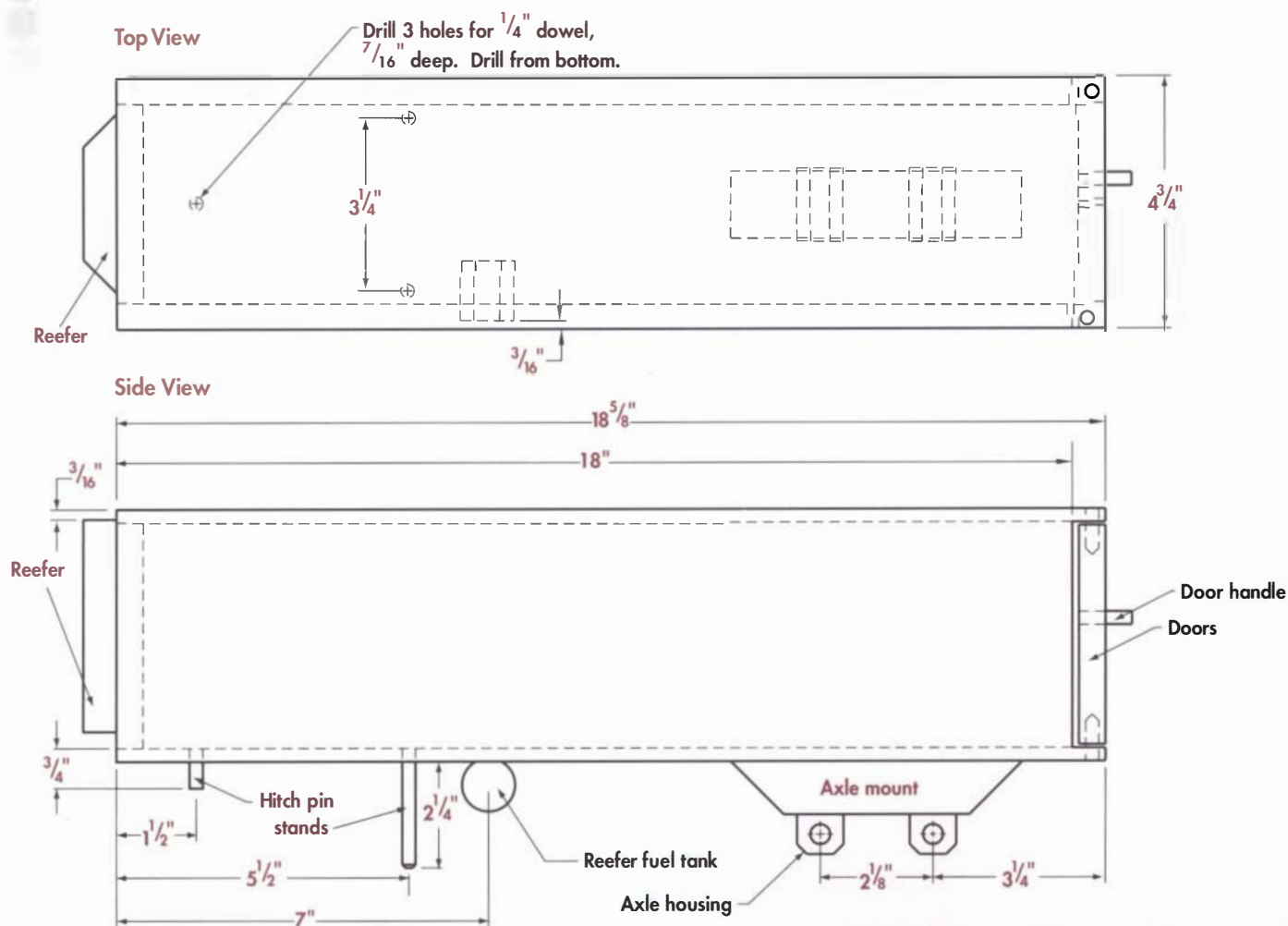
1. Cut the block to size.

2. Sand or plane the bevels on the sides. These angles approximate the real thing and are for appearance only, so the exact angle is not important.

3. Glue the reefer onto the front of the trailer. It is located about $\frac{3}{16}$ in. down from the top.



TRAILER ASSEMBLY



Trailer Hitch and Stands

The trailer hitch and stands are three dowels that go into the bottom of the trailer. The stands are intended to be as long as possible, but not drag when driven over carpet.

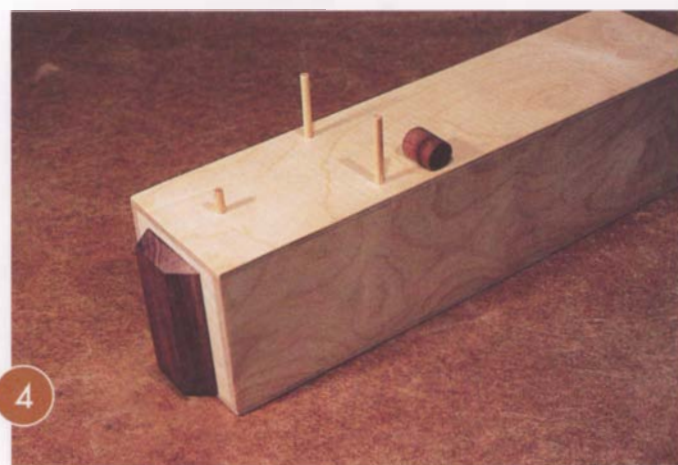
1. Lay out and drill the three holes. If you can, you may want to stop the drill just before it breaks through.

If you are making the flat-deck option, drill the holes for the tie-down dowels as well. Do not drill right through—leave about $\frac{1}{16}$ in.

2. Cut the dowel; sand and bevel the ends slightly.

3. Use a toothpick to put glue in the holes, and tap the dowel into place. Try to have the dowel protrude as little as possible into the interior.

4. Trim the stands if needed to make them the same length.

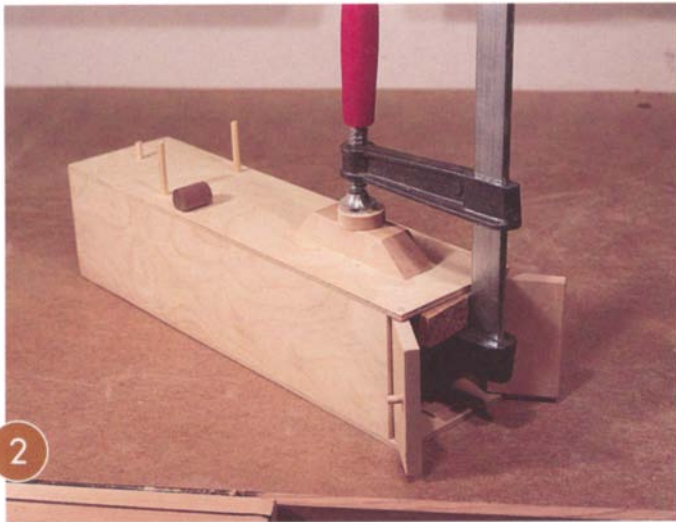


Trailer Wheel Mount

The wheel mount is a block located between the trailer and the axle housings. It is attached to the trailer, then the axle housings are glued to the wheel mount. The wheels are added later.

1. Cut the mount to size and finish-sand.

2. Glue the mount to the trailer.



3. Glue the axle housings, which you made earlier, to the wheel mount.

4. Hitch the trailer to the truck, and measure up from a flat surface so that the truck and trailer axle holes are the same distance up from the ground.

5. Drill the holes, keeping the location as accurate as possible, especially the vertical distances.



Wheels

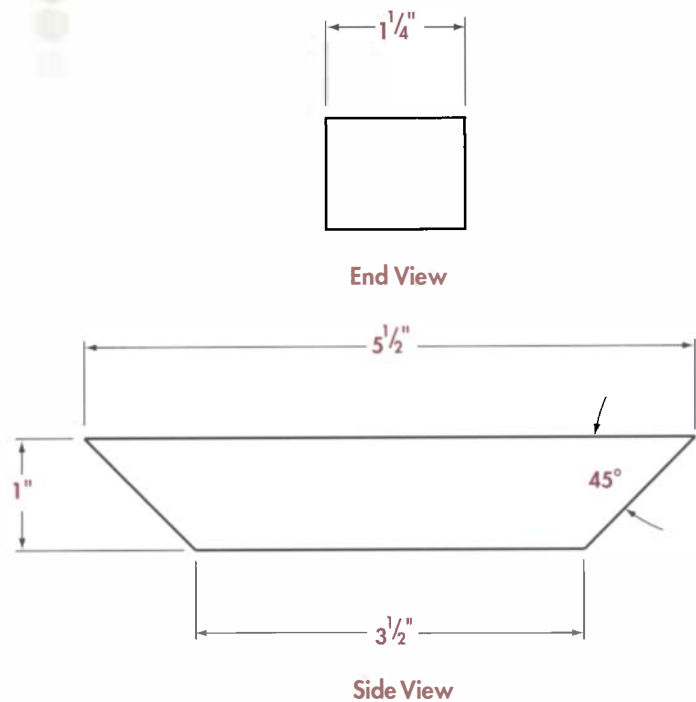
This truck is designed to use standard wooden toy wheels: two for the front of the truck, four duals for the back of the truck, and four more duals for the trailer. They are 2 in. dia. Most hobby stores carry them.

1. Cut the pins as needed to make sure they do not meet in the center of the axle housings. This may not be a problem for the front axle but could be for the rear axles and the trailer.

2. Follow the installation procedure described in chapter 3 (p. 56).

If you are making the flat-deck trailer, you are finished now.

TRAILER WHEEL MOUNT



Ramp Bumper and Ramp

If the semi is to be loaded with small vehicles, a ramp simplifies things. The bumper provides a ledge for the ramp to rest on, and a dowel keeps it from sliding off. The ramp fits in the semitrailer for storage. (See the drawings on p. 134.)

1. Cut the bumper material to size.

2. Sand or plane the angle. This angle approximates the angle of the ramp.

3. Cut the ramp to size.

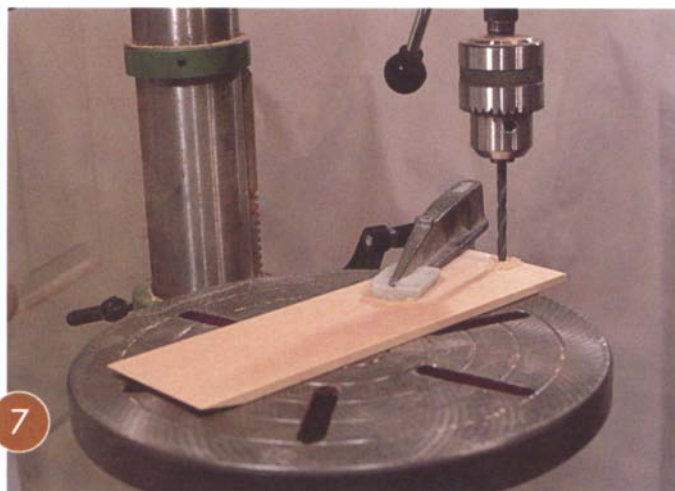
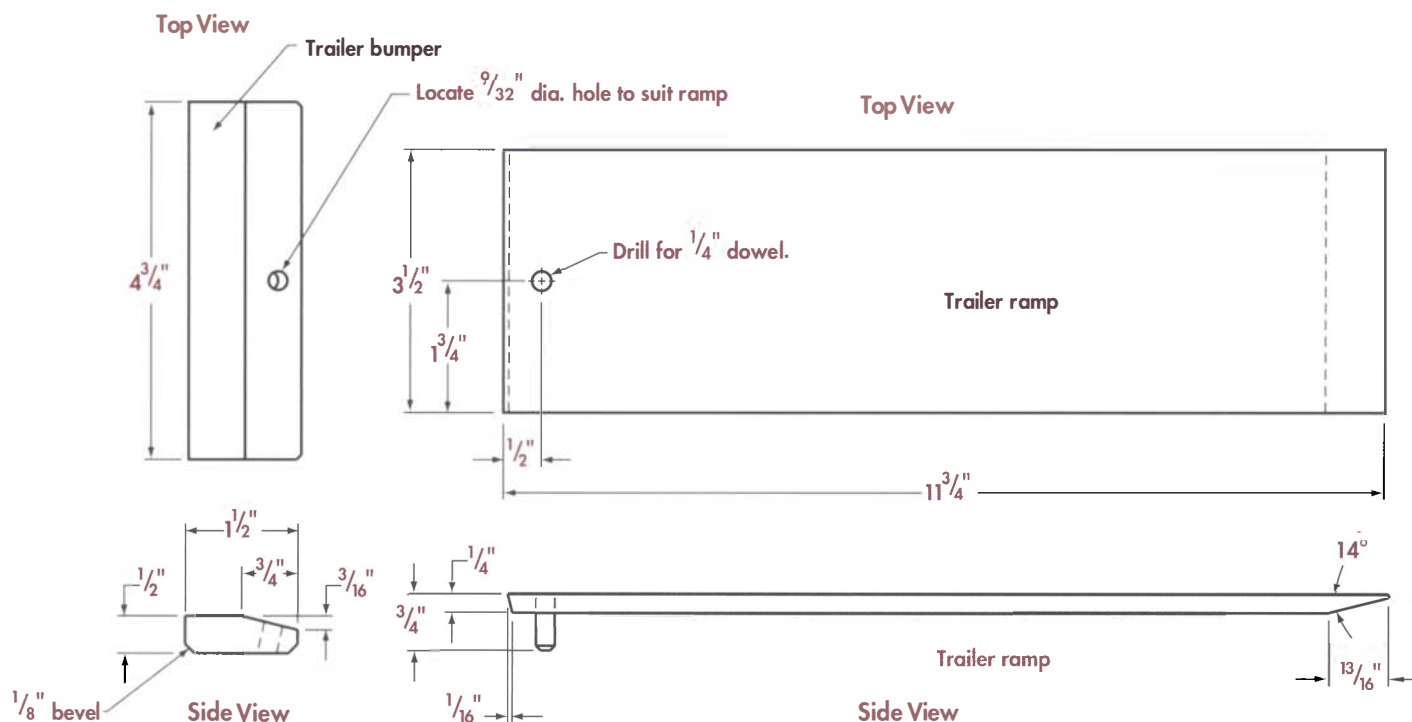
4. Sand the bevel on the top end. It should fit flat against the end of the semitrailer. Hold the bumper and ramp in place to check the angles on these two parts.

5. Sand the bevel on the bottom. It should sit flat when the ramp is in place.

6. Glue the bumper to the semitrailer.



RAMP BUMPER AND RAMP



7. Drill a hole in the ramp. It is a good idea to drill this hole undersize to start with, about $\frac{3}{16}$ in. or $\frac{7}{32}$ in., because it tends to wear a little when it is used as a drill guide in the next step. Later enlarge it to a size that fits your $\frac{1}{4}$ -in. dowel.

8. Hold the ramp on the bumper and drill the bumper to produce the same-size hole that is in the ramp.

Remove the ramp, and enlarge the bumper hole using a $\frac{9}{32}$ -in. drill. Estimate the correct angle as closely as possible,

although there is enough clearance to allow a slightly off-angle hole to work.

9. Enlarge the ramp hole to fit a $\frac{1}{4}$ -in. dowel.

10. Cut the ramp dowel about $\frac{7}{8}$ in. long. Sand and bevel the ends.

11. Put some glue in the ramp hole, and install the dowel from the bottom. Have it protrude out the top about $\frac{1}{8}$ in.

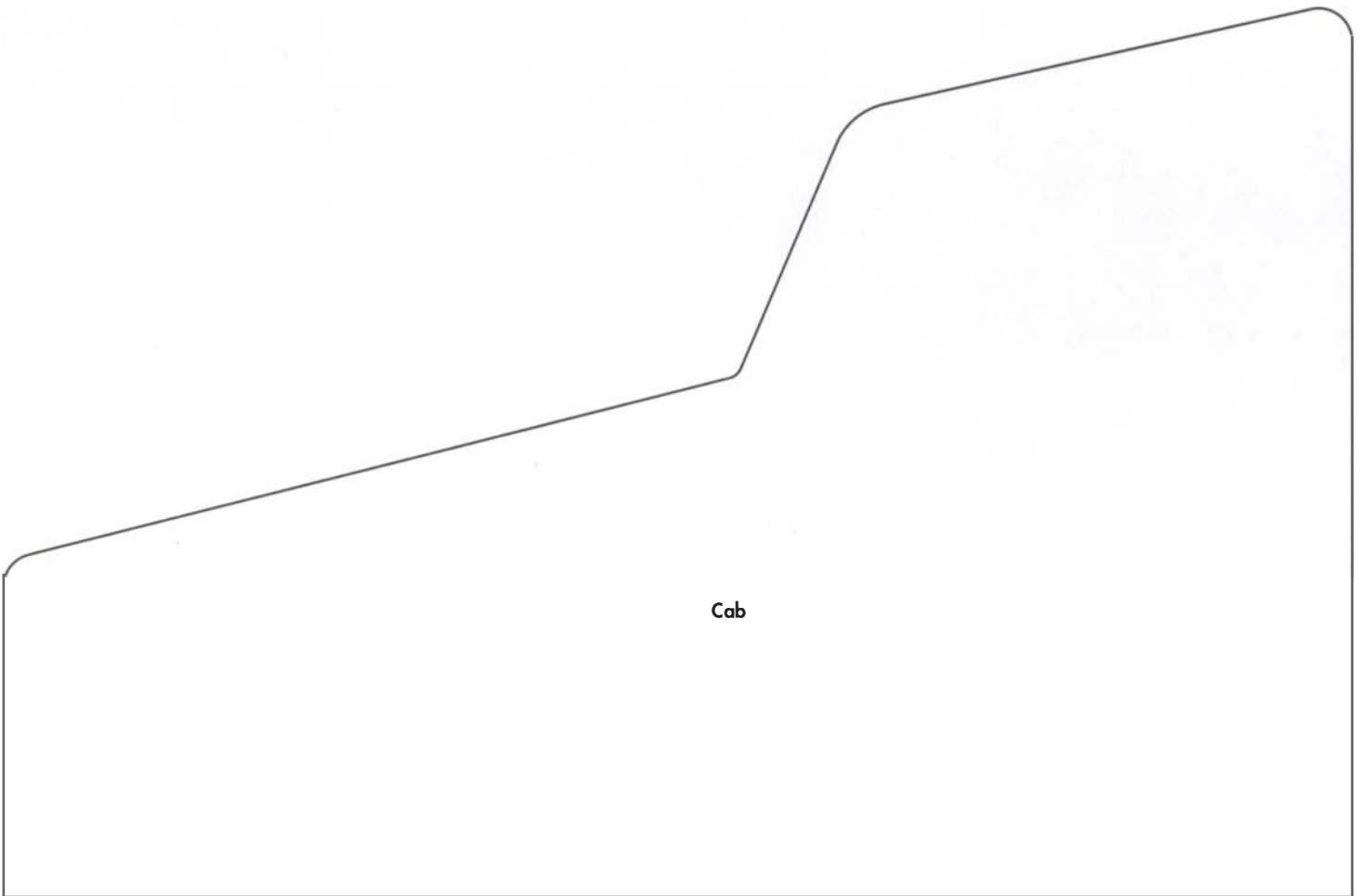
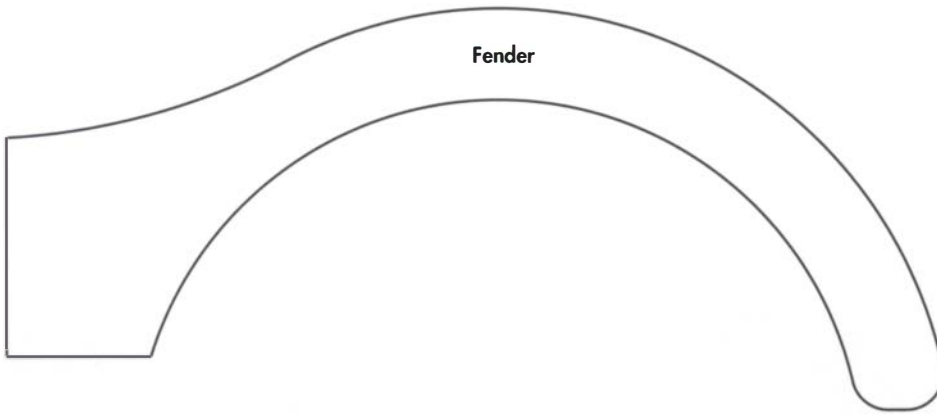
12. When the glue is hard, sand off the excess dowel.

13. Round the corners on the ends of the ramp.



Finish

As desired. You may want to read the appendix on finishing on p. 172.



For full-size templates, copy at 100%.

Chapter 10

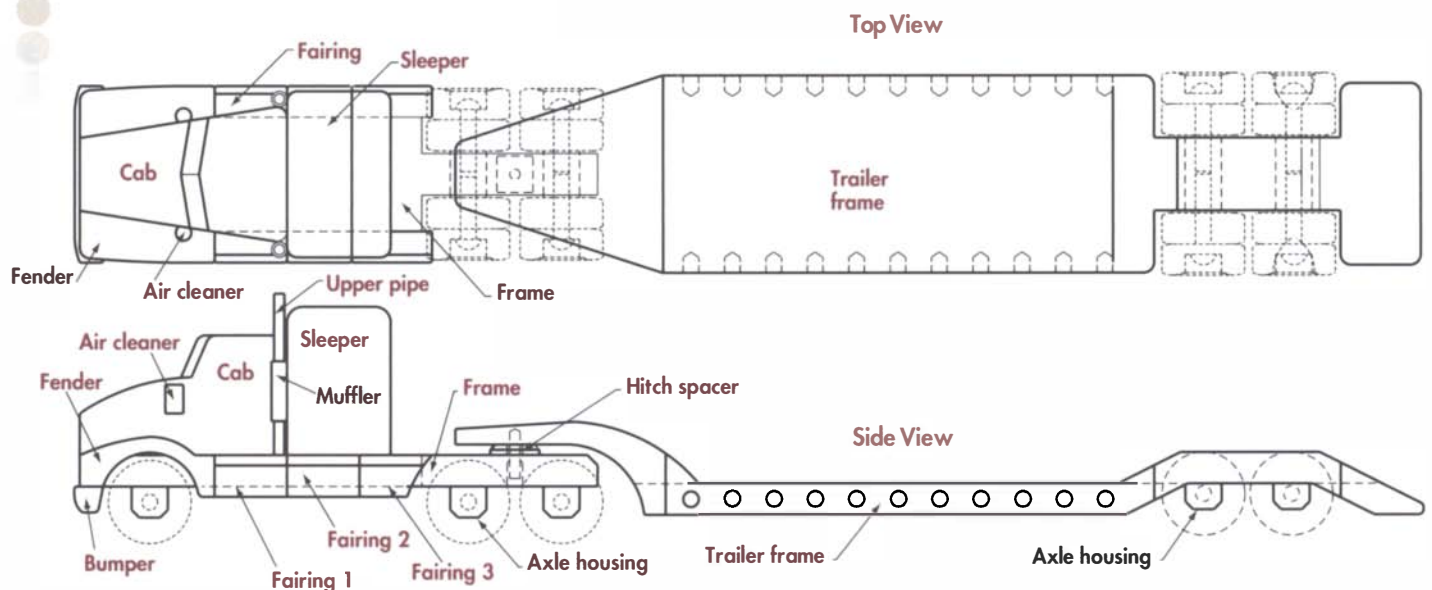
Low-Bed Truck



It seems that children playing with trucks

want to haul other vehicles. I made this truck and trailer to provide that option. The trailer is made to haul the skidder (chapter 7), the log loader (chapter 8), or any of the trucks in this book. Obviously, a lot of other toys can be placed on the trailer as well.

LOW-BED TRUCK PLAN



Any of the highway trucks can be used with this trailer, as they are all interchangeable.

The truck is made of three main blocks of wood—a shaped one for the cab, a long rectangular one for the frame, and a third one for the sleeper—with wheels underneath and some smaller parts attached. The trailer is a long board, with a raised front part for the hitch and another for the wheel mount at the rear.

Although this truck substitutes modern fairings for separate steps and fuel tanks, some of the parts for this truck are similar to those of the dump truck in chapter 3 (cab, fenders, air cleaners, bumper, headlights, axle housings, and exhaust stacks). For these, the drawings of the low-bed truck parts are provided, but you will be referred to chapter 3 for instructions and illustrations.



LOW-BED TRUCK

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Truck frame	12½ x 2¾ x ¾	1	
Hitch spacer	7/8 x 7/8 x ¼	1	
Cab	5 x 3¼ x 27/8	1	
Fenders	3¼ x 17/16 x 1¼	2	Mirror images
Bumper	4¼ x 11/16 x 5/8	1	
Air cleaners	3/8 dowel x 7/8 long	2	
Headlights	¼ dowel x 5/16 long	4	Round end before cutting to length
Truck front axle housing	2¾ x 7/8 x ¾	1	Make enough for all five housings
Truck rear axle housings	1 1/8 x 7/8 x ¾	2	Make enough for all five housings
Trailer axle housings	1 5/8 x 7/8 x ¾	2	Make enough for all five housings
Sleeper	4 x 39/16 x 2½	1	
Fairing 1 upper steps	1 5/8 x 9/16 x ¼	2	Cut enough upper and lower material for all six fairing parts. (Note: Cut only one piece 11 in. x 1 in. x ¾ in. if using the table saw to cut the steps.)
Fairing 1 lower steps	1 5/8 x ¾ x ¾	2	
Fairing 2 & 3 upper steps	1¾ x 9/16 x ¼	4	
Fairing 2 & 3 lower steps	1¾ x ¾ x ¾	4	
Exhaust pipe (upper)	¼ dowel x 2½ long	2	
Exhaust pipe (lower)	¼ dowel x 1¾ long	2	
Muffler	3/8 dowel x 1½	2	
Trailer frame base	19 1/16 x 4¾ x ¾	1	
Trailer frame front (upper)	57/8 x 4¾ x ¾	1	Cut to 6 in. long and trim after
Trailer frame front (lower)	3 x 4¾ x ¾	1	
Trailer frame rear	65/8 x 4¾ x ¾	1	
Trailer hitch dowel	¼ dowel x 1 long	1	
Axle pins	11/32 dia.	12	
Wheels—single	2 dia. (factory made)	2	
Wheels—dual	2 dia. (factory made)	8	Could use 16 singles

Frame

The frame of this toy truck has the same function as the frame on a full-size truck. It is the backbone to which you attach the cab, fenders, and axles.

- 1.** Lay out this frame on $\frac{3}{4}$ -in.-thick stock. Working from a centerline is probably the best system.
- 2.** Bandsaw to shape, leaving a little extra stock on the angled surfaces (cut about $\frac{1}{16}$ in. away from the line on these surfaces).
- 3.** Sand all surfaces except the long angled ones. It is better to sand them later, together with the cab, after the cab is glued on.

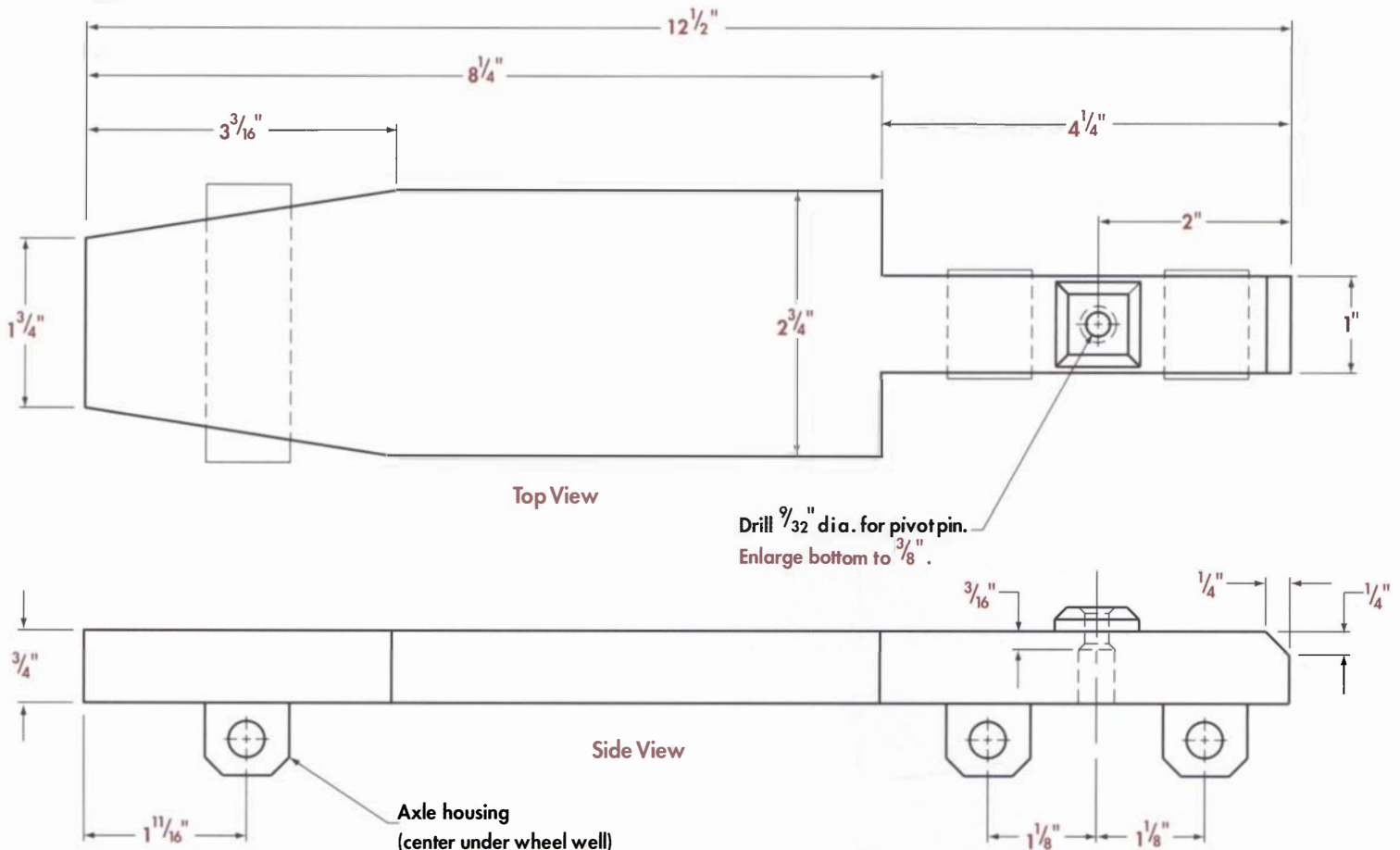


- 4.** Make the hitch spacer by cutting a small square of $\frac{1}{4}$ -in.-thick material and beveling the edges.
- 5.** Glue the hitch spacer in place.
- 6.** Drill the $\frac{3}{32}$ -in. hitch-pin hole.
- 7.** Countersink the top a little, to about $\frac{3}{8}$ in. dia.
- 8.** Enlarge the hitch hole by drilling from the bottom about $\frac{9}{16}$ in. deep with a $\frac{3}{8}$ -in. drill. This leaves the top $\frac{3}{16}$ in. of the original $\frac{3}{32}$ -in. hole and provides clearance to allow the hitch pin to pivot a little, as the truck and trailer drive over dips and rises.

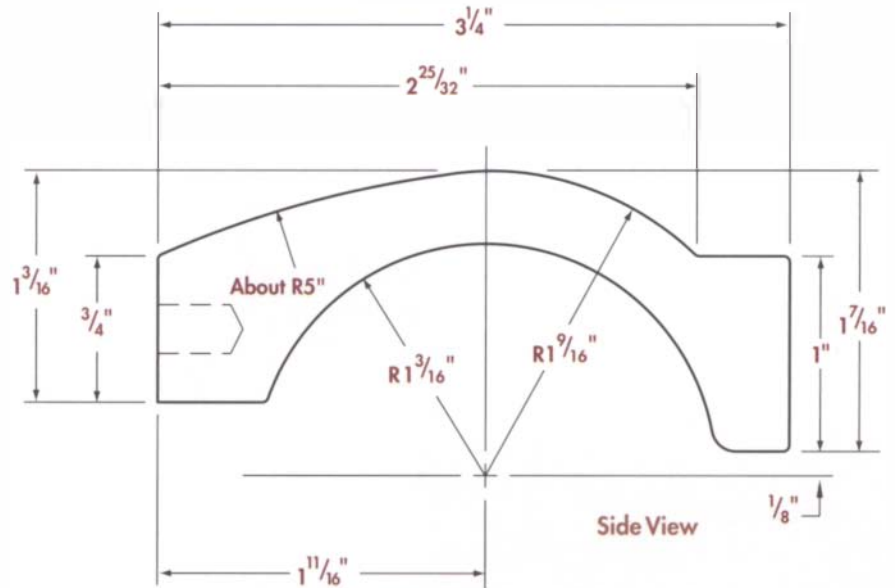
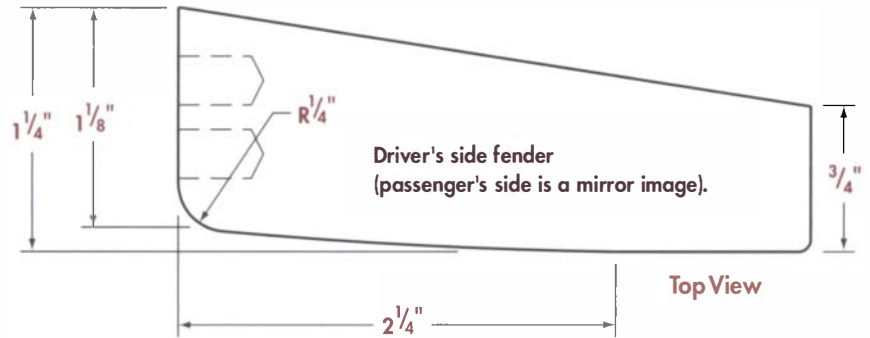
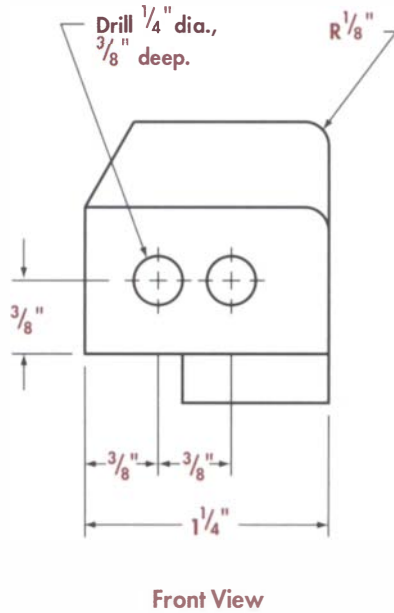


FRAME

Frame (with hitch spacer and axle housings located)



FENDERS



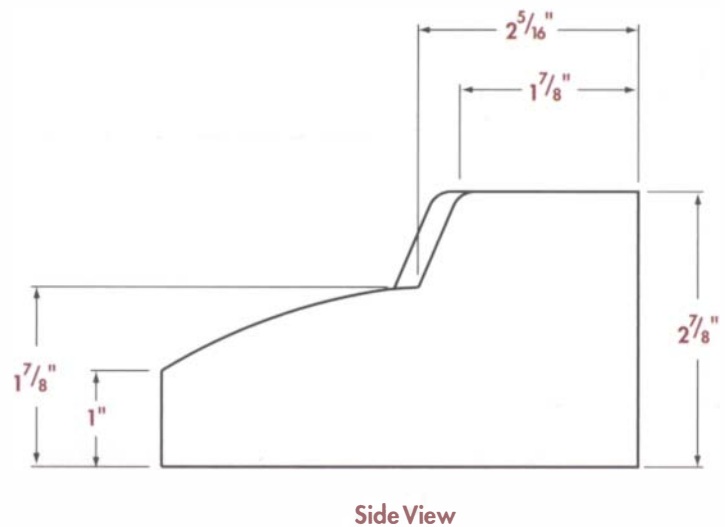
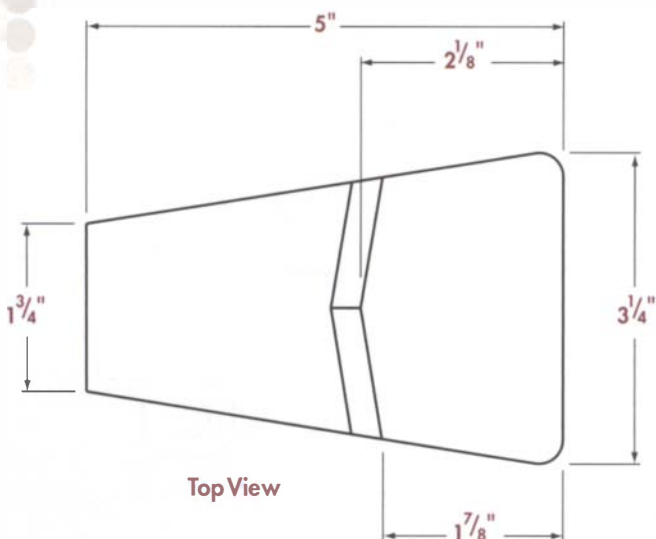
Cab

This cab is very similar to the dump-truck cab, although the dimensions vary a bit. Use the same process as detailed in chapter 3.

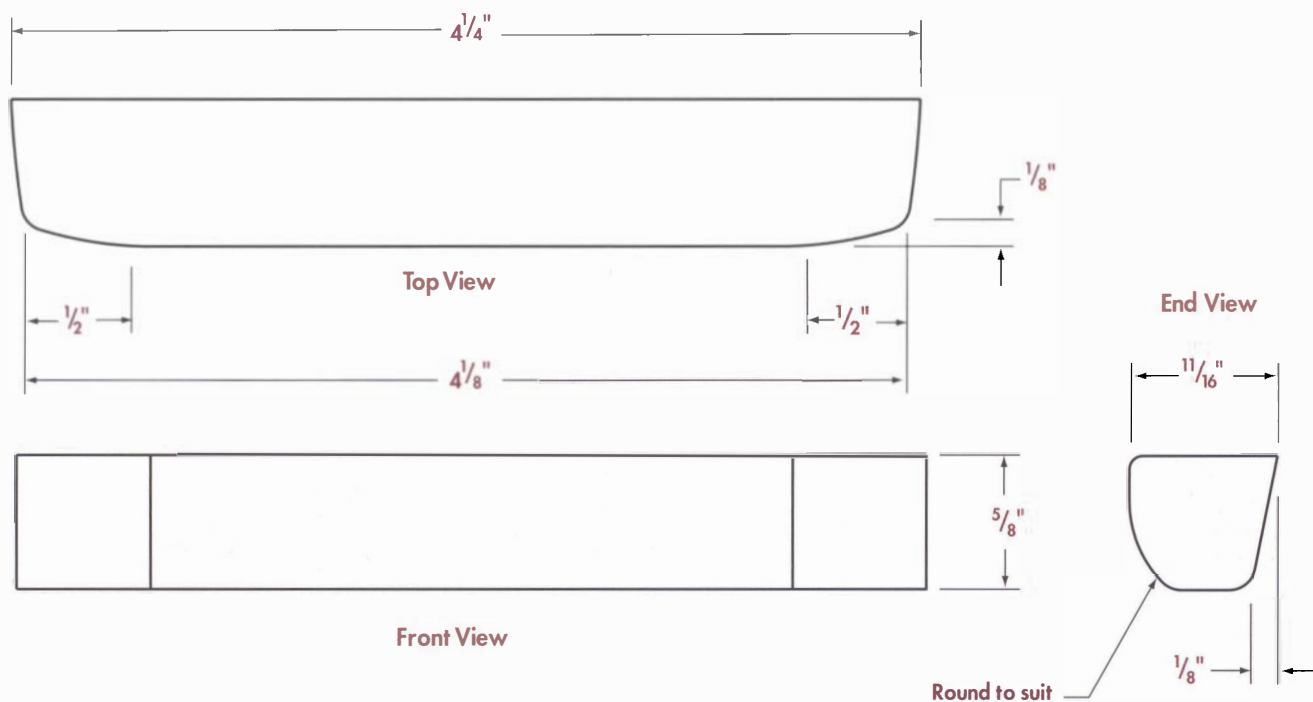
Fenders

Follow the steps shown in chapter 3. Note these fenders have a different profile, with the back end squared off to later join the fairings.

CAB



BUMPER



Bumper

Follow the instructions in chapter 3, p. 49. This bumper's dimensions are only slightly different.

Headlights

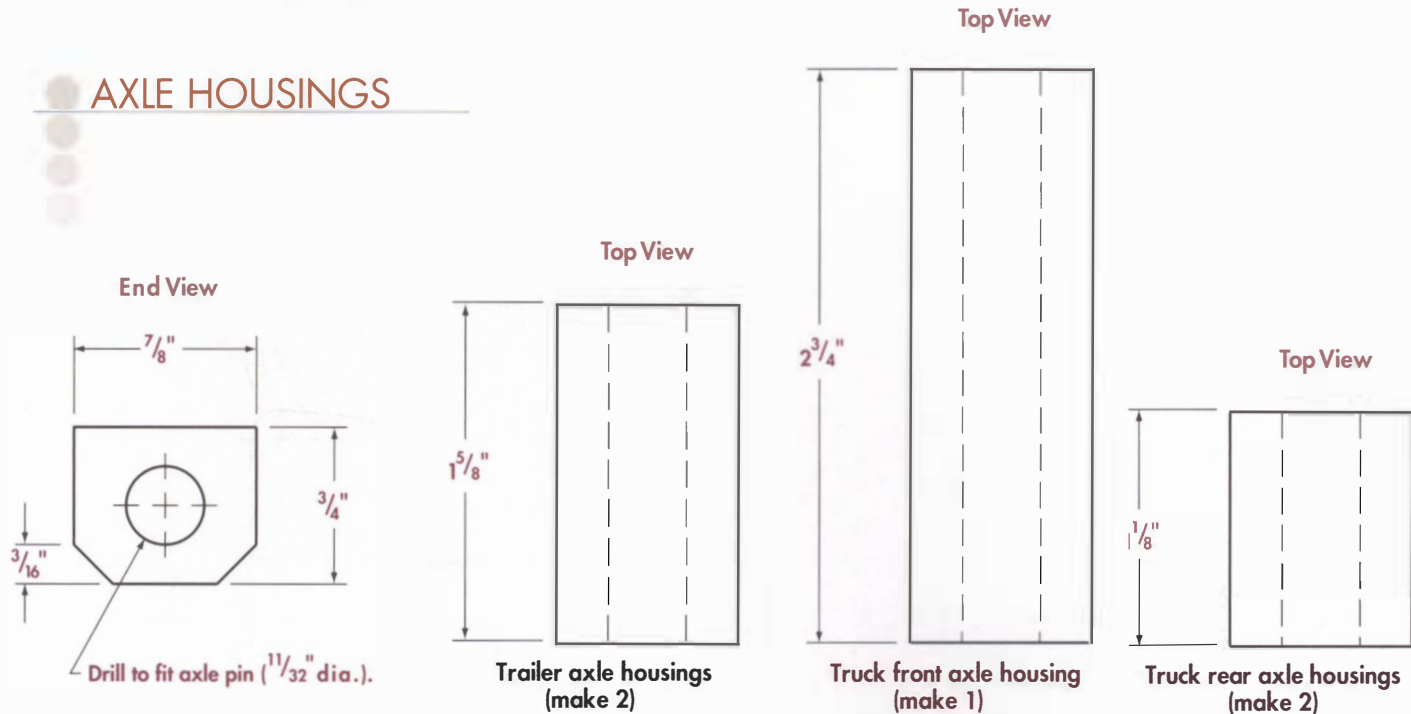
See the fender drawings on p. 139 for location.

For instructions refer to chapter 3, p. 49, but make these headlights only $\frac{5}{16}$ in. long.

Air Cleaners

Use the drawing and the instructions in chapter 3.

AXLE HOUSINGS



Axle Housings

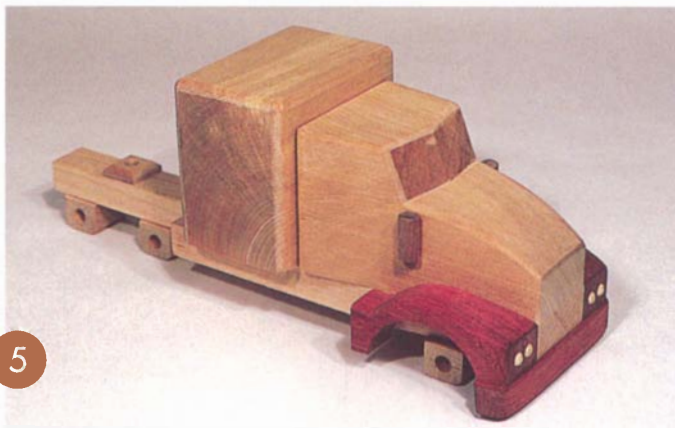
See the dump-truck instructions on p. 50. Make a little more axle-housing material than indicated in those instructions because you need an extra 3 in. or so for the trailer. Drill them after they are glued in place, but don't put the wheels on yet.

Sleeper

The sleeper tucks up behind the cab. This sleeper is basic, but you could change it so that the top has the angles and slopes of the sleeper in chapter 9.

You may also want to drill one or two large holes in the bottom if you want to lighten it, although weight is really not a big problem.

1. Laminate a block of wood if needed.
2. Lay out and cut the block to size.
3. Round the corners and finish-sand.
4. If you want to lighten the truck, drill a large (1 3/4-in.) hole up from the bottom, 2 1/2 in. deep.
5. Glue to the frame and to the rear of the cab. Sand the bottom of the sleeper if needed to ensure that the sleeper fits squarely against the cab.

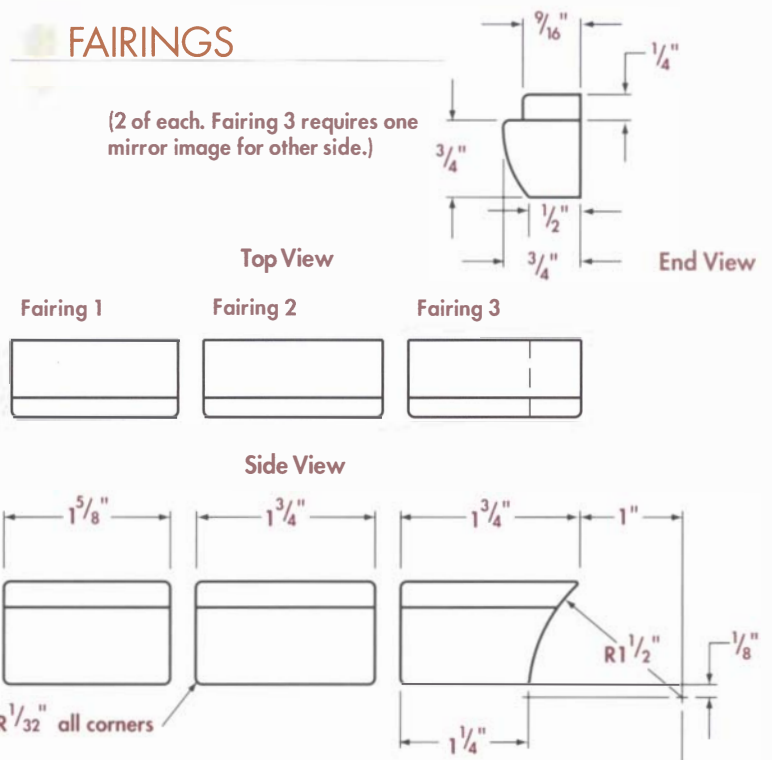


5

Fairings

Some trucks have fairings along the bottom edge of the cab. These fairings form the steps and cover the tanks. The fairings for this toy truck are made from two strips of wood, glued together, then cut into six short sections.

There are two methods to create the fairings: one uses the table saw and bandsaw, the other uses the bandsaw only (my preference).



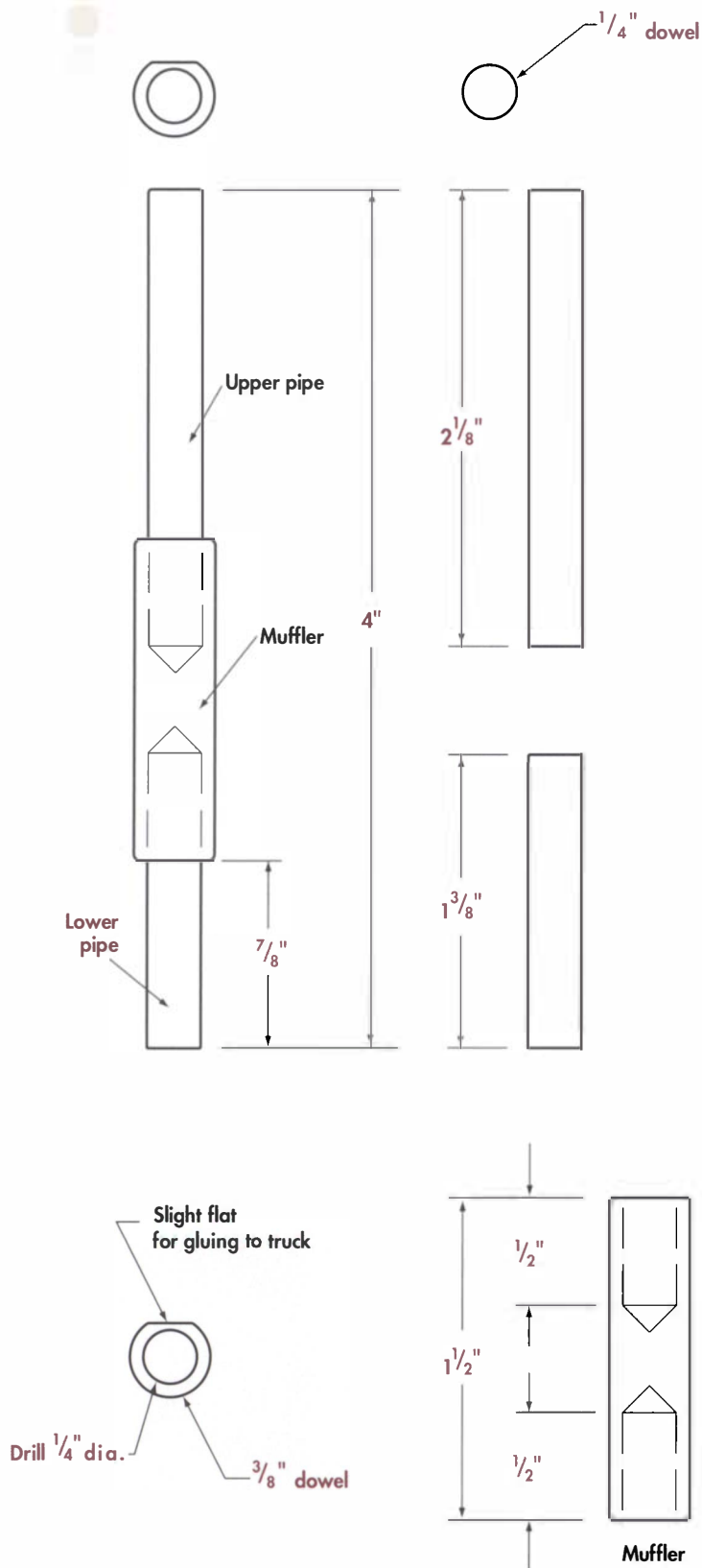
Using a table saw

1. Cut a strip of wood 11 in. by 1 in. by 1 1/6 in.
2. Cut a 1/4-in. by 1/4-in. dado along one edge.
3. Round the front surface until it resembles the drawing.
4. Bevel all sharp corners.
5. Cut to lengths, and cut the 1 1/2-in. radius on two of the pieces (fairing 3) using a bandsaw.
6. Sand as needed. You may want to use a small drum sander on the end radius.
7. Fit fairing 1 to the fender, rounding the edges a little where the parts meet. This makes the toy look a little more realistic and also serves to camouflage any imperfections in the joint.
8. Glue all fairings in place; clamping should not be needed.



8

EXHAUST STACKS



9. File and sand the bottom corner of each fender to blend in with the fairings.

Using a bandsaw

1. If you do not have a table saw, cut two pieces, each about 11 in. long. One is 1/4 in. by 3/16 in., the other is 3/4 in. by 3/4 in. Leave a finished edge on the surfaces where they will be glued together so they are quite flat.

2. Glue the two pieces together, clamping to eliminate gaps.

3. Follow steps 3 through 9 above for using a table saw.



Exhaust Stacks

Follow the sizes shown on the drawing here, but refer to the instructions in chapter 3 on p. 51.

The truck is now complete. Install the wheels on the truck later when you install them on the trailer.

Trailer Frame

This trailer consists of a frame and some wheels. Make the frame from three pieces laminated together, and later add axle housings and wheels.

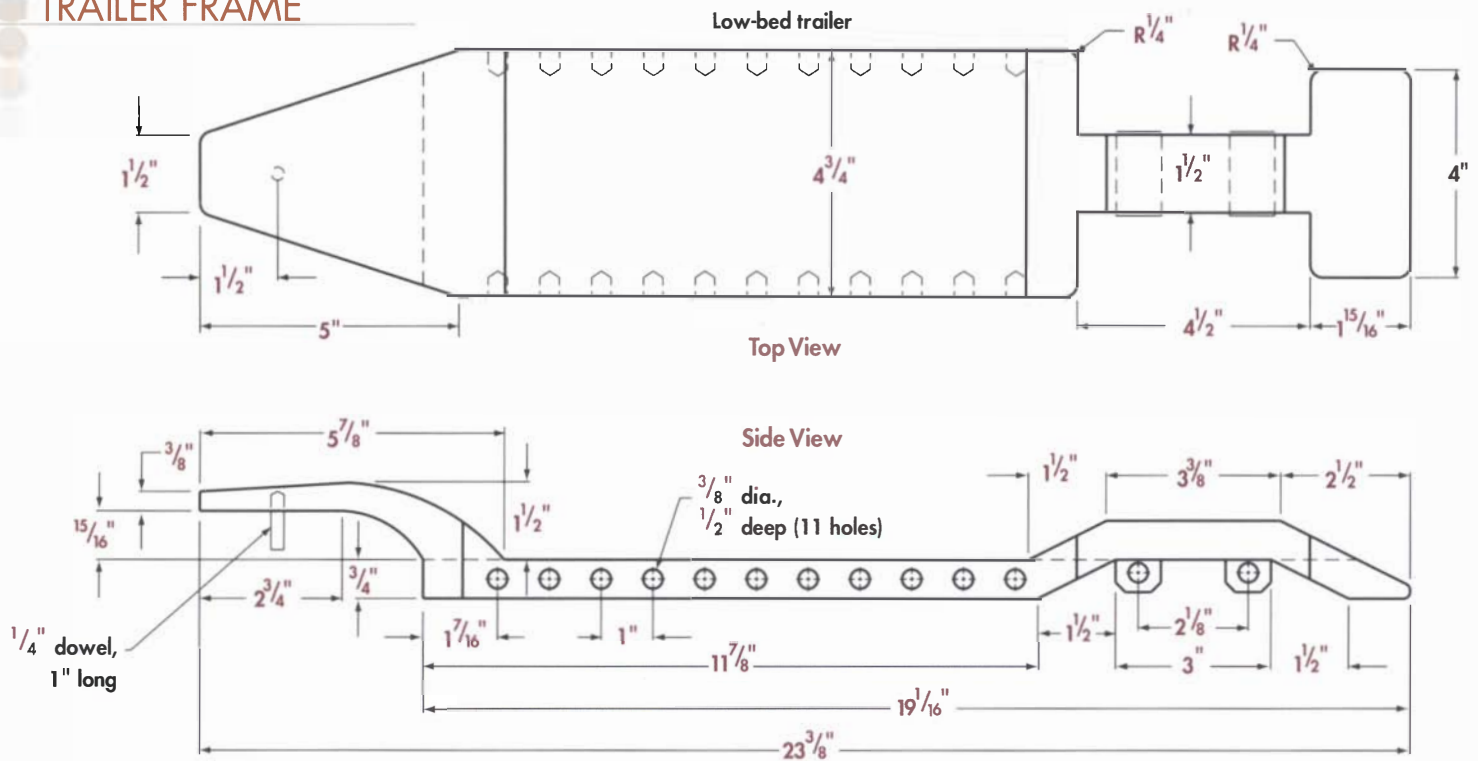
1. Cut the four blocks needed. Cut them about 1/8 in. wider than the finished sizes (normally 4 3/4 in., but they could be as narrow as 4 1/4 in. if desired).

Use 3/4-in.-thick planed wood for the frame base, so that the bed part of the trailer will already be at the finished size.

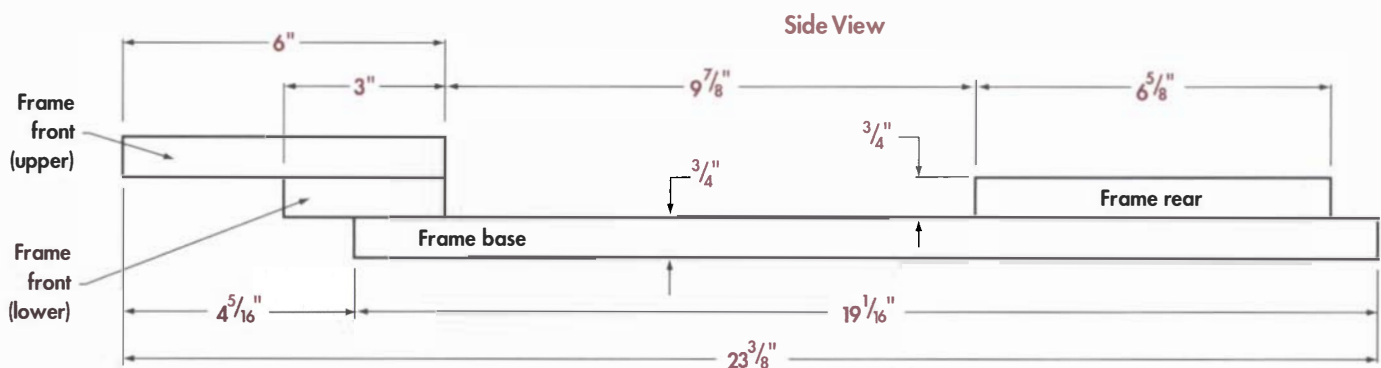
2. Laminate the four pieces together.

3. Plane or joint the edges so they are square and between 4 3/4 in. and 4 1/4 in. wide. The exact finished width is not important.

TRAILER FRAME



TRAILER LAYUP



4. Lay out and cut the side profile. Templates are provided for the front-hitch curves and the rear-wheel area.

This is a pretty deep band-saw cut. If possible, put a new blade on so it does not wander. Check that the blade is exactly square to the table and that the trailer is also sitting square to the table.





5. Lay out and cut the top profile.

6. File and sand as needed. I use a drum sander on the curves at the front, and I round all the corners and edges a little. This takes a while, with all the angles and curves.

7. Drill for the $\frac{1}{4}$ -in. hitch dowel. Drill from the bottom, but do not drill all the

way through since it looks a little better not to have the dowel showing from the top.

8. Lay out and drill the $\frac{1}{2}$ -in.-dia. side holes. These holes are for appearance only, but they look much better if the spacing is consistent.



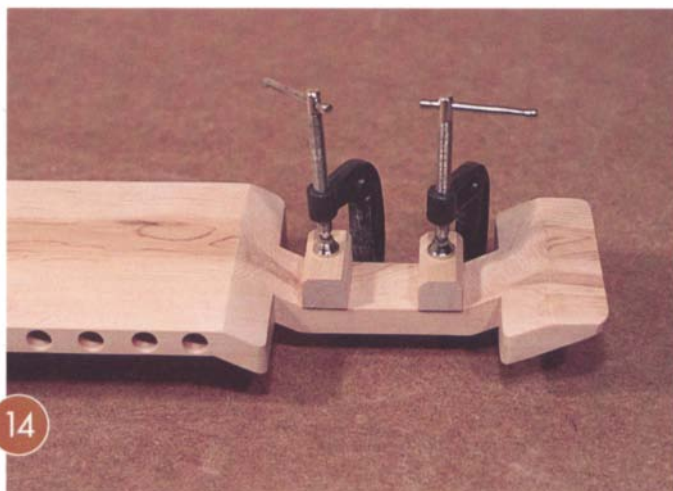
9. Plane or joint the edges a little if you need to remove any chips or break-outs caused by the drilling process.

10. Bevel any sharp corners.

11. Cut the hitch dowel about $1\frac{1}{8}$ in. long. Sand and bevel one end.

12. Put a little glue in the hole, and install the dowel from the bottom.

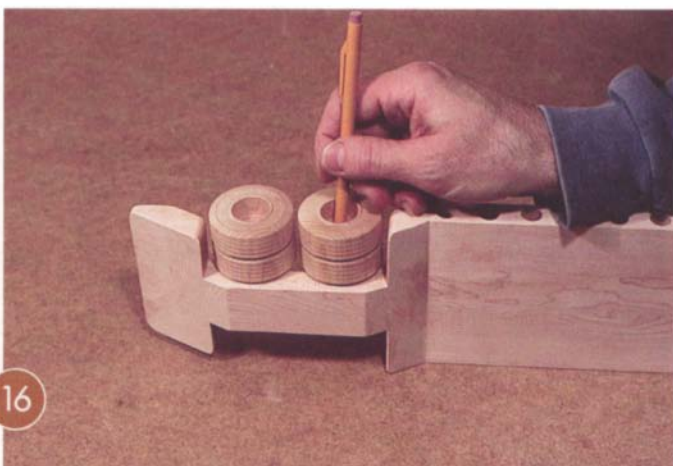
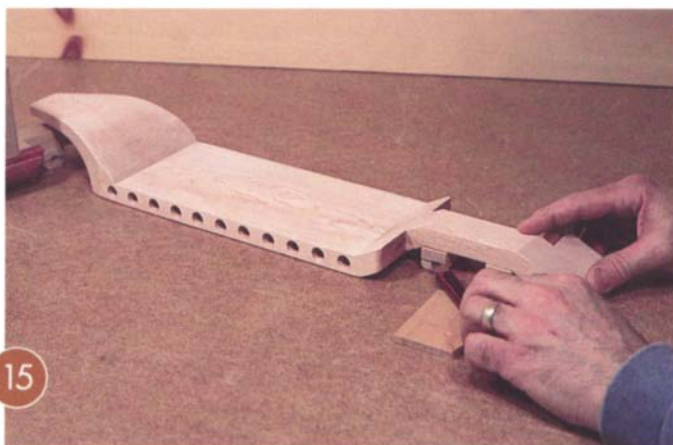
13. Cut two axle housings, using the material left over from the truck axle housings.



14. Glue the axle housings in place.

15. It is a good idea to locate the trailer axle holes with the trailer "hitched" in place. The holes should all be exactly the same distance off the ground, so I measure up from a flat surface.

Mark the hole centers on both ends of the axle housings.



16. Rest the wheels in place to mark the front-to-back location.

17. Drill for the axle pins, being as careful as you can to drill accurately.

18. Cut the pins if needed, to make sure they do not meet in the center of the axle housing.



Wheels

I use standard wooden toy wheels: two singles for the truck front, four duals for the back of the truck, and four more duals for the trailer. They are 2 in. dia. Most hobby stores carry them.

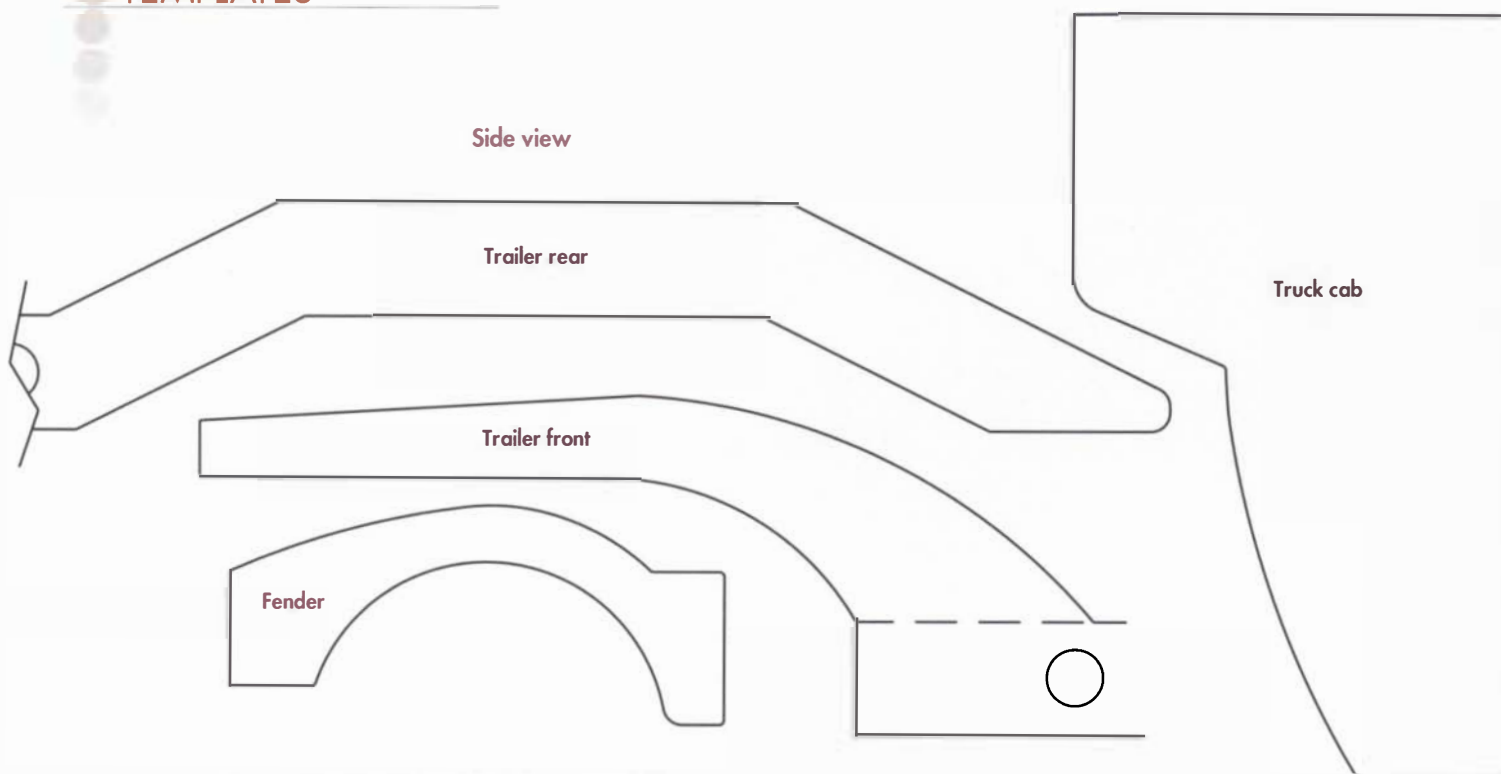
Follow the installation procedure described in chapter 3 (p. 56).

Finish

As desired. You may want to read the appendix on finishing on p. 172.

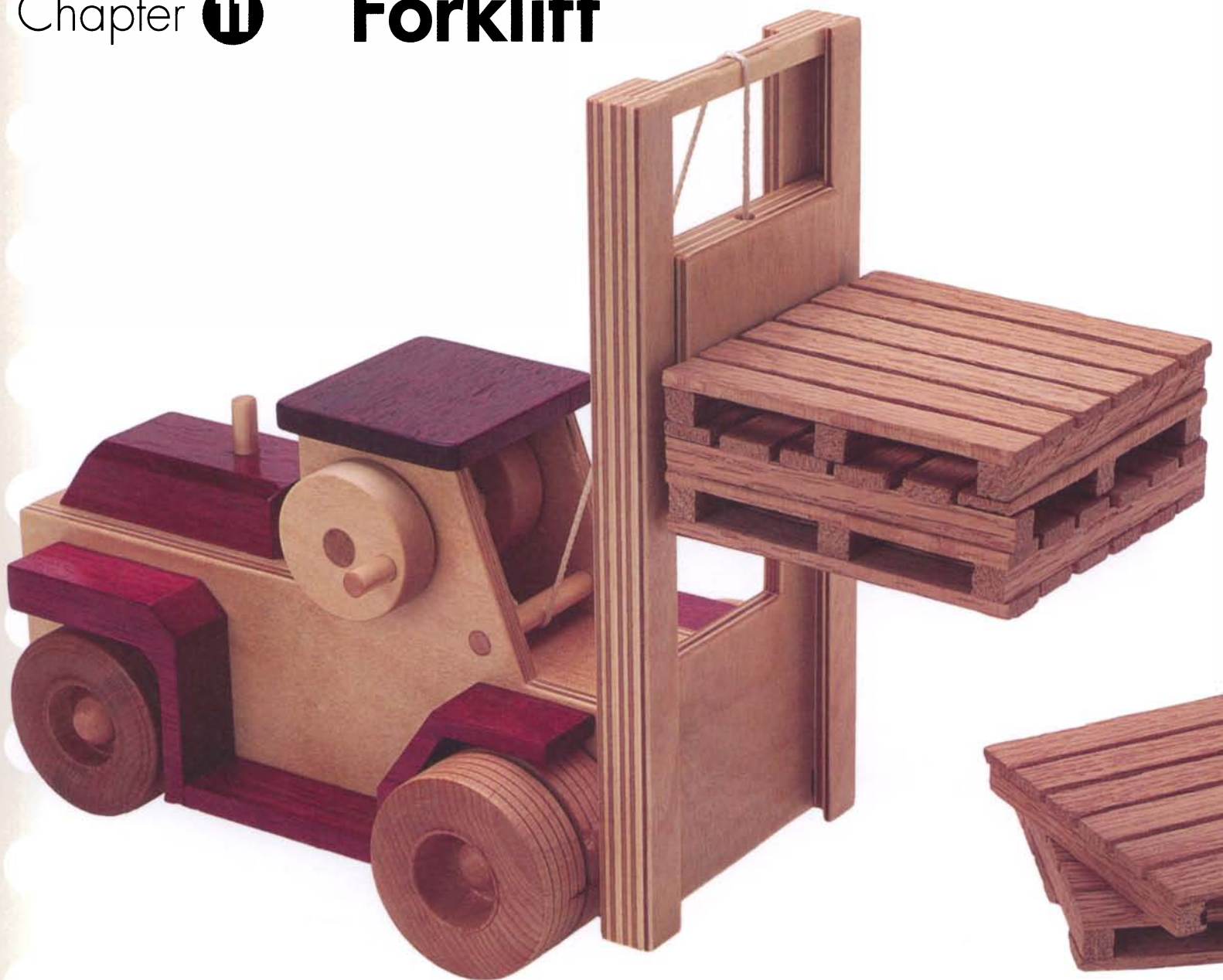
TEMPLATES

For full-size template, enlarge cab by 109%.



For full-size templates, enlarge fenders, trailer front, and trailer rear by 126%.

Chapter 11 Forklift



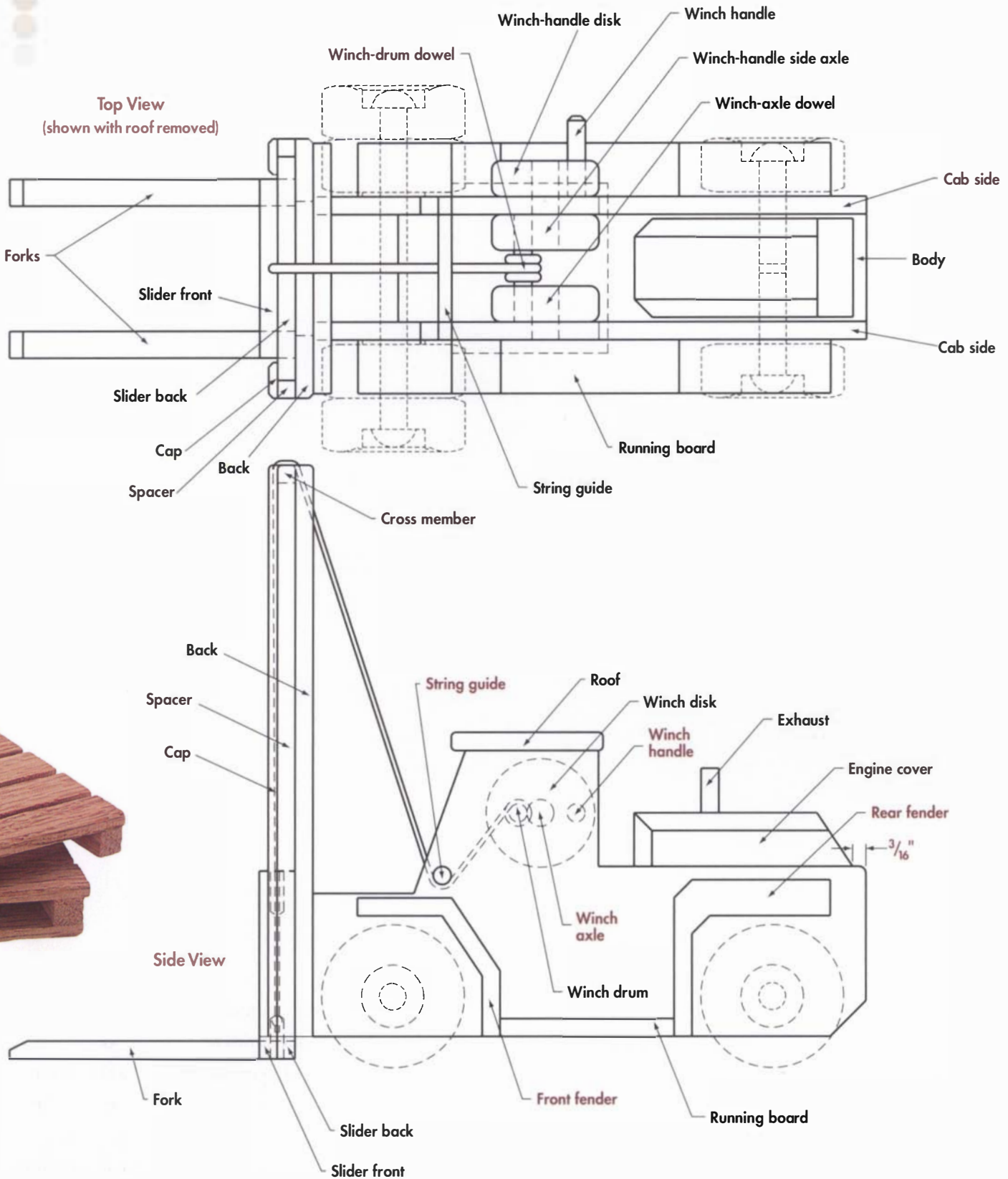
This forklift uses a winch to raise and lower the forks. Like the winch used on the tow truck and the skidder, this one is based on a cam design that ensures that the string does not unwind unless the operator turns the winch. The winch locks in place each revolution, holding the load up as the forklift is driven around.

Pallets for this forklift can easily be made. With these pallets, the flat-deck truck (chapter 5), the semi truck's

flat-deck trailer (chapter 9), and the low-bed truck's trailer (chapter 10) can be loaded with all sorts of goods.

The forklift consists of a central rectangular block for the body, with $\frac{1}{4}$ -in. sides attached to form the cab. The wheels and fenders are attached to these sides, and a winch is mounted in the cab. The fork and slider assembly is glued directly to the front of the body.

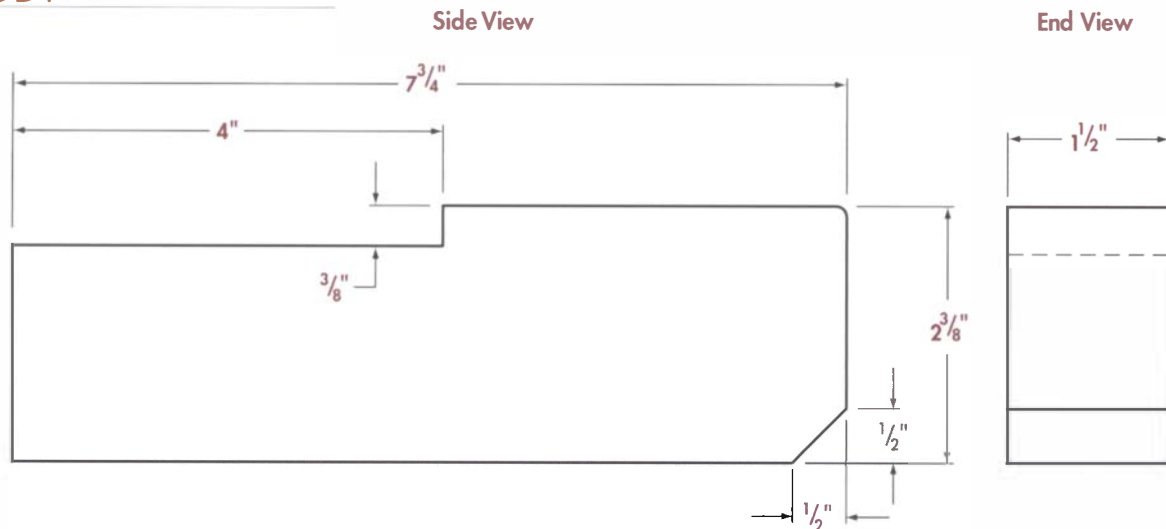
FORKLIFT PLAN



FORKLIFT

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Body	$7\frac{3}{4} \times 2\frac{3}{8} \times 1\frac{1}{2}$	1	
Cab sides	$7\frac{3}{4} \times 4 \times \frac{1}{4}$	2	Solid wood or Baltic plywood
Engine cover	$3 \times 1\frac{3}{8} \times \frac{3}{4}$	1	
Exhaust pipe	$\frac{1}{4}$ dowel x $1\frac{1}{8}$ long	1	
Axle pins	$1\frac{1}{32}$ dia.	4	
Wheels—single	2 dia. (factory made)	2	
Wheels—dual	2 dia. (factory made)	2	
Rear fenders	$2\frac{3}{16} \times 2\frac{3}{16} \times \frac{3}{4}$	2	
Front fenders	$2 \times 1\frac{15}{16} \times \frac{3}{4}$	2	
Running boards	$2\frac{7}{16} \times \frac{3}{4} \times \frac{1}{4}$	2	Cut length to suit—measure distance between fenders
Lift back	$8 \times 3\frac{5}{8} \times \frac{1}{4}$	1	Solid wood or Baltic plywood
Lift spacers	$8 \times \frac{1}{4} \times \frac{1}{4}$	2	Cut about $\frac{3}{8}$ in. wide; trim later
Lift caps	$8 \times \frac{1}{2} \times \frac{1}{8}$	2	Cut about $\frac{5}{8}$ in. wide; trim later
Lift cross member	$3\frac{1}{8} \times \frac{1}{4} \times \frac{1}{4}$	1	Cut length to suit—measure distance between fenders
Slider back	$3\frac{1}{8} \times 2\frac{5}{8} \times \frac{1}{4}$	1	Solid wood or Baltic plywood
Slider front	$2\frac{1}{2} \times 2\frac{5}{8} \times \frac{1}{4}$	1	Solid wood or Baltic plywood
Forks	$3\frac{3}{4} \times \frac{3}{8} \times \frac{3}{16}$	2	
Winch-handle disk	$1\frac{1}{2}$ dia. x $\frac{1}{2}$ thick	1	May be cut from $1\frac{1}{2}$ -in. dowel
Winch-drum side disk	$1\frac{1}{2}$ dia. x $\frac{1}{2}$ thick	2	May be cut from $1\frac{1}{2}$ -in. dowel
Winch-axle dowel	$\frac{3}{8}$ dowel x $1\frac{13}{16}$ long	1	
Winch-handle side axle	$\frac{3}{8}$ dowel x $1\frac{5}{16}$ long	1	
Winch handle	$\frac{1}{4}$ dowel x 1 long	1	
Winch-drum dowel	$\frac{1}{4}$ dowel x $1\frac{7}{16}$ long	1	
Roof	$2\frac{3}{8} \times 2\frac{3}{16} \times \frac{1}{4}$	1	
String	2 ft.		
Pallet beams	$3\frac{5}{8} \times \frac{1}{4} \times \frac{1}{4}$	3 ea.	Make five to ten pallets
Pallet planks	$3\frac{5}{8} \times \frac{1}{2} \times \frac{1}{8}$	12 ea.	Six each if bottom planks omitted

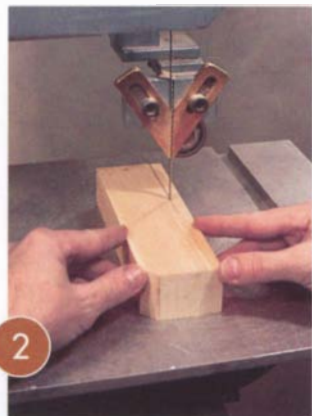
BODY



Body

The body is the block of wood that becomes the core of the forklift. The cab sides are later glued on each side, the lift frame is attached to the front, and the engine cover is glued to the top of the back.

1. Cut the body to its rectangular shape.
2. Lay out and cut the side profile ($\frac{3}{8}$ -in. by 4-in. notch and $\frac{1}{2}$ -in. by $\frac{1}{2}$ -in. angle).
3. Sand the top surfaces. These are hard to get at after the cab sides are glued on.



Cab Sides

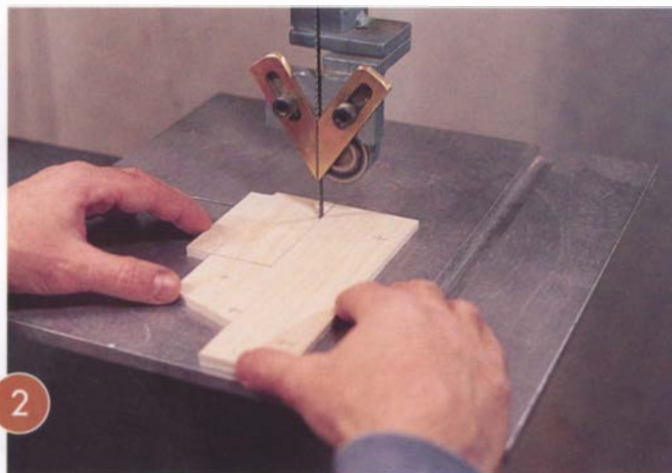
The cab sides provide the structure of the cab as well as the housing for the winch. The entire body is sandwiched between the two sides, and the fenders and running boards are glued to these sides later. You can use solid wood or Baltic plywood for the sides. I used plywood for this forklift.

1. Lay out the sides, either from the drawing or by using the template provided on p. 157. If this is the first project you are making from this book, you may want to take a look at the section on template use on p. 3.

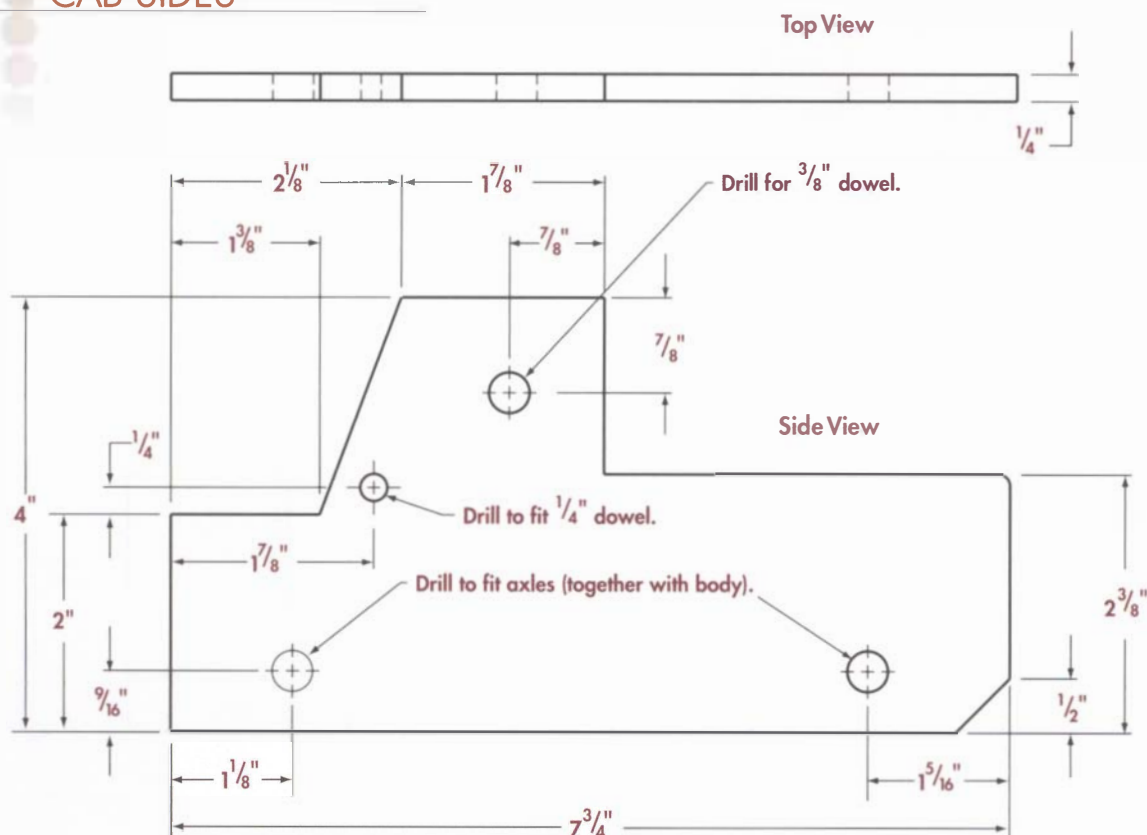
Mark the hole centers using an awl or other sharp tool. These centers only need to be marked on one of the cab sides.

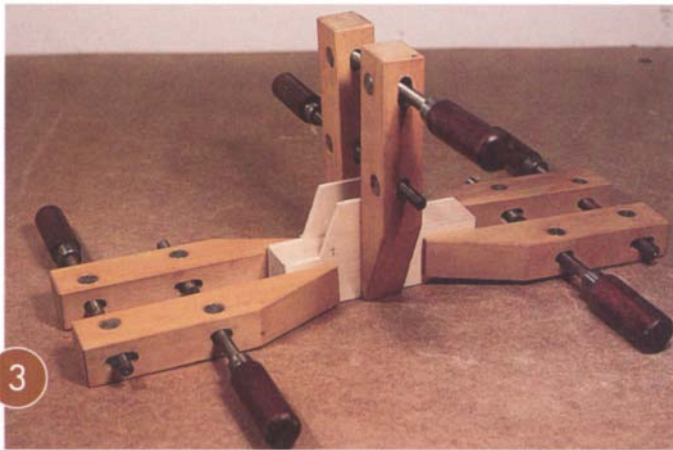
2. Cut the sides out using a bandsaw.

Don't bother sanding or filing the edges yet; do that after the sides are glued onto the body.



CAB SIDES





3. Glue the sides to the body, aligning the edges as closely as possible.

4. Sand the edges flush with the body.

Lay the forklift on its side, and touch the roof edges to the disk sander. You want to ensure that the roof has a flat surface to sit on, when you attach it later.

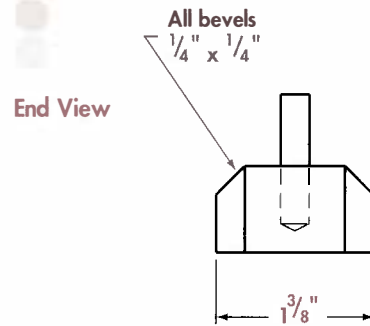
5. Drill the holes. The top hole should be sized for a sliding fit on $\frac{3}{8}$ -in. dowel. I use a $\frac{25}{64}$ -in. or $\frac{13}{32}$ -in. drill, depending on the exact size of the doweling. The hole for the $\frac{1}{4}$ -in. dowel is usually drilled with an F drill, which is just over $\frac{1}{4}$ in. dia., because $\frac{1}{4}$ -in. dowel is often a little oversize. A $\frac{17}{64}$ -in. drill also works well.

The axle-pin holes are generally drilled $\frac{1}{32}$ in. dia., the same size as standard axle pins. I buy these when I buy the wheels.

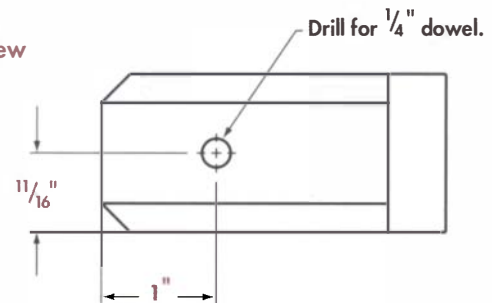
It is important that the axle holes are square to the body, so that the wheel centers are all the same distance up from the ground. If not, one of the wheels will be off the ground.



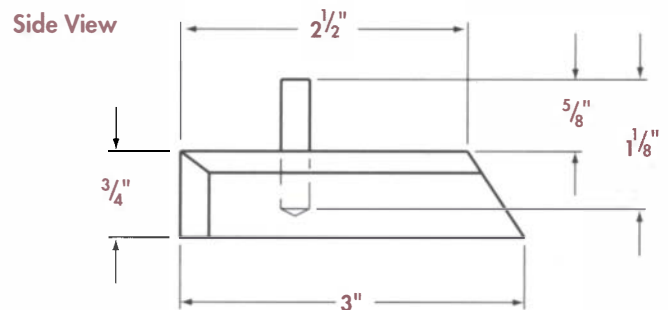
ENGINE COVER



End View



Top View



Side View

I had some small pieces of dark wood (bloodwood), so I used it for the fenders and engine cover, just to give the forklift a little color and contrast.

- 1.** Cut the block to a rectangular shape and size.
- 2.** Saw and sand the bevels on the corners.



Engine Cover

This is a small block with a few angles on the corners. It acts as the engine cover that some forklifts have. The angles are not critical, but they make the cover look better than it does with sharp corners.

3. Glue to the body, with the back of the engine cover about $\frac{3}{16}$ in. from the back of the body.

4. Drill the exhaust-stack hole, to a size that will fit your $\frac{1}{4}$ -in. dowel.

5. Cut the stack dowel $1\frac{1}{8}$ in. long, then sand and bevel each end slightly.

6. Install the stack dowel. Put glue in the hole only, using a toothpick.



Wheel Assembly

1. Test the locations of the axle-pin holes by putting the pins through the wheels and sliding them into the holes in the forklift, but don't use any glue yet. Roll the forklift on a flat surface.

If all the wheels turn, you are in business. If not, drill wheels to $\frac{2}{64}$ in. ($\frac{1}{64}$ in. over factory size) and try again. If worst comes to worst, either drill the wheels out to $1\frac{3}{32}$ in. or cut off the head of an axle pin and glue it into the errant axle hole. When the glue is hard, file or sand the end of the axle-pin plug flush with the forklift body, and drill again.

2. Remove the axle pins, and wax them in the bearing area only or use a Q-tip to put paste wax in the wheel holes.

3. Put glue in the forklift axle holes.

4. Install the dual wheels on the front and the single wheels on the rear.

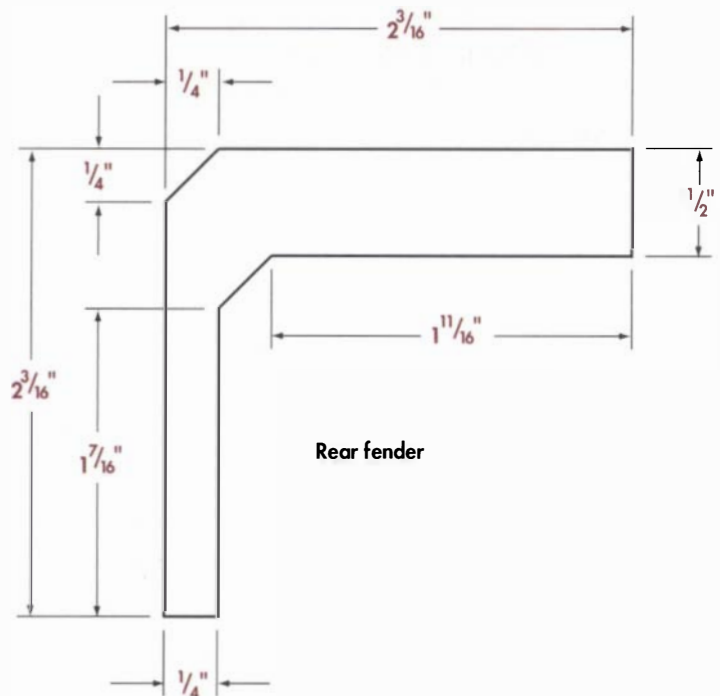
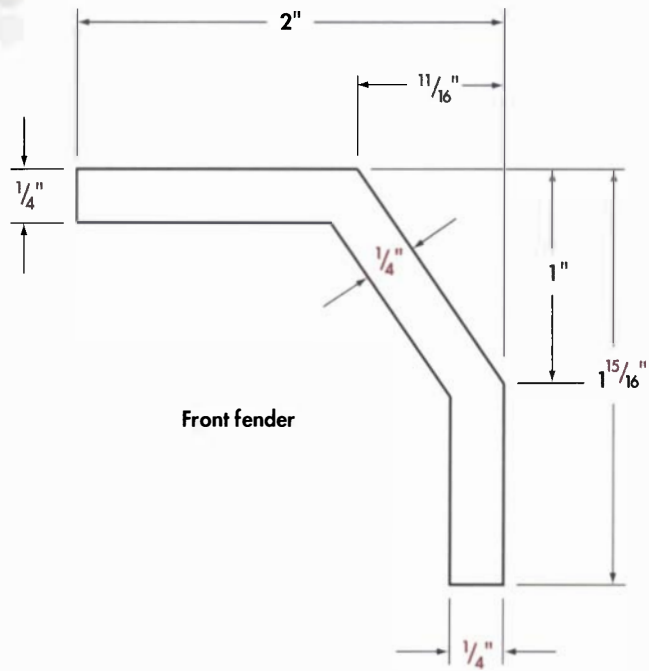


Fenders

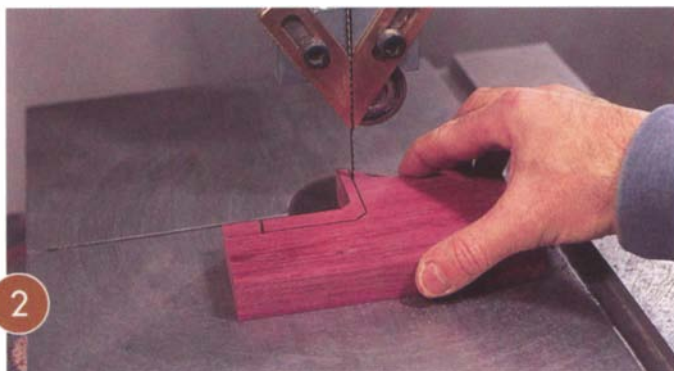
Four fenders are cut out, using wood that contrasts with the body and sides. After the fenders are glued onto the sides, you fit the running boards between the fenders.

1. Lay out the fender outlines on $\frac{3}{4}$ -in. stock. Tracing from the templates is an easy way to do this.

FENDERS

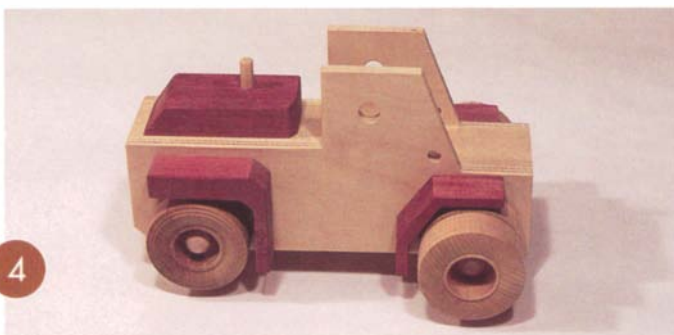


Note: Both fenders are $\frac{3}{4}$ " thick



- 2.** Bandsaw the fenders to shape.
- 3.** File and sand as needed.
- 4.** Glue the fenders to the forklift, leaving only slight clearance for wheels—perhaps a $\frac{1}{16}$ -in. gap. The exact location is not critical as long as the fenders are square to the bottom of the body and the wheels are not touching the fenders.

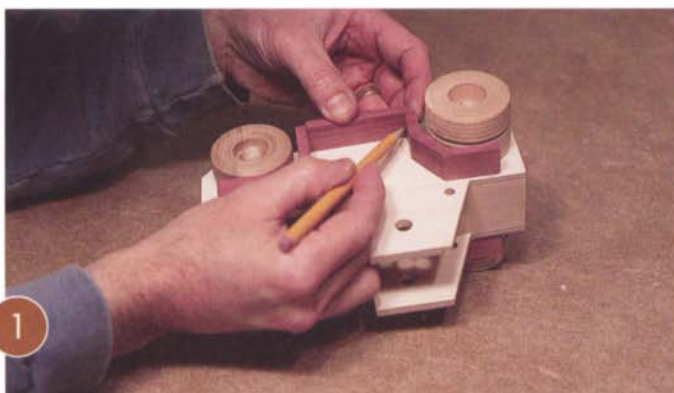
Clamping is optional here; I usually do not clamp.



Running Boards

The running boards are cut to fit between the front and rear fenders, then glued into place.

- 1.** Cut the running boards about $\frac{1}{8}$ in. longer than needed (measure off the forklift), then hold them in place to mark the exact length and end angle (just in case it is not exactly 90 degrees).



- 2.** Saw the running boards about $\frac{1}{32}$ in. too long, and disk-sand the last little bit, frequently checking the fit between the fenders.

- 3.** Glue the running boards in place. You may want to clamp them in place against the body.

Lift Frame

The lift frame provides a channel for the fork assembly to slide in. At the top, a cross member stiffens the frame and provides a “pulley” for the string to run over. The back is cut, the two spacers are attached, then the two caps are glued on to finish the sliding channel. The whole frame is glued to the front of the forklift.

- 1.** Cut the back and spacers from $\frac{1}{4}$ -in. stock. While solid wood is fine, I used Baltic plywood for this example. The spacers may be cut up to $\frac{1}{8}$ in. too wide because the final planing or sanding of the edges is done after the assembly is complete.

- 2.** Cut the caps from $\frac{1}{8}$ -in. wood. These can also be cut up to $\frac{1}{8}$ in. over their final width.

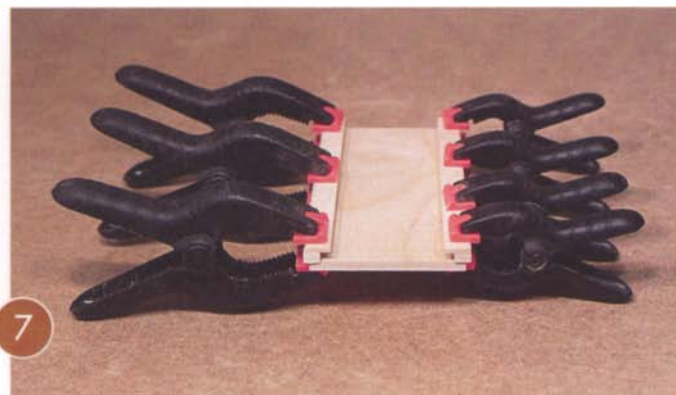
- 3.** Sand or plane one edge of the spacers and the caps. This finished edge will face the inside during assembly; the outside edges will be sanded or planed later.

- 4.** Measure in $\frac{1}{4}$ in. from each edge of the back, and mark out the location of the spacers.

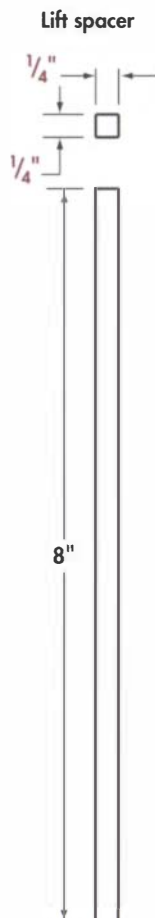
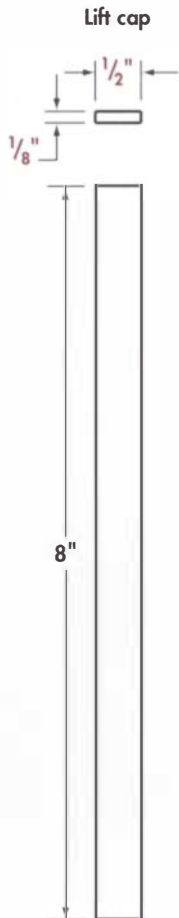
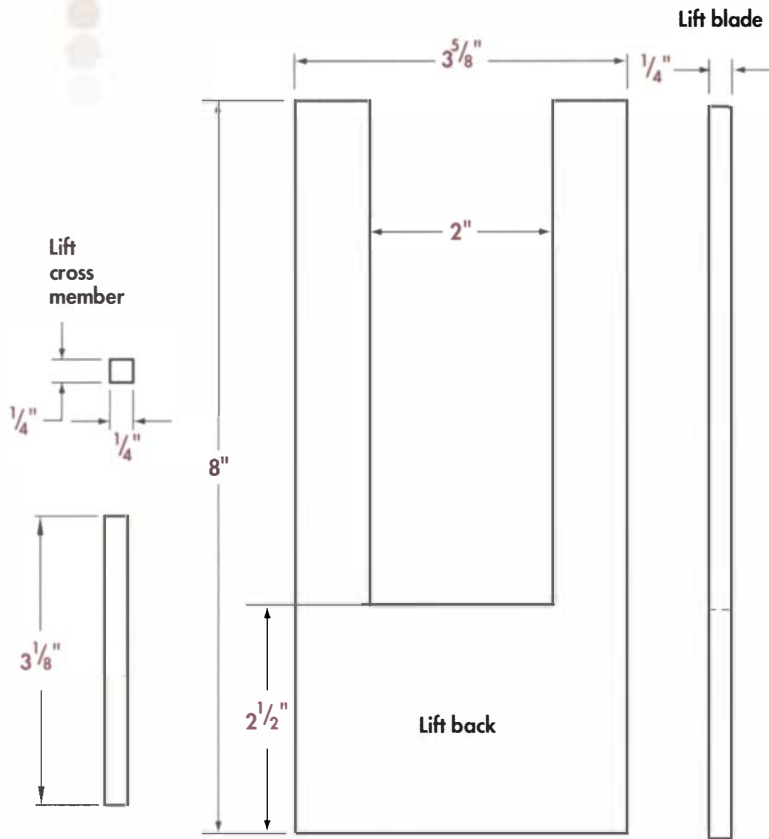
- 5.** Glue the spacers (not the caps yet) into place. Check that the inside edges are parallel.

- 6.** Clean any excess glue from the inside corner. This is nearly impossible to remove after the caps are on.

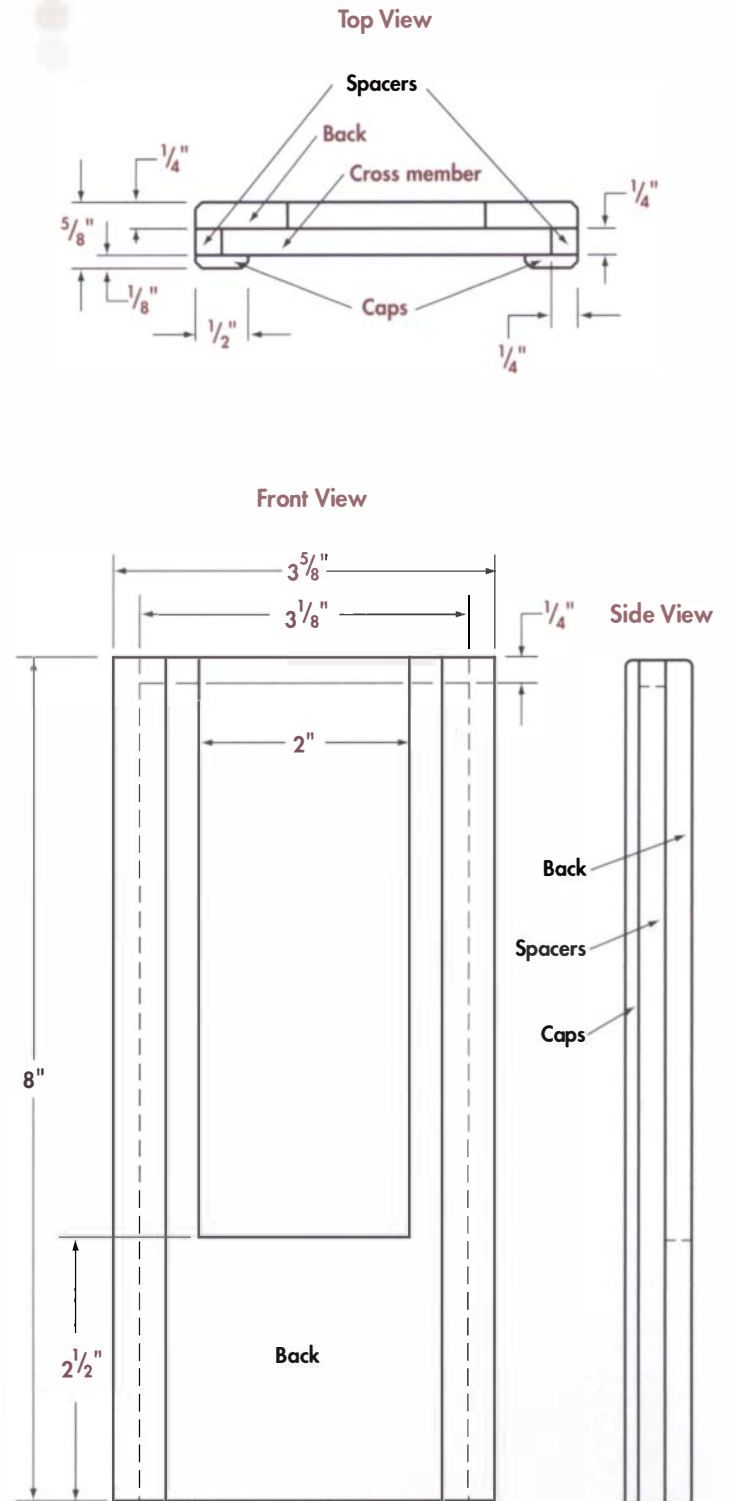
- 7.** Glue the caps to the spacers. Again, check that the inside edges are parallel. They should be about $2\frac{5}{8}$ in. apart.



LIFT

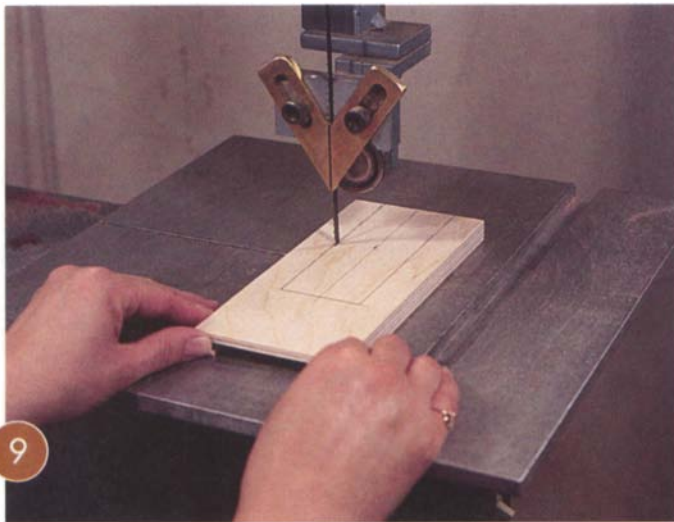


LIFT-FRAME ASSEMBLY



8. Sand or plane the outside edges smooth. Break all sharp corners with sandpaper.

9. Saw out the opening in the frame back.



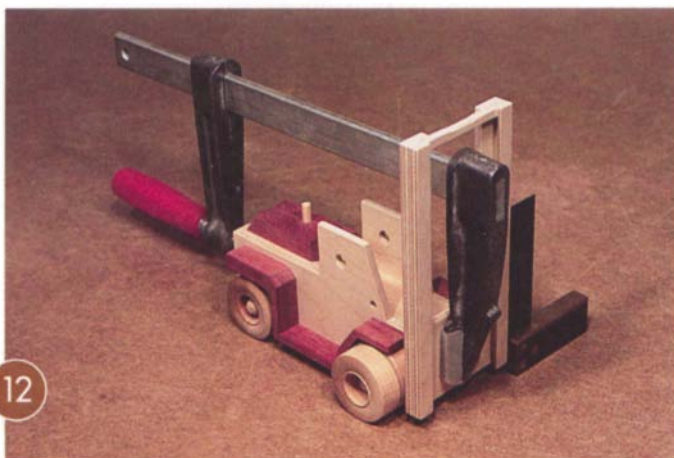
10. Cut the top cross member, using the same material you used for the spacers. Cut the length to fit between the spacers (about $3\frac{1}{8}$ in.).



11. Glue the cross member in place.

12. Round the top edge of the cross member somewhat, so the string will slide over it more easily.

13. Glue the lift frame assembly to the forklift front. Clamp it in place, and check that the lift frame is square to the forklift.



Fork and Slider Assembly

The forks are cut from $\frac{3}{16}$ -in.-thick wood ($\frac{1}{4}$ in. also works) and are glued into the slots that are cut into the slider (the part that slides up and down in the lift frame).

1. Saw two $\frac{3}{8}$ -in.-wide slices from $\frac{3}{16}$ -in.-thick solid wood, or saw two $\frac{1}{16}$ -in. slices from $\frac{3}{8}$ -in.-thick wood. In either case, cut the material a little oversize because you'll need to sand or plane the saw marks out. The exact thickness and width is not crucial.

2. Sand all edges, including the bevel on the end.

3. Cut the slider back out of $\frac{1}{4}$ -in.-thick wood. It should end up about $\frac{1}{32}$ in. narrower than the distance between the spacers in the frame (about $3\frac{1}{8}$ in.).

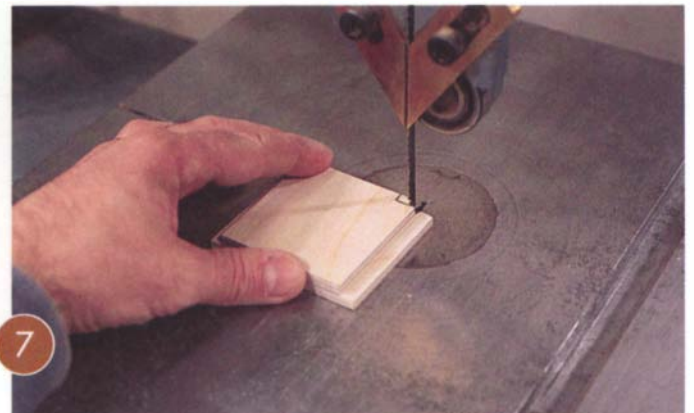
4. Sand it slightly thinner so it slides freely in the frame channel. The veneer of Baltic plywood is thick enough that you can sand it thinner as well, if you are careful to take equal amounts from each side.

5. Cut the slider front, also of $\frac{1}{4}$ -in.-thick wood. It should fit between the caps, with $\frac{1}{32}$ -in. to $\frac{1}{16}$ -in. space on each side.



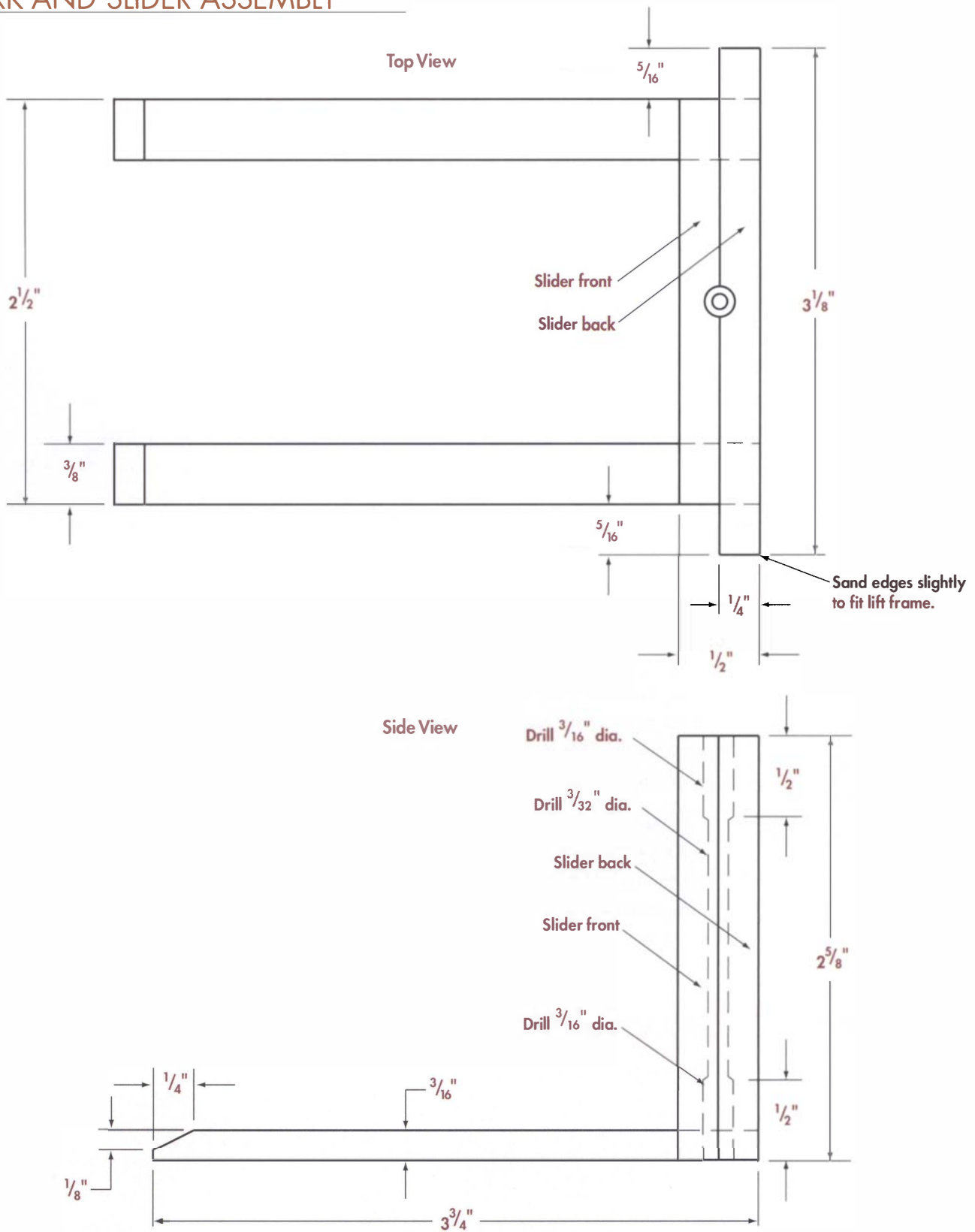
6. Glue the slider front to the slider back, checking that the slider unit slides freely.

7. Lay out the notches for the forks, sizing them to fit the forks snugly.





FORK AND SLIDER ASSEMBLY





8. Fit the forks in place, and glue them in. Make sure that both forks sit flat and are parallel. Check that the slider back is square to the forks.

9. Drill a $\frac{3}{16}$ -in. hole from the bottom, $\frac{1}{2}$ in. deep, as shown in the bottom drawing on p. 155.

10. Drill a $\frac{3}{32}$ -in. hole next. It starts at the bottom of the

$\frac{3}{16}$ -in. hole and goes as deep as possible, right through if the drill is long enough (it usually isn't). If it does not go right through, drill down from the top using the $\frac{3}{16}$ -in. drill, until it meets the smaller hole.

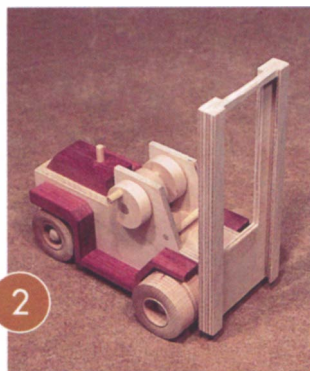
11. Sand as needed.

Winch

See the tow-truck winch drawings and instructions in chapter 4, pp. 64–66. This winch is identical but is mounted in the forklift cab. For the forklift winch, install the $\frac{1}{4}$ -in. string-guide dowel before installing the winch. This makes it easier to sand the ends of the dowel flush with the cab sides.

1. Glue the $\frac{1}{4}$ -in. string-guide dowel in place, and sand the ends flush.

2. Install the winch.



Cab Roof

1. Cut the roof from $\frac{1}{4}$ -in. stock. I used the same wood as for the fenders and running boards but only because I like the contrasting color.

2. Check that the roof sits flat on the top of the cab sides, and then glue it in place. A weight on top will have the effect of clamping.

Finish

As desired. You may want to read the appendix on finishing on p. 172.

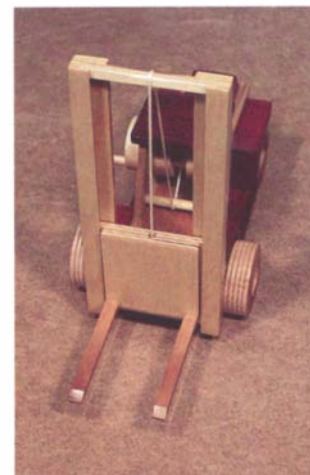
If the fork assembly has very little clearance in the frame, you may want to mask the sliding surfaces before applying the finish.

String

The string (about 2 ft. long) is run through the fork and slider assembly and knotted at the bottom. The other end goes up and over the top cross member, then down under the string-guide dowel.

Tie the string onto the winch, and put a drop of glue on to keep it from slipping. You could also drill a small hole in the winch-drum dowel and slip the string through that hole to start it (see p. 66 in chapter 4).

Wax the sliding surfaces, and slide the fork assembly into the frame.



Pallets

These pallets are easy to make and are a great accessory for the forklift. Little sanding is needed since rough cut wood looks a little more authentic. No finish is needed either, nor is any degree of accuracy. Just slap them together; make 10 or 12.

1. Cut the planks ($\frac{1}{2}$ -in.-wide strips of $\frac{1}{8}$ -in. plywood or $\frac{1}{8}$ -in. side strips of $\frac{1}{2}$ -in. solid wood). Bandsaw these fairly straight, but don't bother to sand these strips because the bandsaw-cut surfaces look more realistic.

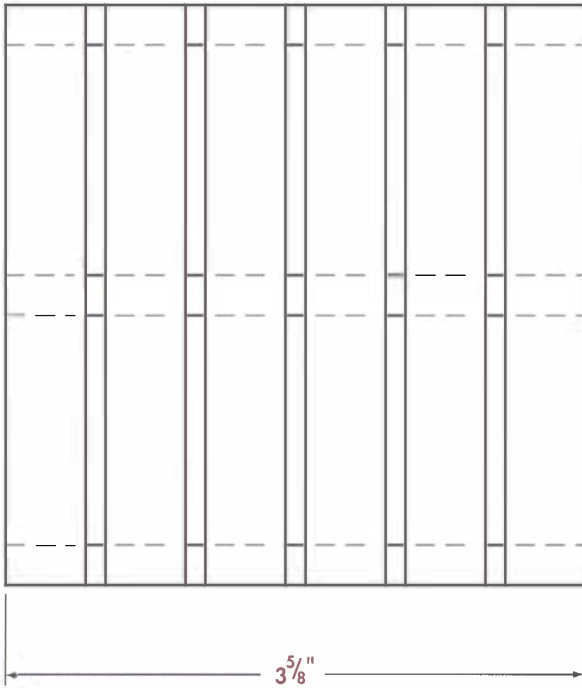
2. Cut $\frac{1}{4}$ -in. by $\frac{1}{4}$ -in. beams. Leave the bandsaw cut marks as they are; just sand the sharp corners.

3. Glue together, placing a weight on the pallet to hold things in place. Don't get too worried about spacing or sizes. If they are a little crooked, or parts overhang a bit, so much the better.

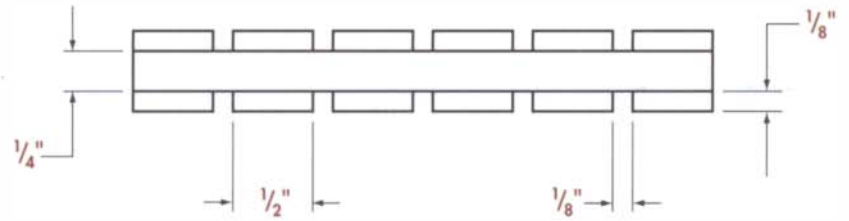
4. Glue on some barrels or blocks if you want. This makes it a little nicer to play with because they don't fall off, but be sure to leave a few pallets empty so kids can load them up as they want. No finish is really needed on these pallets, nor would it hurt.

PALLETS

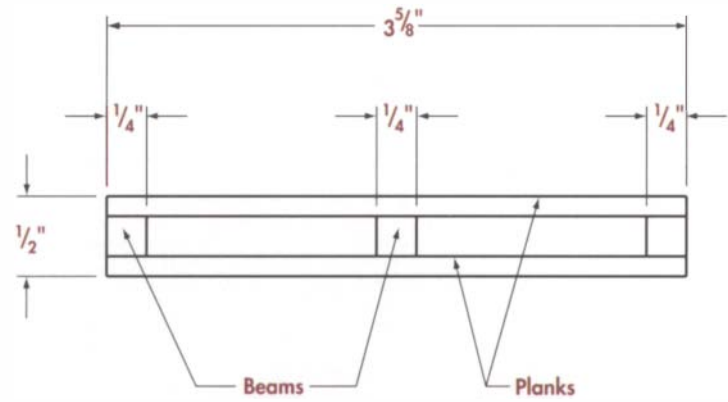
Top View



Side View



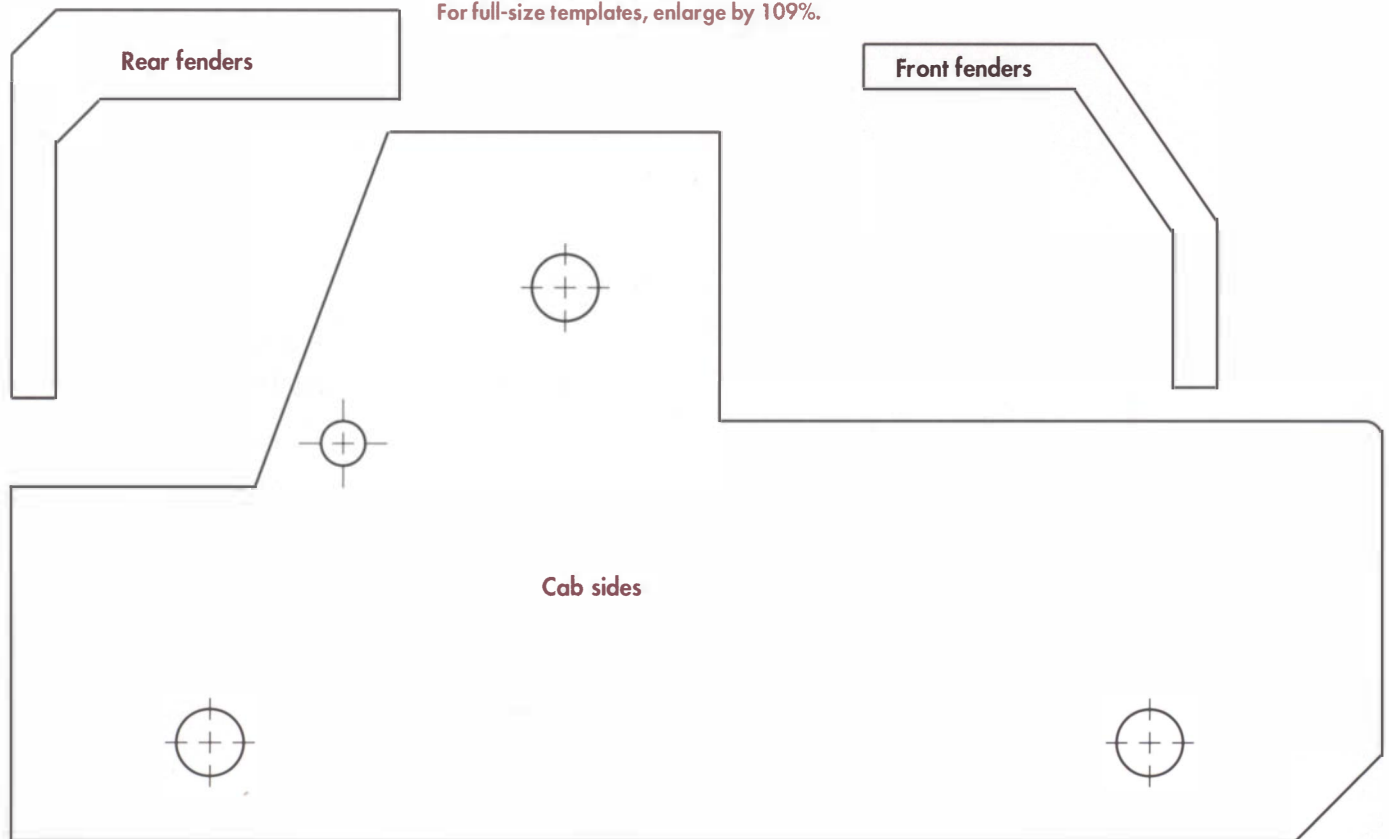
End View



Note: Bottom row of planks may be omitted.

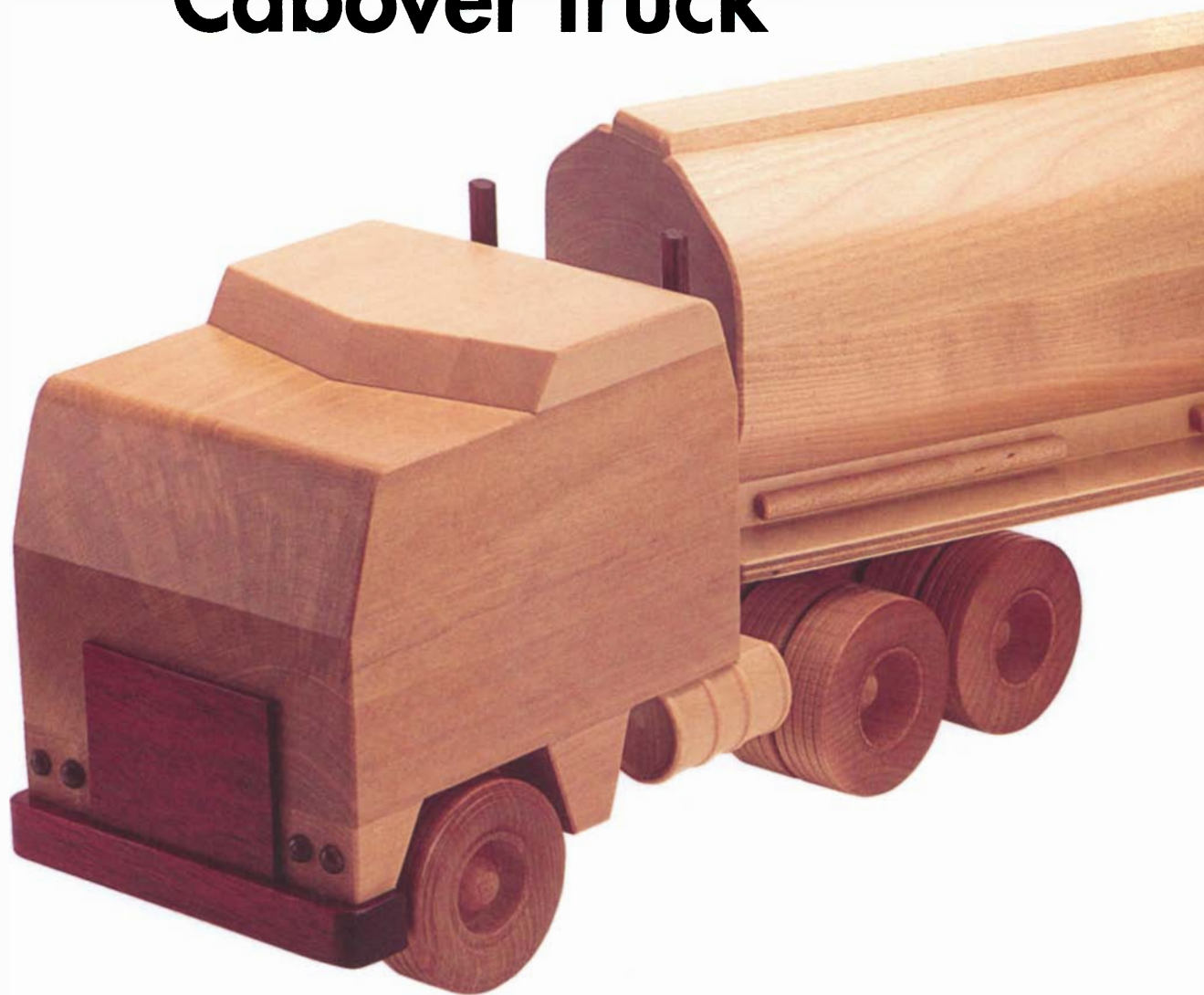
TEMPLATES

For full-size templates, enlarge by 109%.



Chapter 12

Tandem Cabover Truck



If one trailer is good, two must be better.

This truck is a little different from the others, partly because it has tandem trailers (two short trailers) and partly because the truck is a cabover design with a sleeper. The tandem trailers make this truck fun to hook up and drive—and especially to back up.

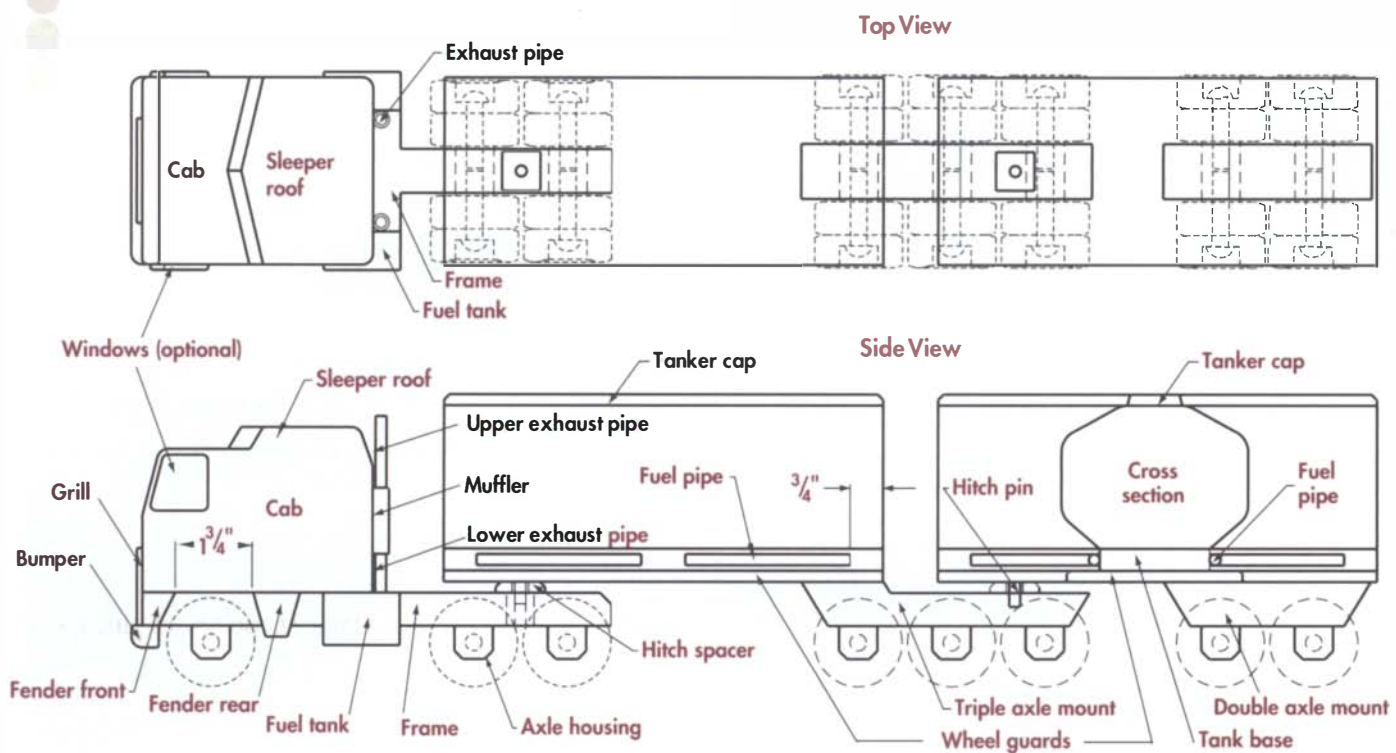
It is possible to simplify the trailers and make two flat-deck trailers. I'll discuss that option throughout this chapter.

The truck can be used to haul the trailers of the semi truck (chapter 9) or the low-bed truck (chapter 10). Likewise, the tanker trailers can be used with either of those trucks.

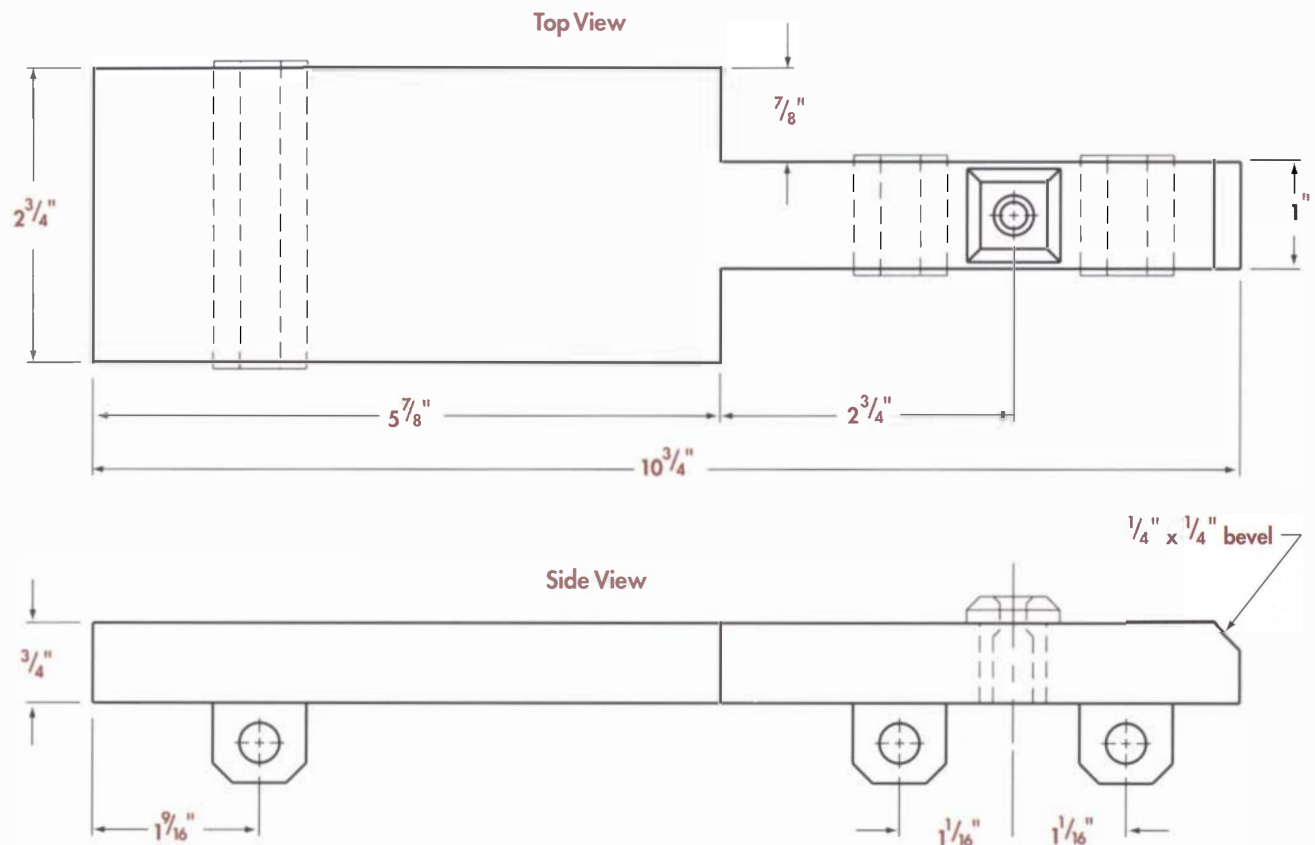
The truck is an almost-square block attached to a board frame with wheels. The trailers are almost identical to one another, each consisting of a large shaped block glued to a thinner board with wheels mounted underneath.



TANDEM CABOVER TRUCK PLAN



FRAME

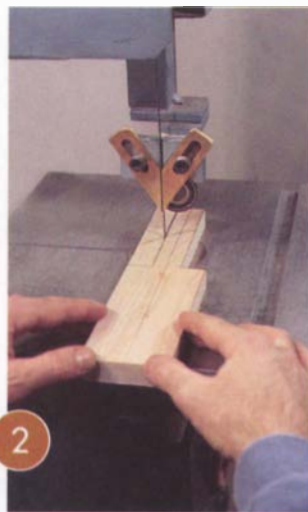


Frame

The frame of this toy truck has the same function as the frame on a full-size truck. It is the backbone to which are attached the cab, the axles, and the fuel tanks.

1. Lay out the frame on $3/4$ -in.-thick stock. Working from a centerline is probably the best system.

2. Bandsaw to shape, but leave the $2\frac{3}{4}$ -in. width about $1/32$ in. oversize, if anything. That way, the fender parts will later protrude past the cab a little, maybe $1/64$ in. or $1/32$ in. It is much easier to sand when the fenders are protruding a little past the cab.

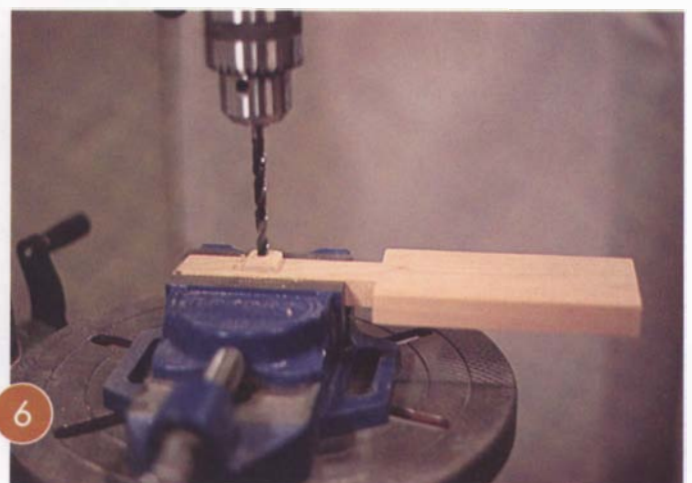


3. Sand all surfaces as needed.

4. Make the hitch spacer by cutting a small square of $1/4$ -in.-thick material and beveling the edges. Also make one for the trailer at this time.

5. Glue the hitch spacer in place.

6. Drill the $9/32$ -in. hitch-pin hole.



TANDEM CABOVER TRUCK

PART NAME	FINISH DIMENSIONS (IN.) (L X W X T)	NO. REQ'D.	NOTES
Truck frame	10 ³ / ₄ x 2 ³ / ₄ x ³ / ₄	1	
Hitch spacers	⁷ / ₈ x ⁷ / ₈ x ¹ / ₄	2	
Sleeper roof	3 ⁵ / ₁₆ x 4 ¹ / ₄ x ¹ / ₂	1	Could use ⁵ / ₈ in. or ³ / ₄ in. thick
Cab	5 ¹ / ₄ x 4 ¹ / ₄ x 3 ¹ / ₄	1	Sleeper roof is a separate piece
Fender fronts	⁷ / ₈ x ³ / ₄ x ³ / ₄	2	
Fender rears	1 ¹ / ₈ x 1 x ³ / ₄	2	
Truck front axle housing	2 ⁷ / ₈ x ⁷ / ₈ x ³ / ₄	1	Make enough for all eight housings
Truck rear axle housings	1 ¹ / ₈ x ⁷ / ₈ x ³ / ₄	2	Make enough for all eight housings
Trailer axle housings	1 ³ / ₈ x ⁷ / ₈ x ³ / ₄	5	Make enough for all eight housings
Bumper	4 ¹ / ₂ x ⁵ / ₈ x ¹ / ₂	1	
Grill	2 ³ / ₈ x 1 ³ / ₄ x ¹ / ₈	1	Use wood that contrasts with cab
Side windows (optional)	1 ⁵ / ₁₆ x 1 ¹ / ₄ x ¹ / ₈	2	Could be ¹ / ₁₆ in. thick
Headlights	¹ / ₄ dowel x ⁵ / ₁₆ long	4	Round end before cutting to length
Fuel tanks	1 ¹ / ₈ dowel x 1 ³ / ₄ long	2	May use factory-made barrels
Exhaust pipes (upper)	¹ / ₄ dowel x 2 ¹ / ₈ long	2	
Exhaust pipes (lower)	¹ / ₄ dowel x 1 ³ / ₈ long	2	
Mufflers	³ / ₈ dowel x 1 ¹ / ₂ long	2	
Trailer tanks	10 x 4 ¹ / ₄ x 3 ¹ / ₄	2	
Trailer tank caps	10 x 1 ¹ / ₄ x ¹ / ₄	2	
Trailer tank bases	10 x 2 ¹ / ₂ x ¹ / ₂	2	
Wheel guards	10 x 4 x ¹ / ₄	2	
Hitch dowels	¹ / ₄ dowel x 1 ³ / ₄ long	2	
Trailer front flat deck	10 x 4 ³ / ₄ x ¹ / ₂	1	Cut only if making flat-deck option
Trailer rear flat deck	11 x 4 ³ / ₄ x ¹ / ₂	1	Cut only if making flat-deck option
Trailer flat-deck tie-downs	¹ / ₄ dowel x ⁵ / ₈ long	18	Cut only if making flat-deck option
Trailer fuel pipes	¹ / ₄ dowel x 3 ³ / ₄ long	8	
Trailer triple axle mount	6 ¹ / ₂ x 1 ¹ / ₄ x 1	1	
Trailer double axle mount	4 ³ / ₄ x 1 ¹ / ₄ x 1	2	
Axle pins	1 ¹ / ₃₂ dia.	16	
Wheels—single	2 dia. (factory made)	2	
Wheels—dual	2 dia. (factory made)	14	

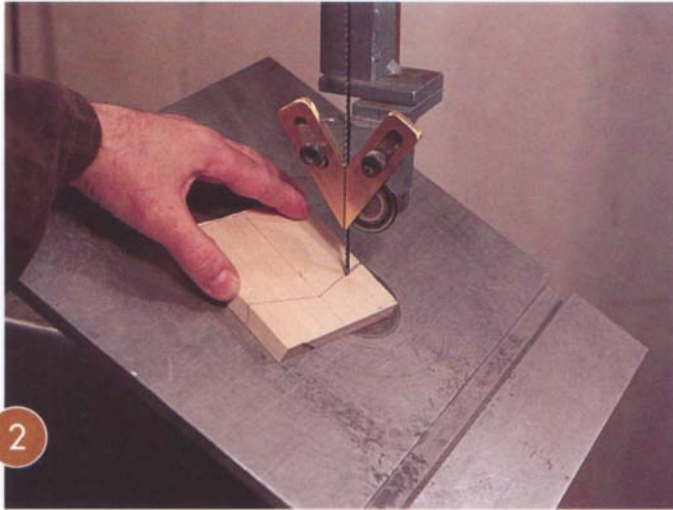
7. Countersink the top a little, to about ³/₈ in. dia.

8. Enlarge the hitch hole by drilling from the bottom about ⁹/₁₆ in. deep with a ³/₈-in. drill. This leaves the top ³/₁₆ in. of the original ⁹/₃₂-in. hole and provides clearance to allow the hitch pin to pivot a little, as the truck and trailer drive over dips and rises.

Sleeper Roof

This roof is a small raised section that is glued to the top of the cab. It is much easier to cut and sand the angled surfaces of the sleeper roof while the roof is a separate block of wood.

1. Lay out on ¹/₂-in.-thick wood that closely matches the cab. Saw the sides and back to rough size, leaving it about ¹/₁₆ in. over on each cut. You could use ⁵/₈-in.-thick or even ³/₄-in.-thick wood if desired.

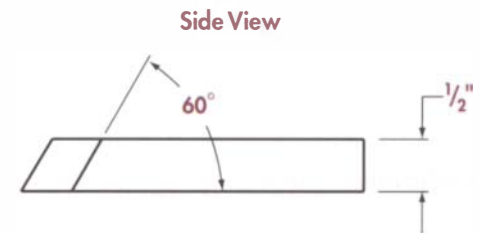
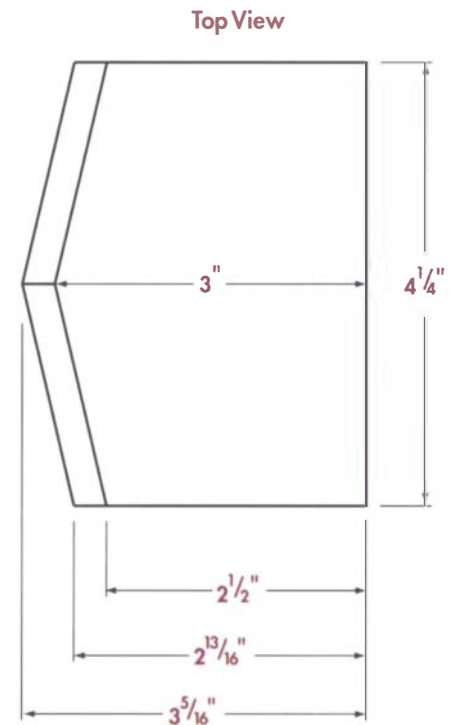


2. Set the bandsaw table to 30 degrees, and saw the front edges.
3. File and sand these angled edges. Don't worry about the sides yet; it is better to sand them after the sleeper roof is glued to the cab.

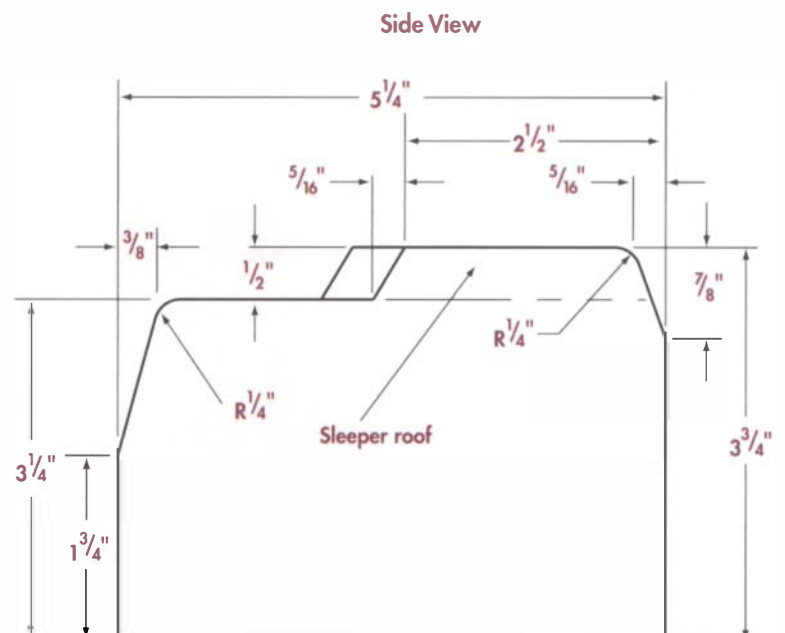
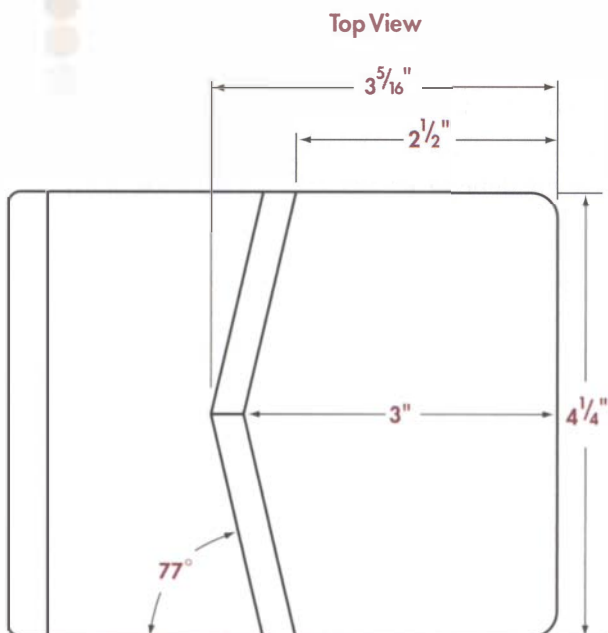
Cab

1. Laminate wood for the cab, if needed.
2. Trim to size, squaring all sides. The length is not critical, but the 4 1/4-in. width should be very close. You want it to

SLEEPER ROOF



CAB



be just under 1 1/2 in. wider than the frame. The cab should overhang the frame almost (but not quite) 3/4 in. on each side.

3. Drill holes in the bottom to lighten if desired. In this example, there are two 2-in. holes, on center. The holes are 2 1/16 in. apart, center to center, and were drilled 2 1/2 in. deep.

4. Finish-sand the top of the cab, but keep in mind that it needs to remain quite flat so the sleeper roof can be attached without large gaps.

5. Glue the sleeper roof to the cab. Have the sides and back surfaces of the roof slightly overhanging the cab. Remove excess glue from along the front while it is still easy to do, before it hardens completely.

6. Sand the sides even. Don't do the finish-sanding now, however, because the small fender parts will need some trimming and sanding after they are in place.

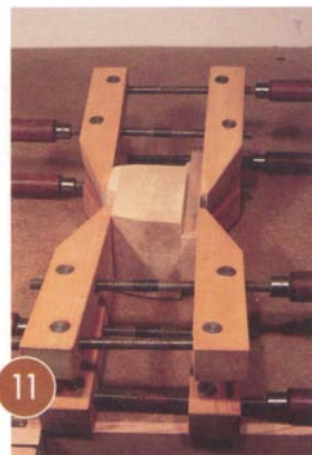
7. Lay out the angles on the front and rear of the cab top.

8. Saw these angles using the bandsaw.

9. File or sand the rounded edges on the front and back top corners.

10. Finish-sand the top and back of the cab.

11. Glue the cab to the frame.

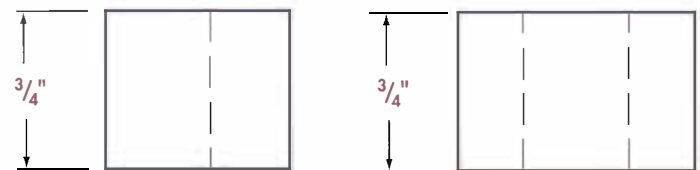


FENDER PARTS

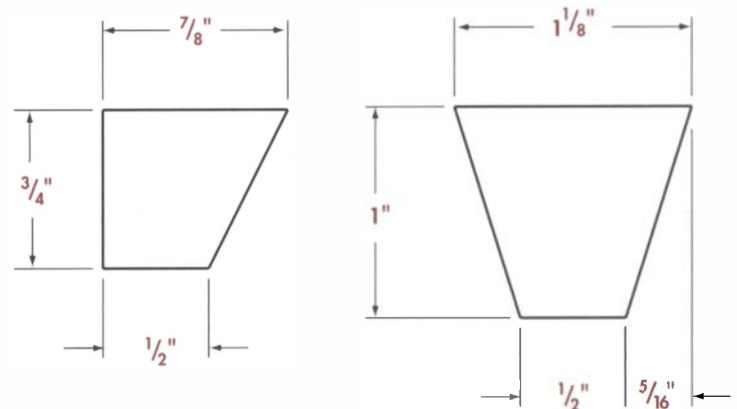
Fender front

Fender rear

Top View



Side View



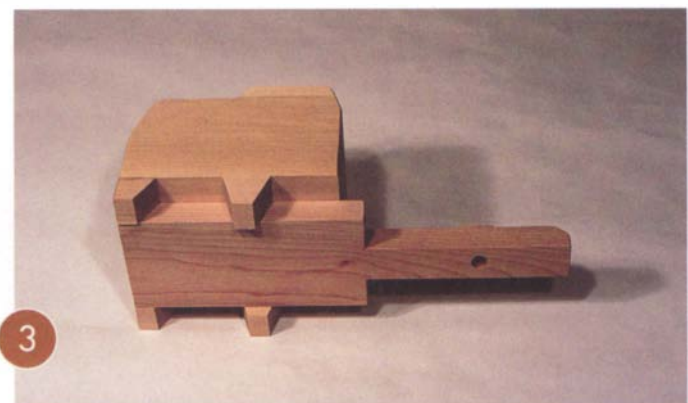
Fender Parts

These four small parts make up the two wheel wells.

1. Cut parts from 3/4-in.-stock. Use wood that matches the cab, if possible.

2. File and sand as needed. The edges of these parts are very hard to sand after installation.

3. Glue to the cab and frame. Don't clamp these parts; just press them in place and rub them back and forth slightly. If you have not done so already, take a quick look at my notes on gluing on pp. 2–3.

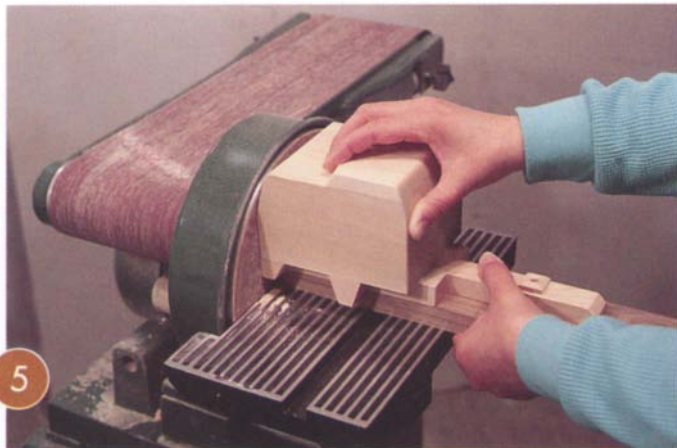


4. File or plane the bottoms of the fender fronts (the parts that go just in front of the wheel wells) so they are flush with the frame. You will glue the bumper here, so it is important to have this quite flat.

5. Disk-sand the cab front so the fender fronts are flush with the rest of the cab.

You will need to have a spacer strip of wood under the frame while sanding; otherwise the fender rears (the parts that go just behind the wheel wells) will keep the assembly from lying flat on the table.

This could also be done by hand, but keep the front quite flat if you are planning to put the grill on later.



Axle Housings

See the dump-truck instructions in chapter 3 (p. 50). Make enough for the truck plus five trailer housings.

Bumper

1. Cut out the bumper. I cut the bumper from wood that contrasts with the cab, although similar wood is certainly an option.

2. Sand as needed, rounding the corners as shown on the drawing. Break all other sharp corners as well.

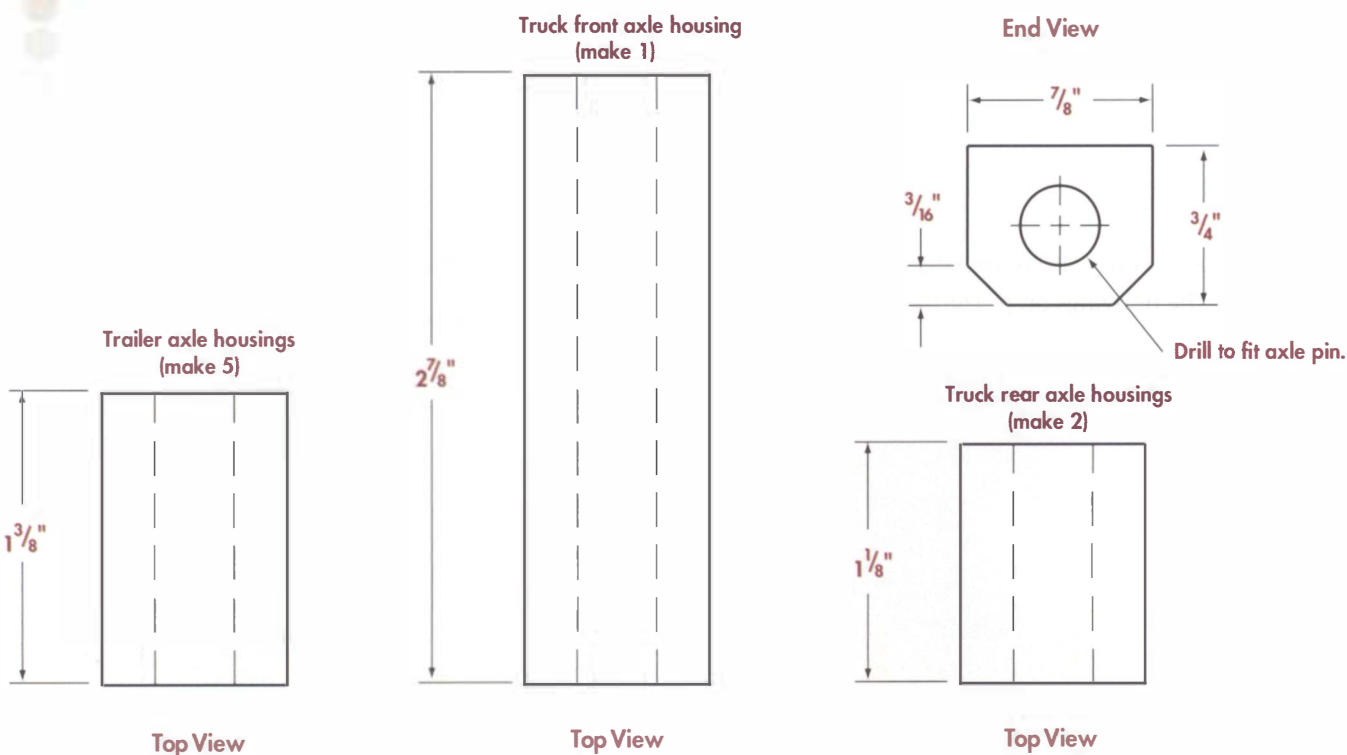
3. Glue the bumper to the truck. It protrudes out the front about $\frac{1}{4}$ in., and the rear edge lines up with the front of the wheel well.

Grill and Windows

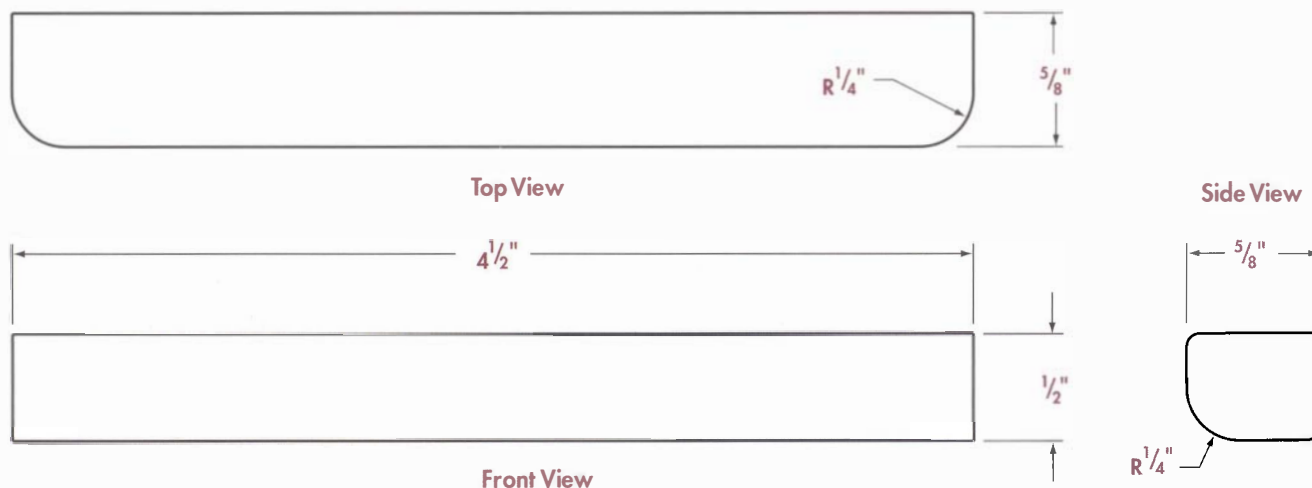
These parts are decorative. I usually add the grill but seldom make the windows. The process, however, is the same for both.

1. Cut from wood that contrasts with the cab—thin wood is preferred, so $\frac{1}{8}$ -in. plywood works, as does $\frac{1}{16}$ -in.-thick wood. I had a thin slice of walnut so I used that.

AXLE HOUSINGS



BUMPER



2. Sand the edges.

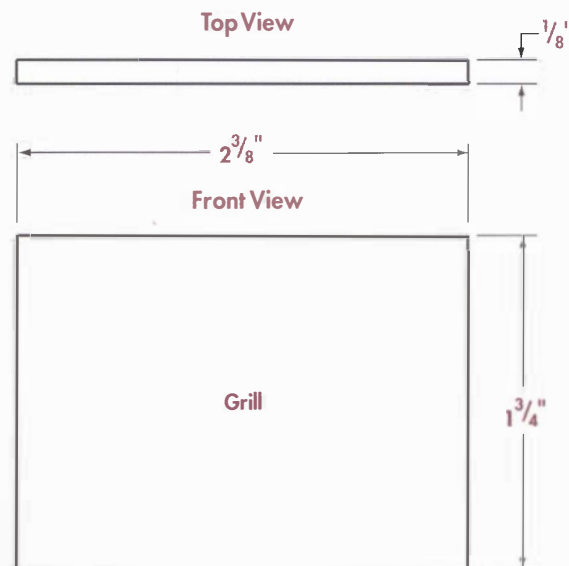
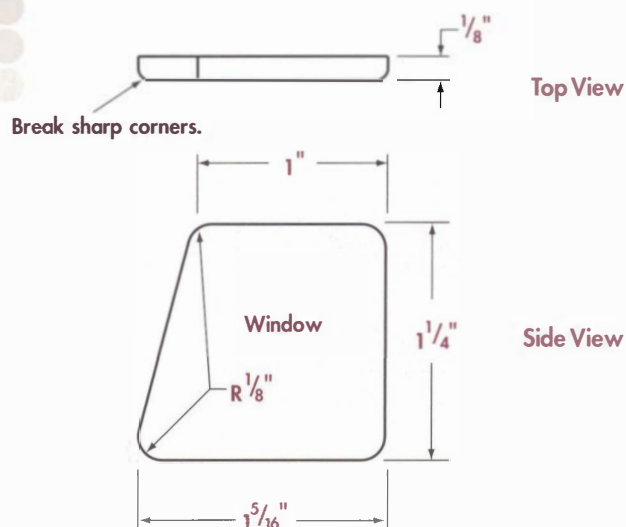
3. Glue the grill to the cab. The grill sits on the bumper and is centered side to side. You will probably want to clamp it.

If you are making the windows, locate them visually. The plan drawing has them $\frac{1}{8}$ in. back from the front and $\frac{1}{8}$ in. down from the top.

4. Finish-sand the face of the grill and/or the windows.

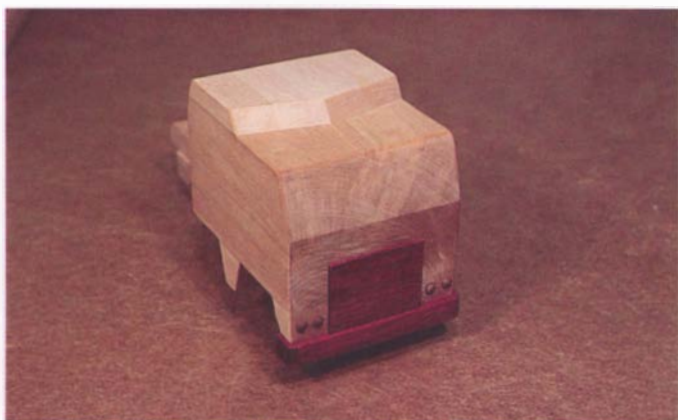


GRILL AND WINDOWS

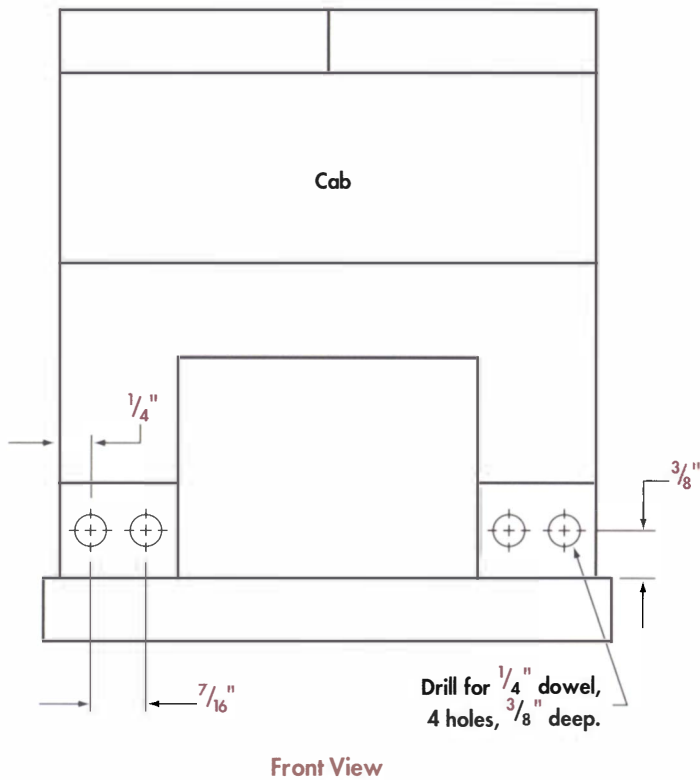
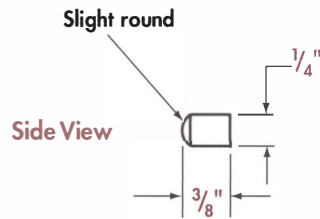


Headlights

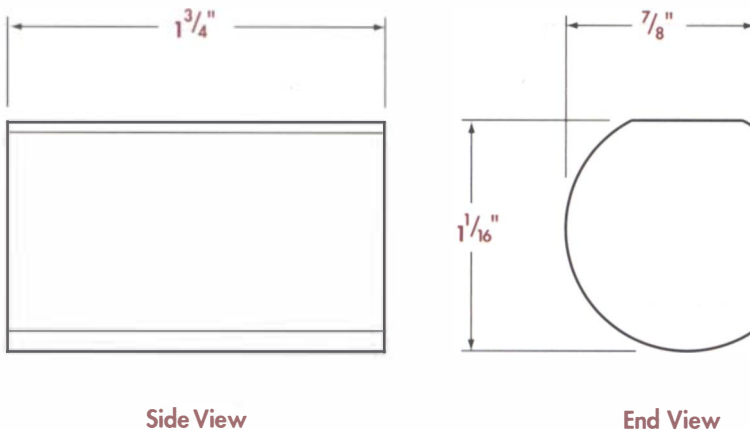
Although the location is a little different, refer to the dump-truck instructions on p. 49 for making and installing the headlights (see the drawings on p. 166).



HEADLIGHTS



FUEL TANKS



Fuel Tanks

These tanks can be made of 1 1/8-in. dowel as drawn, but I often use factory-made wooden barrels, available at most craft or woodworking stores. These barrels are also about 1 1/8 in. dia. but have bands around them that are similar to the bands that hold the tanks on a real truck. I used barrels for this example.

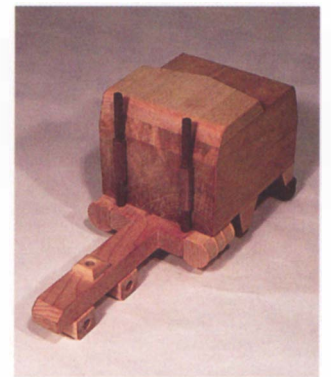
1. If you are using dowel, cut it to length.
2. Sand the ends and bevel the corners a little.



3. For either dowel or barrels, sand the flats for gluing.
4. Glue the tanks to the truck.

Exhaust Stacks

To make the stacks, refer to the dump-truck instructions (see p. 51), but glue these stacks behind the cab, not on the sides. Use the dimensions shown here, which are slightly different than those for the dump truck.



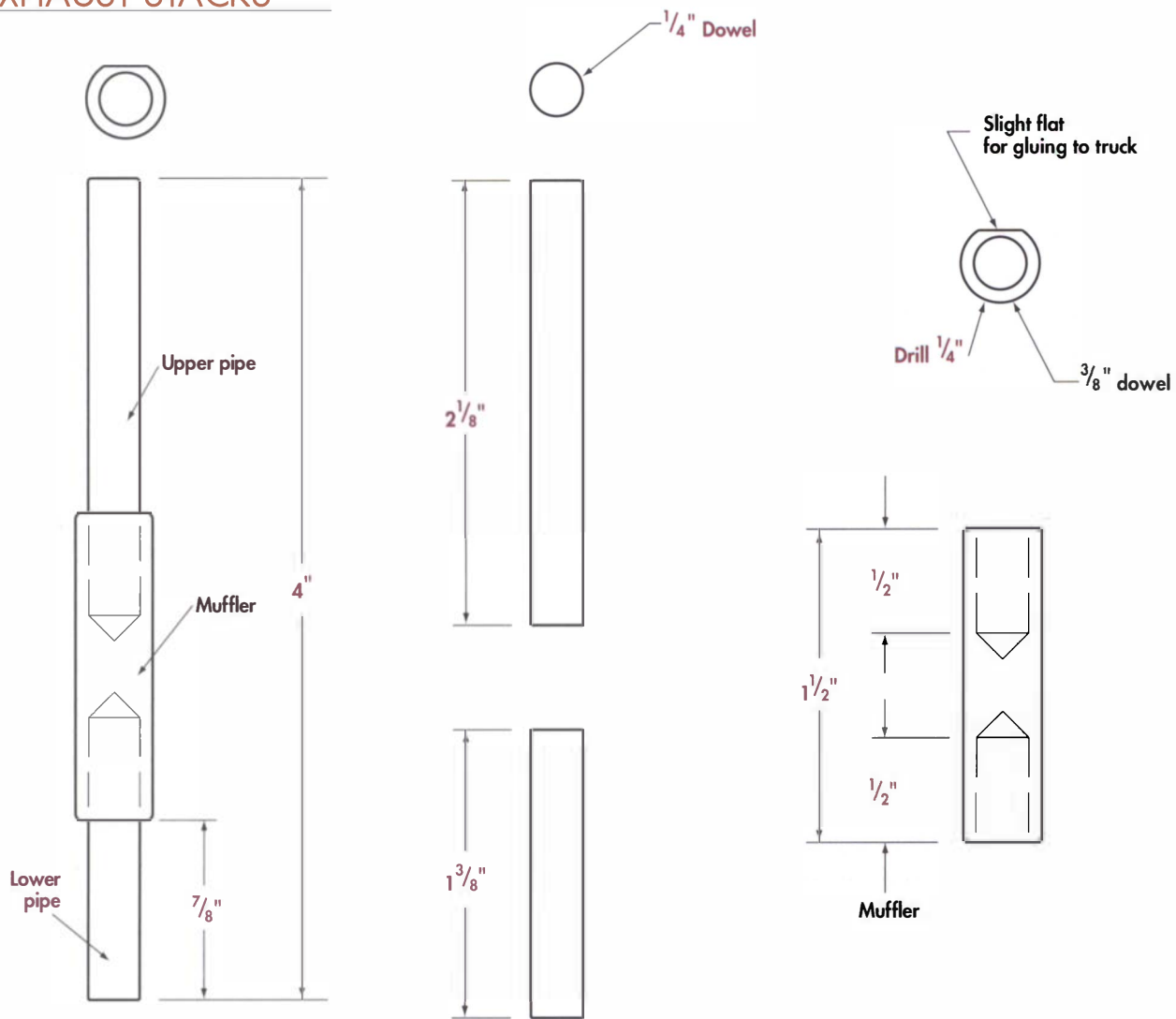
Trailer Tanks

The tanks form the main body of the trailers. They are glued to the tank bases, and the caps are attached to the top of the tanks. If desired, weight-reduction holes can be drilled in the tanks before assembly.

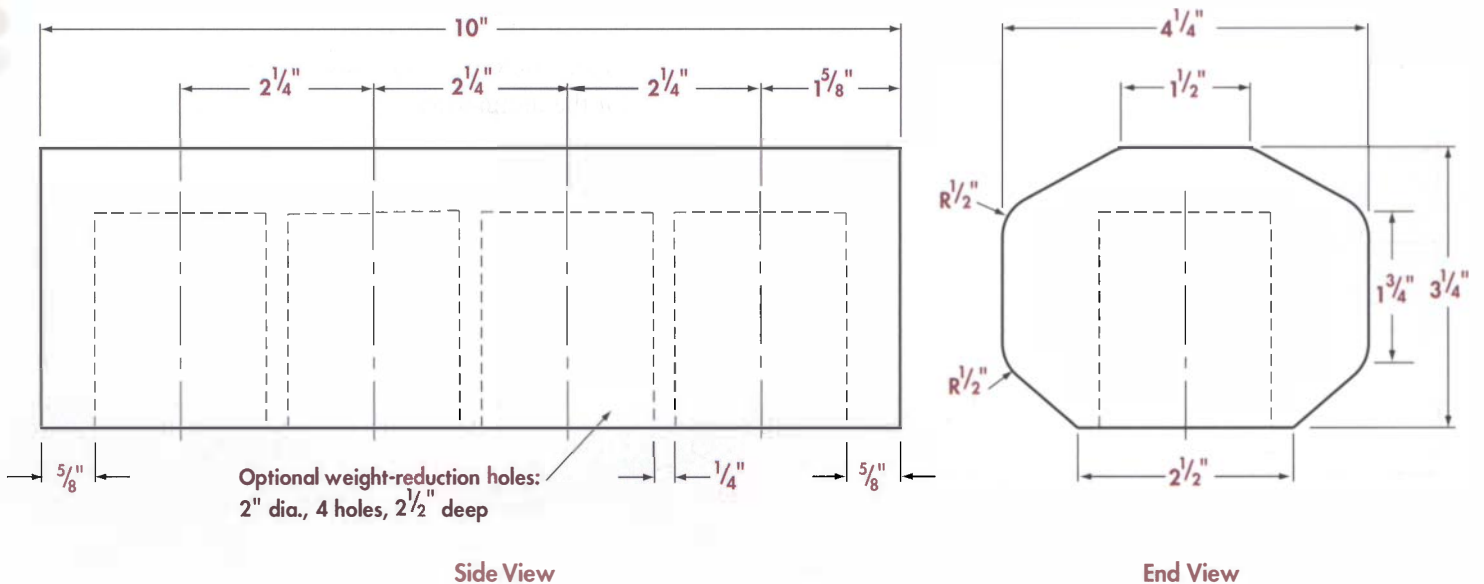
If you are making flat-deck trailers rather than tankers, skip to the flat-deck option on p. 169.

1. Laminate wood as needed. For this example, I used two pieces of solid birch.

EXHAUST STACKS

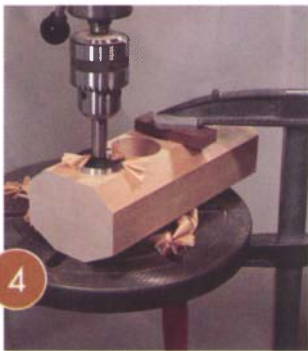
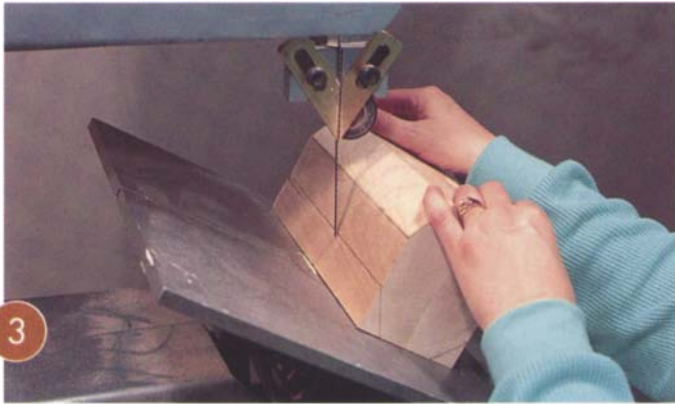


TRAILER TANKS



2. Cut to a rectangular shape, squaring up the sides and ends.

3. Saw the angle, then plane to smooth the cuts.



4. Drill weight-reduction holes in the bottom if desired. I use a 2-in. Forstner-style bit, as I did with the cab.

5. Round the corners on the sides, and sand the sides and top. The bottom doesn't need sanding since it is glued to the base, and the ends should be sanded later when the base and wheel guards are on.

Trailer Tank Caps

These caps are attached to the top of the trailer tanks.

1. Cut the parts to size.

2. Bevel the long edges slightly (the exact angle is not important).

3. Sand as needed.

4. Glue to the tops of the trailer tanks.



Trailer Tank Bases

The trailer tanks go on top of these bases, and the wheel guards go on the bottom. The hitch pins are installed after assembly.

1. Cut the 1/2-in. wood to size.

2. Sand the edges, but don't worry about the top, bottom, or ends yet.

3. Glue to the bottom of the tanks.

Wheel Guards

These trailers generally have wheel guards that extend over the wheels. They don't extend the whole length of the trailer as on these toys, but they do extend past the wheels. My trailers are a little shorter than true scale would have them, so I extend the guards to be a continuous cover over the wheels in front as well as those in the rear.

1. Cut the 1/4-in. wood for the guards.

2. Sand the edges.



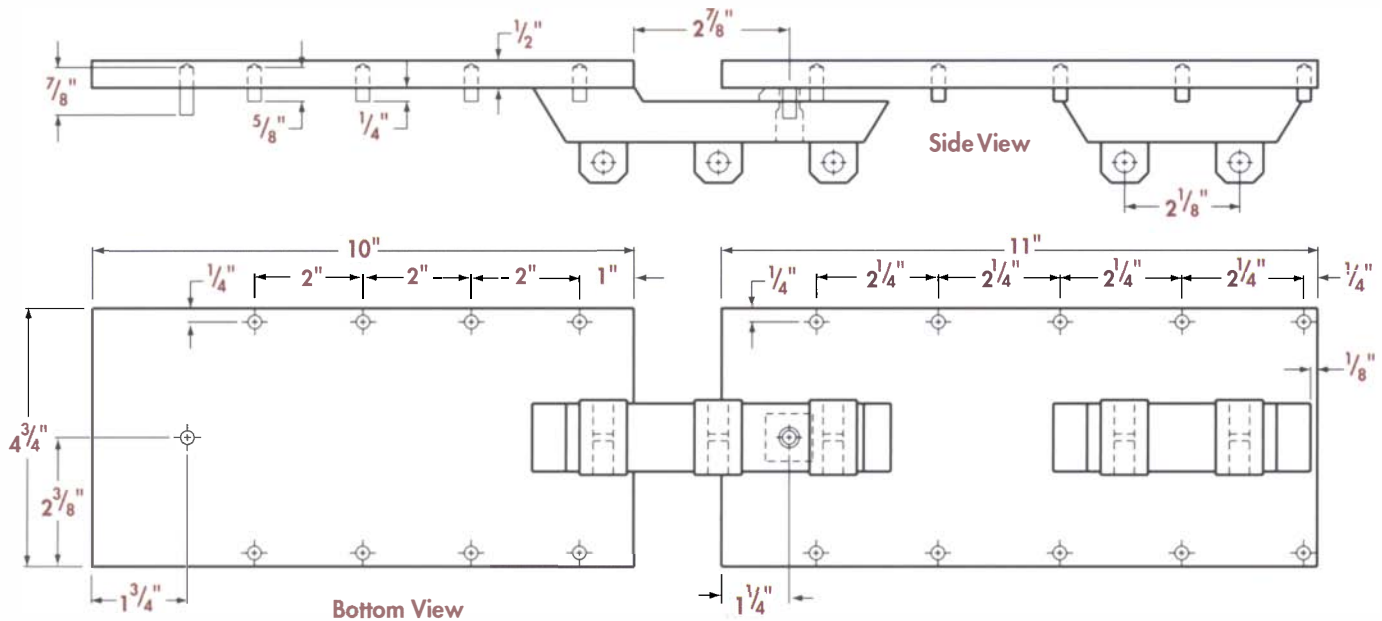
3. Glue the guards to the bottom of the tank bases.

4. Lay out and drill the holes for the 1/4-in. dowel hitch pins 1 3/4 in. from the end. I use an F drill (.257 in. dia.) because my 1/4-in. dowel is generally a little oversize. Drill 3/4 in. deep.

5. Cut the hitch-pin dowels, and bevel the ends a little.



TRAILER DECKS



6. Put a little glue in the holes, and tap the hitch pins in place.

Flat-Deck Option: Trailer Decks

This option is so easy to make that it is worth including in this chapter. The decks are similar to the wheel guards but are thicker and have 1/4-in. dowels for tie-downs, which protrude from the bottom. The operator can loop elastic bands over these to tie down the cargo.

The center distances to the hitch and hitch pin are slightly different than the tanker trailers.

To make the flat-deck trailers, cut two pieces of 1/2-in.-thick wood. Note that the rear deck is 1 in. longer than the front one. It looks much better this way, as it spaces out the wheels a little more.

1. Drill the holes for the hitch pins and the tie-downs, but don't drill all the way through.

2. Cut the eighteen 5/8-in.-long dowels, and bevel the ends slightly. You can also cut the hitch dowel now.

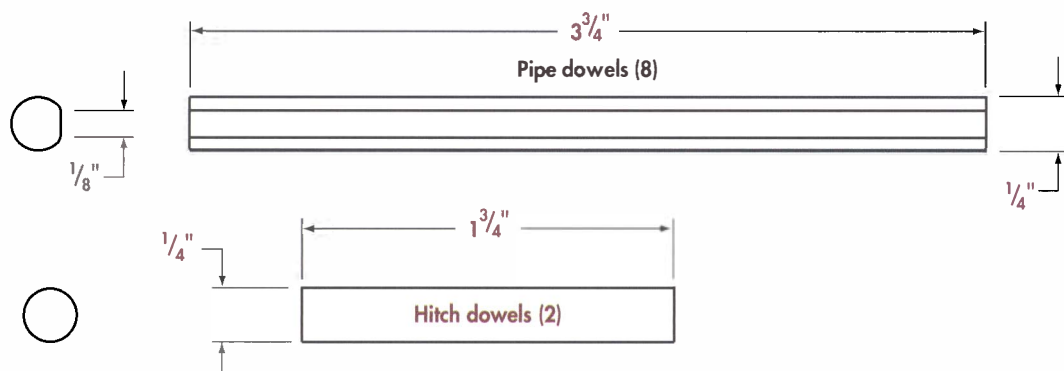
3. Put glue in the holes, and tap the dowels in place. The tie-downs should not protrude more than 1/4 in., to give clearance over the wheels and frame when turning.

Skip to "Trailer Axle Mounts" on p. 170.

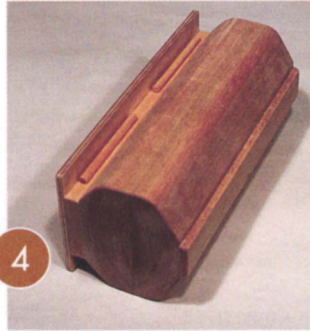
Pipes

Out of some (probably misguided) sense of purity, I have made all the parts out of wood, including these sections of pipe. These sections are really only decorative since they are not removable.

PIPES



I considered using $\frac{1}{4}$ -in. surgical tubing, which could act as a hose and could be stored on the wheel guards (with a little ledge to hold it in). Although I decided to stick with wood, you may want to invent some little hoses.



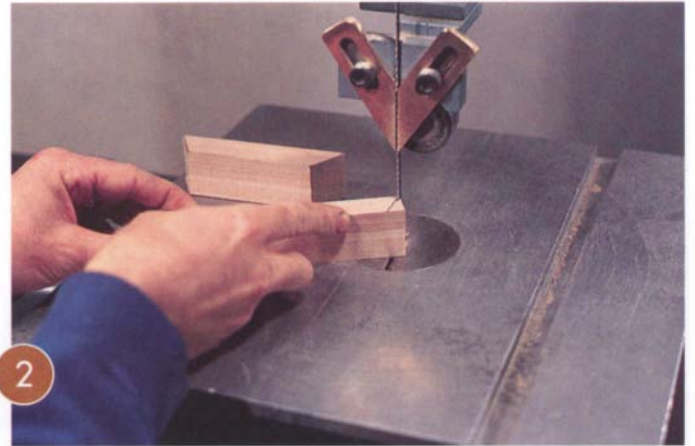
4

1. Cut eight lengths of $\frac{1}{4}$ -in. dowel.
2. Sand and bevel the ends.
3. Sand the $\frac{1}{8}$ -in.-wide flats for gluing.
4. Glue the pipes to the trailers.

Trailer Axle Mounts

These two mounts—one a triple axle mount, the other a double axle mount—are blocks that attach to the bottoms of the trailers. The axle housings are glued to the bottoms of these mounts.

1. Cut both mounts to rectangular shapes. You want good, flat surfaces—ideally jointed or planed edges where the mounts are glued to the trailers.



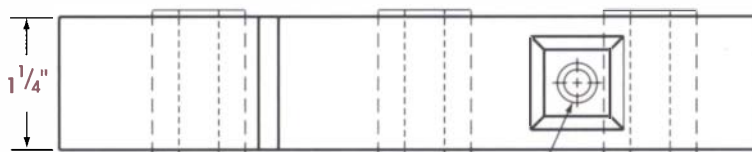
2

2. Lay out the angles, and cut to shape using a bandsaw.
3. Sand as needed, making sure the top surfaces are flat where they attach to the trailers.

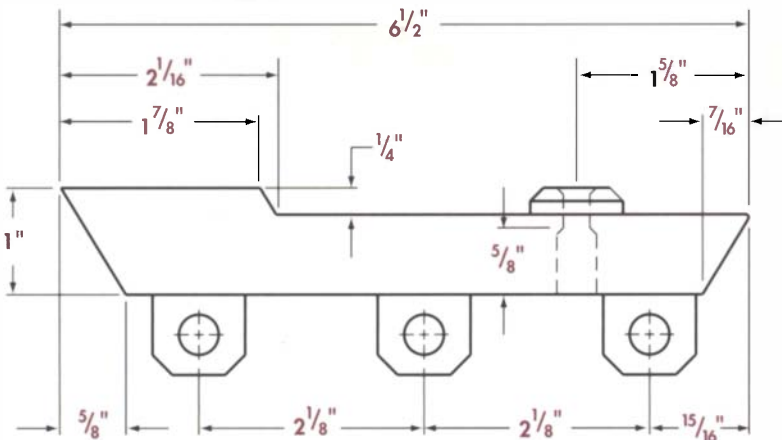
TRAILER AXLE MOUNTS

Triple axle mount

Top View



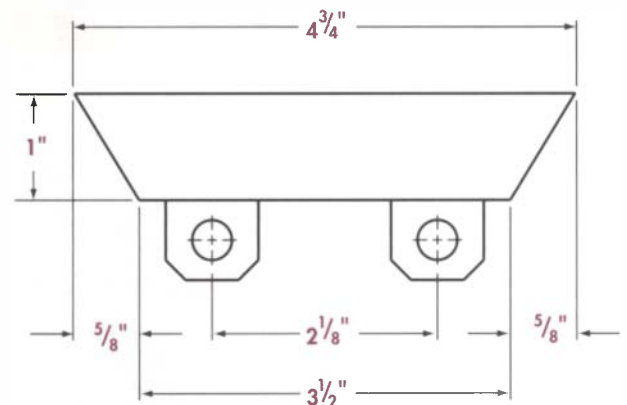
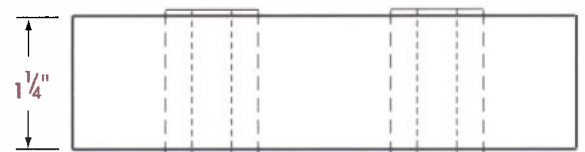
Drill $\frac{9}{32}$ " dia. and countersink to $\frac{3}{8}$ " (on top side). Drill $\frac{3}{8}$ " dia. ($\frac{5}{8}$ " deep from bottom).



Side View

Double axle mount

Top View

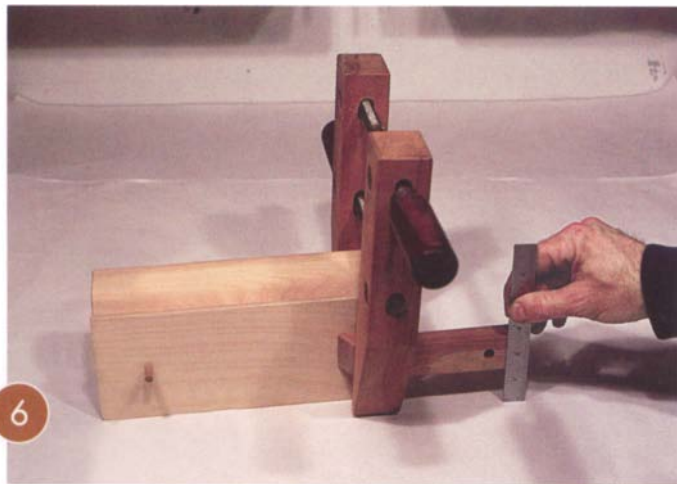


Side View

4. Find the trailer hitch spacer that you made when you made the one for the truck. Glue it to the triple axle mount.

If you are making the flat-deck trailer, check the plan drawing on p. 169 for the slightly different position of the hitch spacer.

5. For the triple axle mount, drill a $\frac{1}{2}$ -in. hole and the $\frac{3}{8}$ -in. countersinks as you did with the truck.

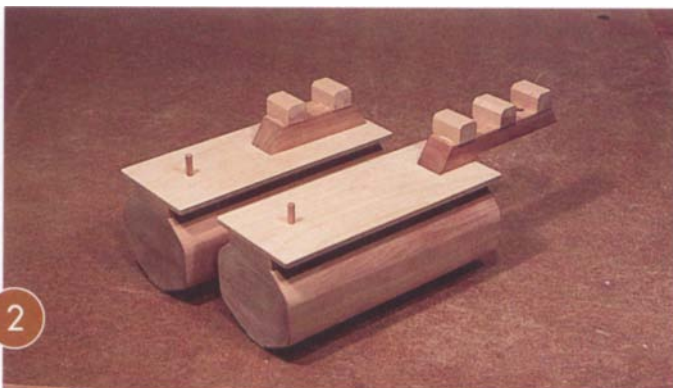


6. Glue the axle mounts to the trailers. Measure in a couple of places to ensure the mounts are closely aligned with the trailers.

Trailer Axle Housings

1. Use the axle-housing material left over from the truck, and cut the five parts needed (if you have not already done so).

2. Glue the axle housings to the mounts.



3. Hitch the trailers to the truck, and lay out for the holes. Check that the axle-hole height is identical to the truck axles when the whole assembly is sitting on a flat surface.

4. Drill the axle holes, as you did with the truck. Make sure they are at least $2\frac{1}{8}$ in. apart.



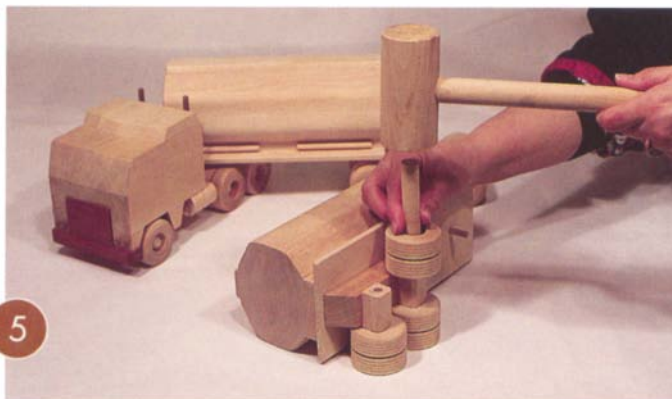
Wheel Assembly

1. Drill the wheels out to $\frac{25}{64}$ in. With this many wheels, it is a good idea to have a little extra movement on the axles to allow all the wheels to touch the ground as the truck is driven.

2. Cut the axle pins short if needed.

3. Wax the wheel holes using paste wax and a Q-tip.

4. Dry-assemble the wheels and axles. Don't push the axle pins in all the way if they are a bit tight. Check that all the wheels contact the ground. If not, you may want to drill the wheels out an extra $\frac{1}{64}$ in. If you have one axle hole that is inaccurate, plug it with an axle pin. Saw off the extra, and re-drill the hole when the glue is good and hard.



5. Having attained all-wheel drive, glue the axle pins in place. Have the wheels a little loose if anything, although $\frac{1}{64}$ in. of in-and-out travel is enough.

Finish

As desired. You may want to read the appendix on finishing on p. 172.

Appendix

I Equipment Needed

A minimal amount of equipment is required to follow these instructions. I built many of these toys before I had a jointer or thickness planer and without using a table saw. That is not to say that these machine tools are useless—far from it. However, they are not a must as far as these projects are concerned. The machinery you will need are a bandsaw capable of sawing wood up to 5 in. thick, a small drill press, and a small belt/disk sander. None of my machines are especially heavy duty. The bandsaw is one I made years ago, the drill press is a bench model with a 1/2-in. chuck, and the sander is a light one with a 9-in. disk and a 6-in.-wide belt.



II Finishing Recommendations

These trucks and machines are best suited for children past the toddler stage, but if you think toddlers will be licking or biting the toys, you will want to use beeswax, natural tung oil, salad-bowl oil, or other nontoxic finishes. These finishes are commonly available at hardware stores.

Wooden baby cribs tend to have a lead-free urethane finish, which may be a good starting point. Waterborne urethane is another alternative but leaves wood with a slightly lighter color than does oil-based urethane. Whichever finish you use, make sure that it is lead free and nontoxic when hard.

The toys in this book were finished with one coat of gloss urethane then two coats of semigloss, and they were sanded lightly with 220-grit paper between coats. Finishes were applied using spray bombs. If semigloss or satin ure-

The photo shows the hand tools and machine accessories that were used to make the toys in this book:

Drum sander set for drill press

Forstner-style bits (1½ in., 1¾ in., 2 in.)

Files: 10-in. Nicholson (or equivalent) half-round bastard cut, 8-in. round file, 6-in. smooth flat file, and 8-in. square file

Awl

Woodworker's vise

Smoothing plane or block plane

¾ in. Hand drill

Combination set protractor

Chisel

Small square

12-in. scale

Mallet

Compass

Clamps (It seems you can never have too many, and often a C-clamp will work instead of a handscrew clamp, so the following suggestions are just that, suggestions.):

Handscrew clamps (such as Jorgensen) (4 or 5)

C-clamps, 1-in. to 4-in. opening (5 or 6 total)

Spring clamps (5 or 6; often come in sets of 8 or 10)

Sliding "L" clamps (1 or 2)

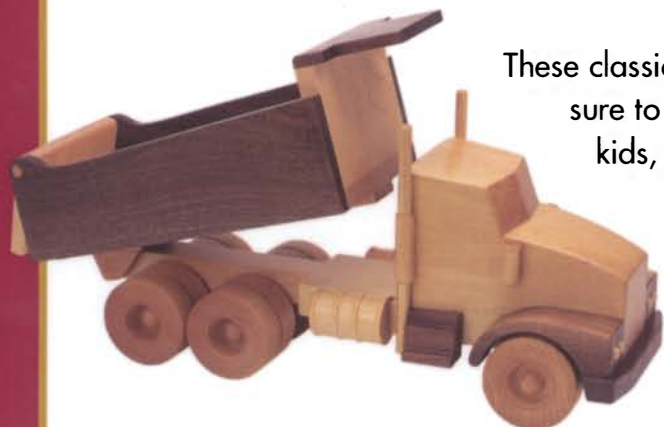
thane is used for the first coat, it can leave a white residue. While the instructions say that this residue will disappear with subsequent coats, it does not always do so, especially in small corners such as tire treads.

As with other woodworking projects, the quality of the finish is crucial to the toy's appearance and, to some extent, its durability as well. I don't sand finer than 220, and where possible I use a fine-grit belt or disk on a machine to do most of the sanding. In the end, every part needs to be sanded well. In the past, I have taken shortcuts in the finishing process, but they didn't pay off.

I have tried painting or staining a few parts to add some artificial color but did not like the appearance. Maybe those of you with more artistic talent could do this successfully. None of these toys has any stain but most have used more than one color of wood.

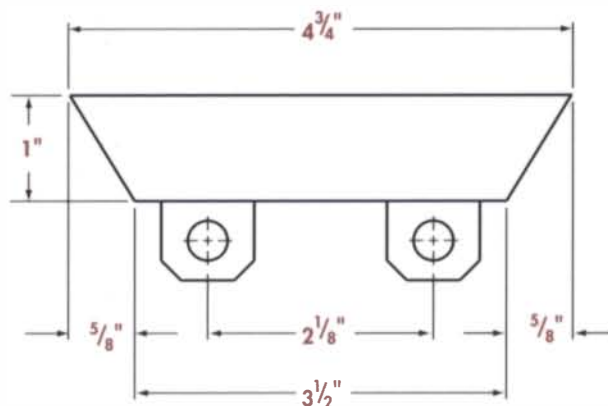
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ABOUT THE AUTHOR

Les Neufeld has been an ardent woodworker since childhood. With early training in the logging and lumber industry, he later became a machinist and went on to earn a

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