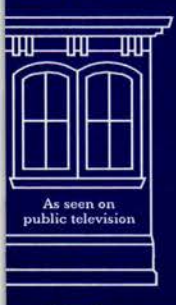


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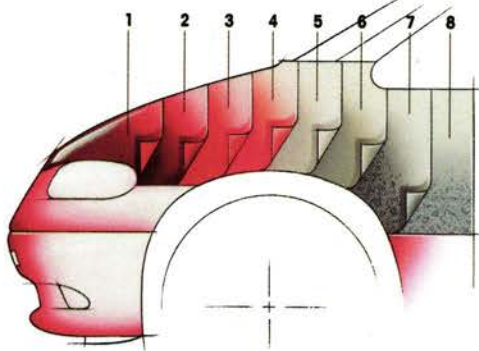
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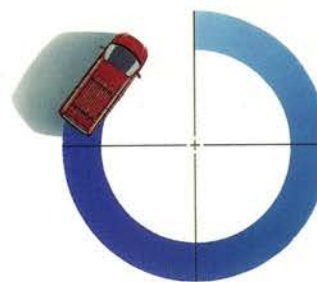


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To keep Caravan looking good at any angle, we use a highly protective, eight-step finishing process that includes a full-body powdered anti-chip primer coat and two separate clear coat applications.



Available anti-lock brakes and traction control give you extra control when braking and steering on slick surfaces.

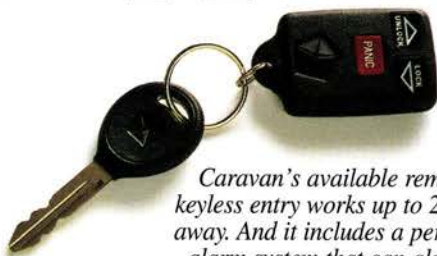


A remarkably tight turning circle makes parking easy.



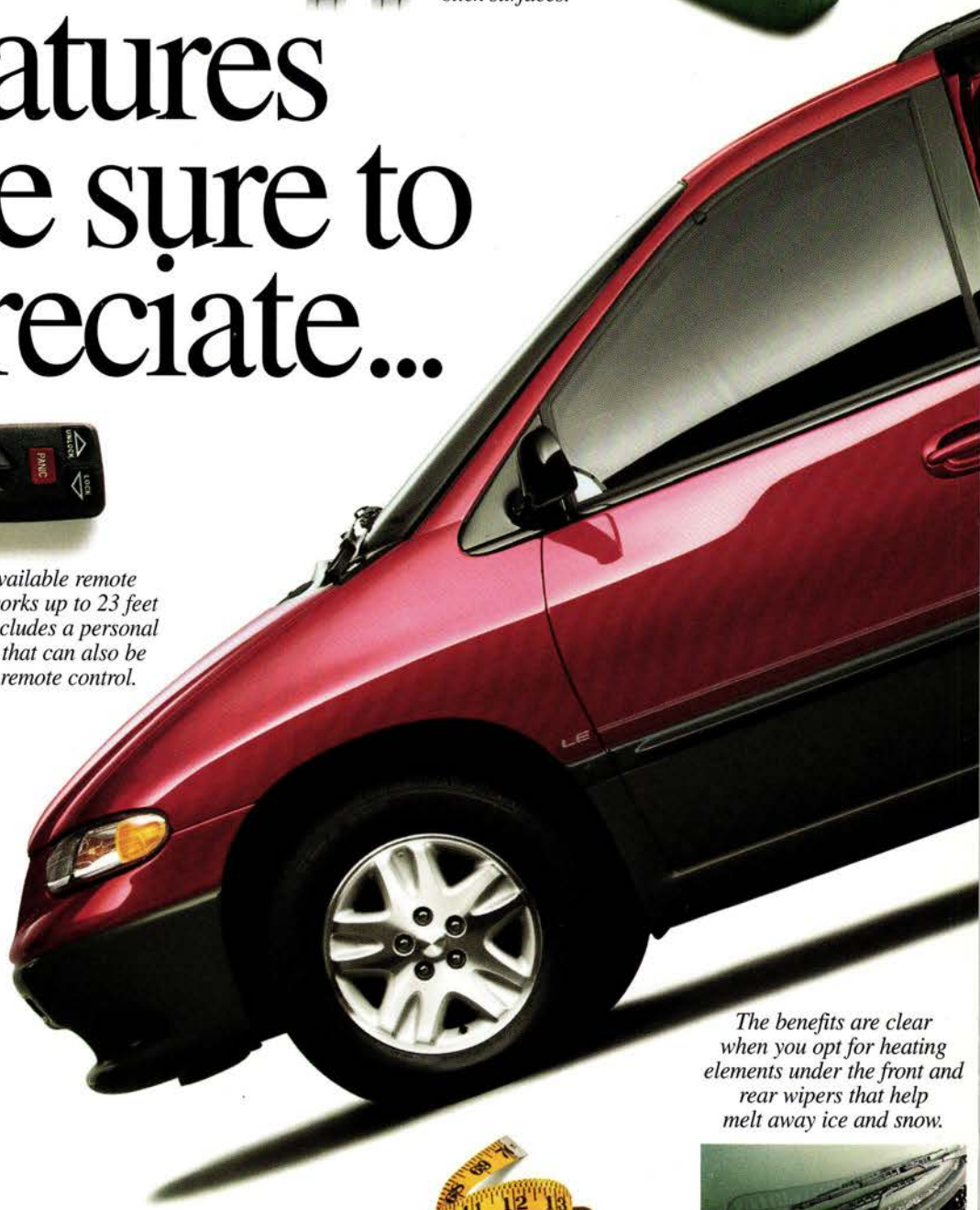
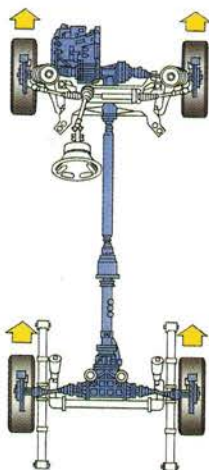
With 12 convenient storage bins, grabbing a tissue is not an issue.

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Caravan's available all-wheel-drive system features an inter-axle viscous coupling that automatically gives more torque to the rear wheels as needed.



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Gloves, maps and such can go in Caravan's tilt-out glove box. And some models have handy door pockets for additional storage.

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Absorber -
Bake-on-mastic -
Sheet metal -



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Caravan  The New Dodge

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Suggested retail price \$1,500.



If you've ever cooked on an ordinary gas grill, chances are, you've apologized for it. The flare-ups that singed your steaks. The cold corners that made it impossible to cook food evenly. The shoddy construction

element of the Platinum Series II cooking system. Weber's Crossover® Ignition System assures a fast start. And there are three stainless steel burners strategically placed to provide another rarity: a grill that heats

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that cost more in repairs than the grill itself.

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A.

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features

MAY/JUNE 1997

Team **Tucson**

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A short spring TV schedule leaves no time for contractors who aren't willing to work on top of each other or homeowners who aren't willing to make decisions quickly. Thanks to extraordinary teamwork, This Old House polishes off an eight-month renovation in three. By Jack McClintock

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78

The soul of the Sonoran Desert is hidden beneath the bark of its most prevalent tree. Crafted by cabinetmaker James Vosnos, this precious but stubborn wood becomes the centerpiece of the Tucson project kitchen. By Jack McClintock

Poured Floors

84

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90

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Why Is My **Paint** Peeling?

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Exploding pipes, airborne fireplaces and vaporized wiring is child's play for 150,000-amp lightning bolts. Without lightning rods, every cupola, dormer and satellite dish on your house wears an electrostatic "Kick Me" sign. By Claudia Glenn Dowling

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In the **Garden**

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It may seem crazy, but we're in love with a push mower—an old-fashioned reel mower that doesn't require old-fashioned effort. Also, razzle-dazzle raspberries.

Strike breaker, p. 104

Cover photograph by Michael Llewellyn

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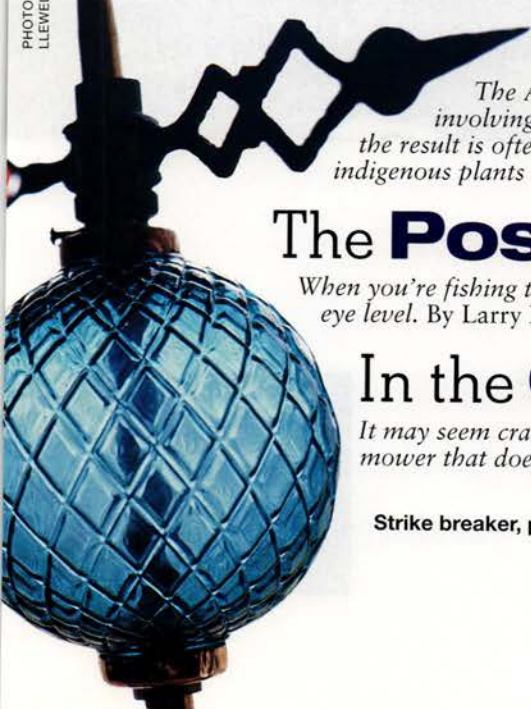


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PHOTOGRAPHS, CLOCKWISE FROM TOP LEFT, BY FRANK W. OCKENFELS III, MICHAEL LLEWELLYN, KELLER & KELLER, KOLIN SMITH, STEWART FEREBEE



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*Based on an average of consumer-reported problems at 3-months' ownership in a survey of Ford and competitive models designed and built in North America. Sales leadership based on Divisional sales.

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up front

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Blinded by Brackets

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Visit *This Old House* on the World Wide Web to read about our project houses, view articles on-line and get up-to-the-minute appearance schedules for the crew. www.pathfinder.com/TOH/



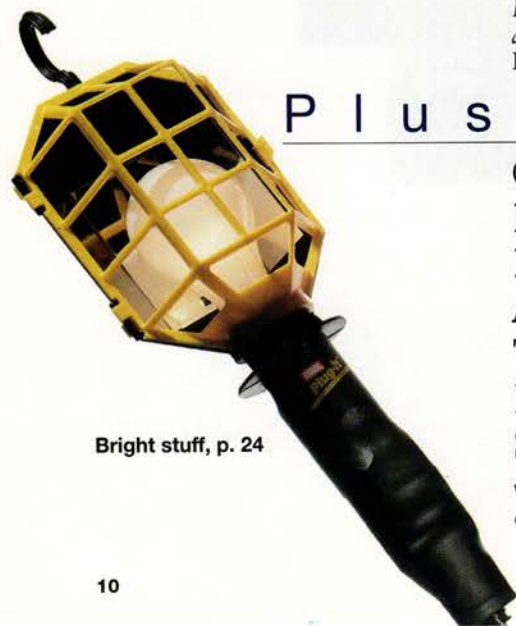
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Which plants are the champs in the "survival of the fittest"?

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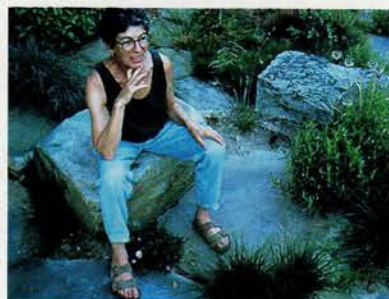
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contributors

MAY/JUNE

SARA STEIN (author, "Rethinking the Lawn") is a gardener and amateur ecologist. Her books include *My Weeds*, a gardener's botanical guide, and *Noah's Garden*, the story of how



she restored native plants and animals to her property in suburban New York. Both books received the Washington Irving Award for nonfiction. A sequel, *Planting Noah's Garden*, was published by Houghton Mifflin in April. In 20 years as a car-

penter, **JEFF TAYLOR** (author, "The Reverse of Hammering") has col-

lected more than 1,000 vintage and modern hand tools. In reviewing his book of essays, *Tools of the Trade: The Art and Craft of Carpentry* (Chronicle Books), the *New York Times* wrote that "his prose can bring a tool to life." Now a free-



lance writer in Oregon's coastal mountains, Taylor works out of a former parsonage that was built with lumber salvaged from an old army barracks. **LARRY KATZENSTEIN**

(author, "Workshop First Aid") was for six years the medical editor of *American Health* magazine. He has won national recognition for his reporting on health issues, including the New York Newspaper Guild's Page One Award for his exposé of fraud in the health-food industry.

He lives with his wife in New York City and spends weekends in a 1920s bungalow in the



Berkshires (E-mail: 76123.1540@compuserve.com).

A Virginia native and dedicated surfer, New York-based

STEWART FEREBEE (photographer, "Zeus on the Loose") has shot for *Travel & Leisure*, *Martha Stewart Living* and *Vogue*. His photographs of Prague were included in last year's "Condé Nast Traveler 100," an exhibition of the magazine's hundred best images.



Help

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More ideas, more advice, other homeowners to chat with, up-to-the-minute appearance schedules for the crew, updates on the TV project houses. Join us at www.pathfinder.com/TOH/

LETTERS TO THE EDITOR

Got a problem? We can help. Got a gripe? We're listening. Have a happy experience with a supplier or manufacturer? Share the kudos. Contact us via E-mail at Letters@toh.timeinc.com or write to Letters, *This Old House* magazine, 20 West 43rd Street, New York, NY 10036.

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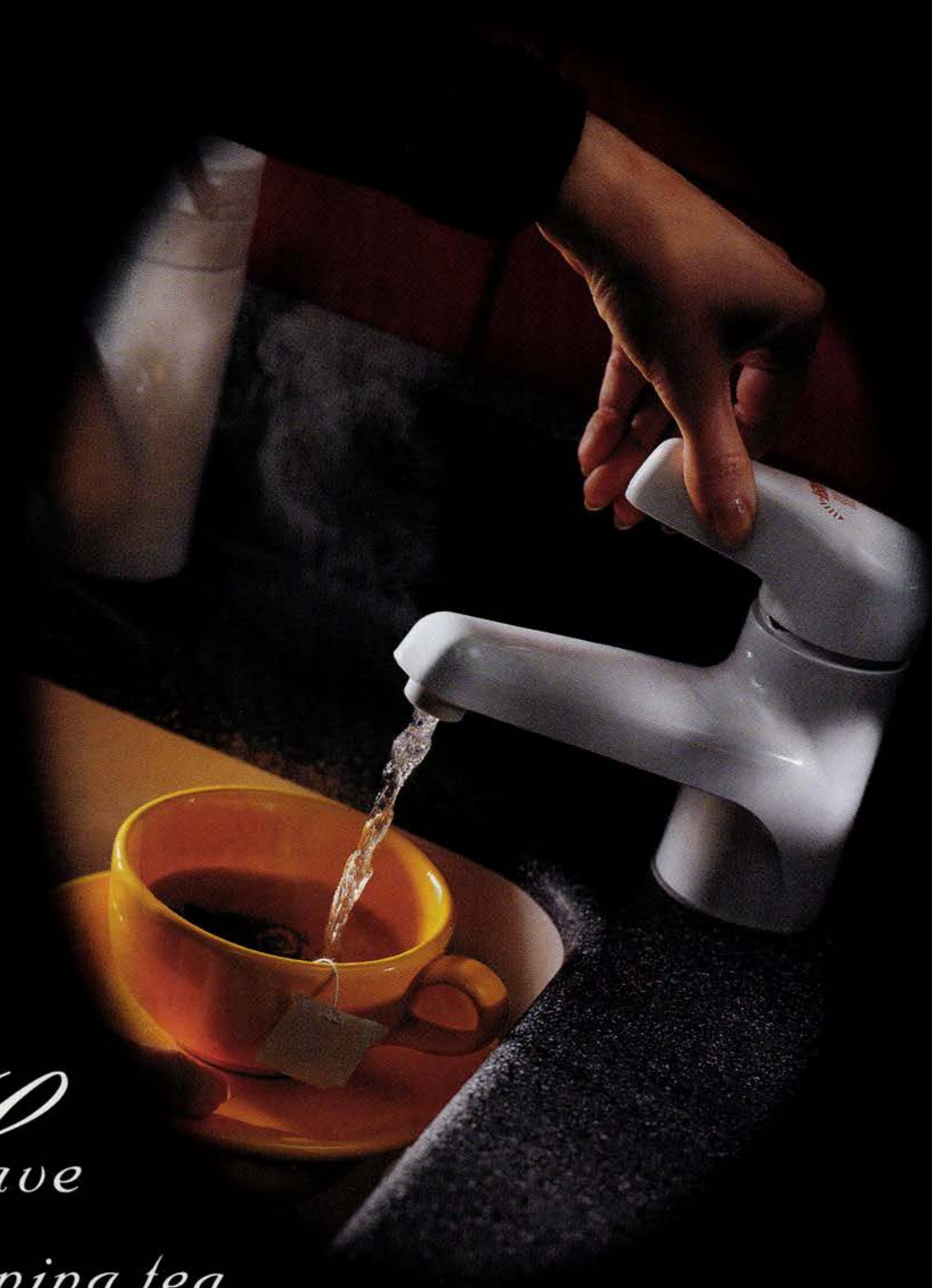
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Letters

In 1990, I had a top-line company install three bays and a box window, and they all leaked from the get-go. When the representative couldn't stop the leaking, he denied it was a manufacturing problem. He would not provide the model number or a copy of the warranty or cite a solution. We went into arbitration in 1995, and I won the cost of replacement. Then I decided to go with all-vinyl replacement units.



But, after the new box window was installed, I read in "Worrisome Windows" [January/February] that vinyls expand and contract, causing leaks. If the experts in your article are correct, I wonder whether to replace my bay windows with all-vinyl ones.

Wayne Padgett
Daly City, CA

Although there is debate over the performance and reliability of all-vinyl windows, we think they are problematic and wouldn't

recommend them. In response to our article, Ray Garries, first vice president of the Vinyl Materials Council of the American Architectural Manufacturers Association writes:

"Worrisome Windows" had many good points; we appreciate your comment that the AAMA label "indicates windows that should last." However, some of the generalizations about vinyl windows indicate a lack of balance in the story. Specifically, it is true that without constraint vinyl is not as rigid as wood or fiberglass. In the real world, however, windows are installed in rigid openings, which increases their strength, as do their welded or mechanically fastened corners. As to your comment that vinyl expands with temperature change much more than glass, the silicone seal between the vinyl sash and the glass can withstand this movement without failing. If water does get in, many windows also have weep holes that allow it to get out. Finally, on vinyl's tendency to heat up in the sun, only a very small surface area ever reaches temperatures approaching 165 degrees Fahrenheit.

"Sticky Stuff" [Extras, January/February] recommended fabric-backed duct tape for fixing broken tool handles. When a hand tool has a cracked handle, it should be thrown away if the handle cannot be replaced. OSHA standard 1926.301(d) is very specific on this: "The wooden handles of tools shall be kept free of splinters or cracks and shall be kept tight in the tool."

Michael Gardner
Director of Technical Services
Foundation of the Wall and
Ceiling Industries

We agree that broken handles on tools like hammers and shovels should be replaced, not repaired. But you can mend brooms, leaf rakes and other light-duty implements with glue and well-placed

just built a brand new deck?

uh oh.

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screws. For these repairs, duct tape only covers rough wood and splinters; it does not hold broken pieces together.

I'm about to build a new house and have heard that for framing lumber, hem-fir is stronger and cheaper than Douglas fir. Is it really the best choice? I'm going to demolish an existing house and build on the same spot. As the general contractor, I'd appreciate advice on cutting costs.

Frank Uchman
via e-mail

Kenneth Bland of the American Forest & Paper Association says there are two kinds of hem-fir: standard hem-fir and hem-fir (north). Both are incrementally weaker than the No. 1 grade of Douglas fir.

But, he adds, any species is okay as long as it meets the required strength and stiffness values. If you're willing to pull a lot of nails, and the building inspector approves, you may be able to save some money by reusing the lumber from the old house.

I was surprised Peter Jensen did not address outside combustion air supply in his otherwise excellent article on Rumford fireplaces [January/February]. Many building codes require it.

Steven Hansen
Caseyville, IL

The article did not mention that Buckley does build in ducts that deliver outside air directly to the fireplace when the glass doors are closed.

When they're open, room air feeds the fire, but either way, Buckley's Rumford meets the tight EPA Phase II pollution standards for wood stoves.

I would like to clarify two points about the piece on bees in "Raising Arizona" [March/April]. I am neither an exterminator nor, as the TV show said, an entomologist. I am an apiarist, and that is but a hobby. Because the bees had been in the Meigses' roof for a long time, my fear of

them being Africanized was minimal since such bees tend to be nomadic. Any beekeeper will tell you that bees have enough natural enemies without adding indiscriminate eradication by unknowing humans. If anyone has a bee problem, they can call a local beekeeping supply store to find beekeepers who want hives. For more information, call the American Beekeeping Federation at 912-427-4233.

Terry C. Kilmer
Tucson, AZ

p u n c h l i s t

definition: a list of items incorrectly done or remaining to be finished on a construction job

- The illustrations for our March/April Moldings Poster were incorrectly credited. The artist is Michael Custode.
- "Comfort Control," the air-conditioning story we referred to in last issue's Letters column, can be found on page 68 of the January/February 1996 issue.

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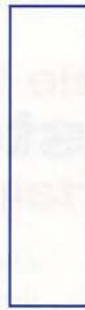


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Blinded by Brackets

Sometimes the right hardware store is better than a good boyfriend

BY JEANNE MARIE LASKAS



I am missing my old hardware store. We broke up about a month ago. No, there was no anger. No fights. No fooling around on the side. We were torn apart by circumstances: I moved to a new neighborhood. I stopped in one last time for a masonry drill bit and said, "See ya later," knowing full well that I never would. It's hard to turn your back on a 10-year relationship.

What I'm talking about here is that little place down the street with the dusty old garden tools and sacks of cement in the display window, where you are treated with the same amount of respect whether you need a huge new circular saw or some pathetic little wing nut.

"Whadd'ya need?" some guy or lady with black stuff underneath his or her fingernails will say. The black stuff is critical, a sign of dedication, of personal involvement with the merchandise.

"Well, I've got this here bolt that's too big," you'll say, and before you can finish the sentence the clerk will be gone; hardware-store people take it as their mission to lead you to

"Here," the clerk will say. No fancy explanation, no whining about the weather or the darn computer age. And, most importantly, none of this, "Can I interest you in new a set of socket wrenches?" Sales pressure is the antithesis of a good hardware-store experience, and any clerk worth his fingernail gook knows this.

Hardware stores are get-what-you-need places, not impulse-buying places. And hardware stores, like libraries and museums, house the secrets of the ancestors.

"Whadd'ya need?" the clerk says. Out of your jacket pocket comes an old faucet. "You got a washer that will fit this thing?"



PHOTOGRAPH BY JOYCE RAVID

"Let me see here. American Standard, eh? I remember back in '52, they were puttin' them in everywhere," the clerk says. "I might have something in the back." And you go in the back and there are trays and trays of little faucet parts nobody makes anymore.

Hardware stores value fixing over replacing. They encourage you to honor time, as opposed to throwing it out.

At least that's the way my old hardware store was. When I would leave that store, I'd often be carrying a little brown paper bag contain-

ing a single bolt and a single washer.

It would be the tiniest, cutest bag, difficult even to

know how to hold. I would dangle it by my fingertips and recall the days of penny candy.

My new hardware store? Well, I don't know. The truth is I haven't been in it yet. I drove by a few times. It looks okay. It shares a wall with the post office, which is nice.

It's not so simple to just leap into a new hardware-store relationship. It takes a certain amount of circling.

A few days ago I was faced with a hardware-related problem: how to block out some of the blinding afternoon sun streaming into my new home office. And I'll confess right here: Rather than stopping in to see if my new hardware store could help, I opted to drive on out to the suburbs to a superstore, where shelves are scientifically designed to inspire impulse buying. It would be a good neutral experience. No risk of personal involvement. In the end, my neutrality cost me \$228 in mini-blinds, \$68 in tropical houseplants, \$24.97 for a 35-gallon "ultimate" storage locker, \$75 in cleaning supplies and \$98 for a fancy new 12-volt cordless drill.

My hatchback was full, and I felt satisfied, as shoppers are apt to feel after a successful day of hoarding. Still, I couldn't help wondering about the fate of the local hardware store, and any of the other remaining places where you can feel satisfied leaving with just a tiny little bag.

Now I am home, trying to hang these new blinds, and I find myself having an epiphany around this very issue. I am realizing that the local hardware store can never die, will never die, because of one fundamental home-remodeling principle: No job ever goes the way you think it will.

You get a set of blinds home, thinking you're going to go zeet zeet zeet with your new cordless drill and have those babies up in an hour. Wrong. The blinds don't fit because the windows are crooked. I need to take a hacksaw to the headrail, a plane to the window frame.

I drive up to my new hardware store. I take a deep breath. I walk inside. "Whadd'ya need?" says a bald man with two hearing aids, deep blue eyes and plenty of black stuff under-

neath his fingernails. His name tag says "Bill."

"Hacksaw blade, block plane," I say, and within 14 seconds both are in my hands. Not bad.

Bill's dog comes out. "Her name's Cybil," says Bill. "Because she's a shepherd. Get it?"

I smile. I give him money. I leave. I feel hopeful.

I get home and downsize the headrail and window frame.

Perfect. But now the brackets that came with the blinds are ren-

It's not so simple to just leap into a new hardware-store relationship. It takes a certain amount of circling.

dered useless, thanks to my hacking and planing. I need something else. I feel surprisingly happy about this. I feel tugged back to the hardware store, and it feels good.

"Whadd'ya need?" Bill asks.

"I don't know," I say. "I truly don't know." I explain my problem. He gives me some brackets to take home and try.

"One dollar," he says, putting six brackets in an itty-bitty bag. "Come back if they don't work." I dangle the bag by my fingertips, feeling safe.

They don't work. I go back. I feel surprisingly happy about this. I come home with a new set. Alex, the boyfriend, points out that this is a lot of trouble for mini-blinds.

When I return the second set of brackets, Bill asks me to make a drawing, with sizes and dimensions. "And I'll just make you some brackets in the back," he says. I think, Wow! Where else would you get service like this? I begin to think of my new hardware store in family terms.

I get home to find that Alex has himself taken a personal interest in the bracket situation. He is in the basement, fiddling.

"I'm making you some brackets," he says.

"Huh?" I say, followed by, "Um" and "But." I wonder if I can tell him that my new hardware store is already performing this function in my life. I feel like a teenager with two dates to the prom.

I stop for a moment and examine the contents of my heart. I find myself choosing the hardware store over the boyfriend. Hardware stores are better than boyfriends at certain things—although there is no need to point this out to the boyfriend.

"Don't bother with the brackets," I say, casually. "The guy at the hardware store says he'll make them."

Alex looks at me. "Oh," he says. And then he doesn't say anything. He looks down at his project. He lays his hammer down like it's a limp fish. "Well, I'm sure his brackets will work out just fine," he says. "Of course, they won't be *decorative*."

Maybe not.

Maybe I should just hang curtains.



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Swiss army saw?

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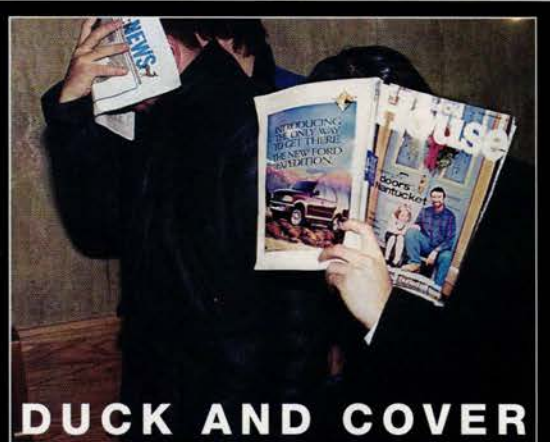
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extras



DUCK AND COVER

We've been told readers can't put our magazine down, but, as this photo proves, it's not always because of our great words and pictures. An Associated Press photographer snapped a stockbroker being led into Manhattan Criminal Court to face charges of hiring a stand-in to take his licensing exam. We don't know if he's guilty, but we probably appreciate the exposure more than he does.

What If the River Rises?

It seems like a no-brainer: Homeowners living in flood zones should have flood insurance. But the sole provider of flood insurance, the Federal Emergency Management Agency (FEMA), says that of the 10 million houses at high risk, only 25 percent are covered. Owners who haven't been flooded shouldn't be complacent: FEMA's numbers show that nearly 30 percent of claims come from supposedly low- to moderate-risk zones. What to do? Find out from an insurance agent if your home is in a FEMA-recognized flood zone and thus eligible for its National Flood Insurance Program. Homeowners can get up to \$350,000 worth of coverage on the structure and contents, excluding basement improvements (such as paneling and pool tables) and any items in storage. It isn't always necessary to insure for a total loss, says Bill Hearn, a senior policy analyst with Consumers Union. Floodwaters usually do most of their damage to furniture, floors and walls, leaving the structure intact. FEMA also arranges low-interest loans to victims in flood-disaster areas, but which would you rather have—a payment book or an insurance check?



FLEX-NECKS

With their ribbed necks, they cling like giant twist-ties. Some use the same rechargeable batteries as heavy-duty cordless tools; others have two beam options, pencil and flood.

CLIP-ONS

Descended from the sleek, chrome-plated jobs used by doctors to look in ears and down throats, these plastic models have spring clips that grab onto pockets, belts and hat brims for convenience at close quarters.

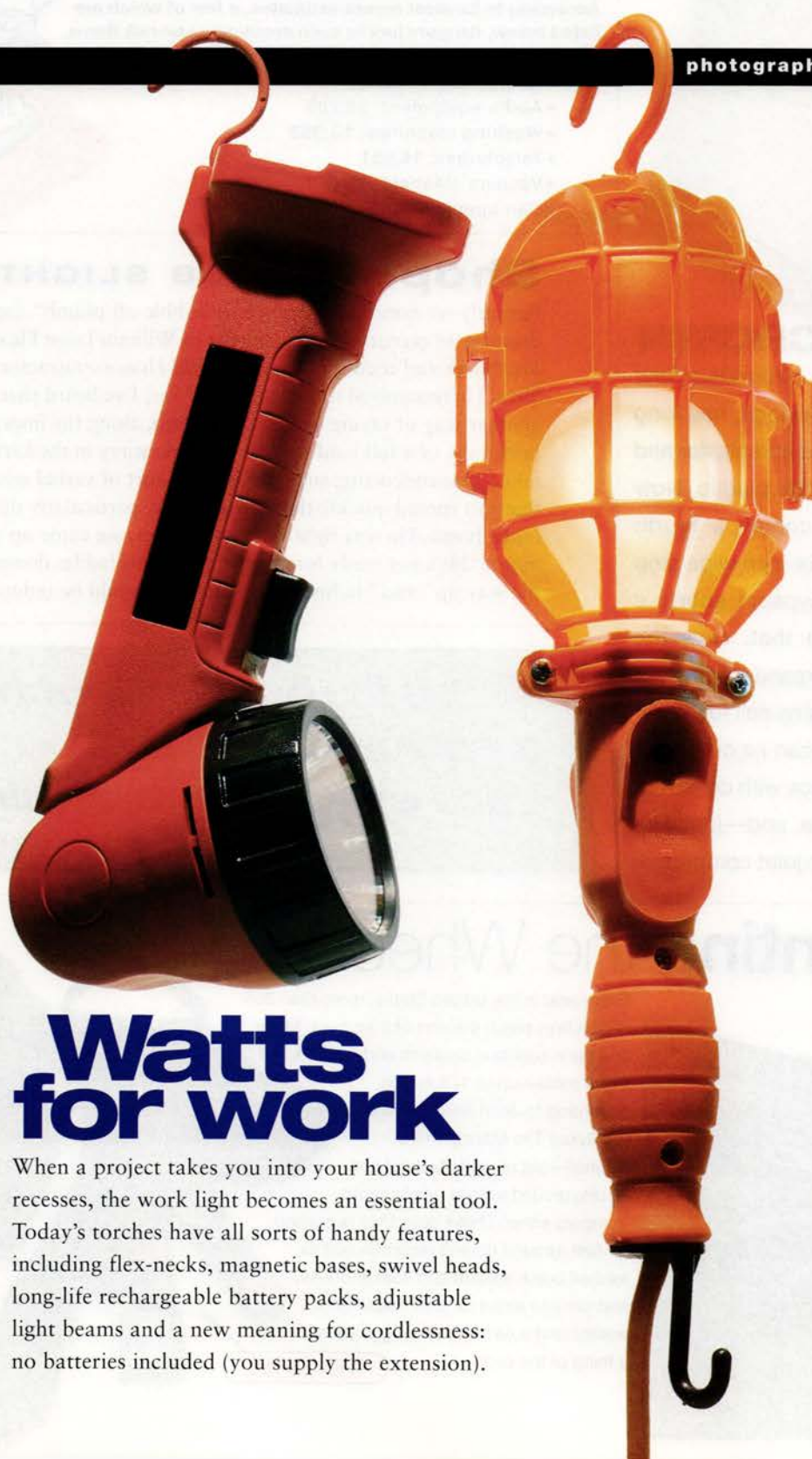
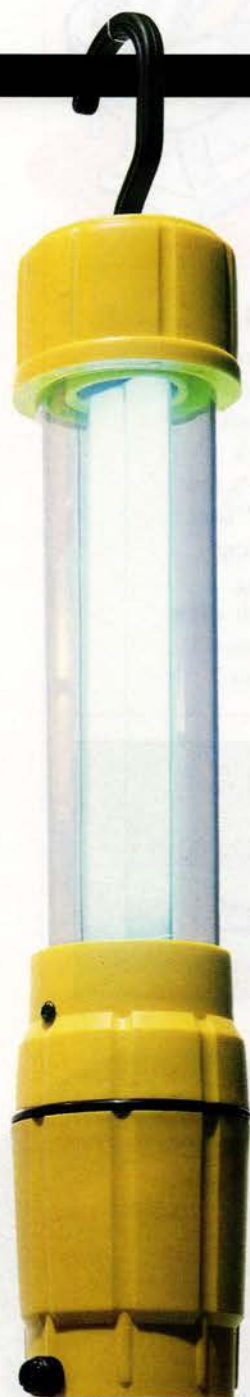


BETTER BASICS

For probing attics, basements and other nooks and crannies, you can do better than the basic flashlight. The one at far left has a ratchet head, while the rechargeable unit, near left, can stand up all by itself.



photographs by Darrin Haddad



Watts for work

When a project takes you into your house's darker recesses, the work light becomes an essential tool. Today's torches have all sorts of handy features, including flex-necks, magnetic bases, swivel heads, long-life rechargeable battery packs, adjustable light beams and a new meaning for cordlessness: no batteries included (you supply the extension).

HOT HALOGENS

With up to 500 watts of lighting power, there's nothing brighter than a halogen lamp, above. But user beware: They generate enough heat to burn skin and start fires and should be covered with wire guards and glass faceplates. Even when cool, the bulb should never be touched: Skin oil can trigger an explosive failure.

HANG-UPS

They haven't changed much, but they've changed for the better. Old-style metal cages that rust and dent have given way to plastic guards, near left, that don't corrode and are safer because they don't conduct electricity. The rechargeable model, middle, delivers freedom from the cord and adaptability with a neck that can swing up to 120 degrees. Fluorescent lights provide light without glare. The model at far left has neither cord nor batteries. It holds price and inconvenience down by connecting to your own extension cord (an incandescent version is also available).

Attack of the Killer Toilets

Millions of household accidents happen every year, but some of them make you wonder. The Consumer Product Safety Commission collects data on the things that emergency-room patients associate with their injuries. Although the CPSC doesn't keep tabs on exactly *how* the accidents occur, it does use the information when it investigates product safety. According to its most recent estimates, a few of which are listed below, dangers lurk in even seemingly low-risk items.

- Toilets: 43,687 injuries
- Refrigerators: 26,731
- Audio equipment: 20,209
- Washing machines: 13,352
- Telephones: 16,651
- Vacuum cleaners: 17,063
- Can openers: 2,070



BRITISH CROWN

Crown molding, that decorative fillet between walls and ceilings, has long been available in wood and plaster and more recently in flexible plastic. Now from Great Britain comes a fourth option: drywall. The 5½-inch wide strip of paper-wrapped gypsum sports a familiar ogee profile that, says the manufacturer, won't expand, contract or sag. The 12-foot lengths sell for about the price of pine and can be cut with a handsaw, glued in place with construction or tile adhesive and—just like drywall—finished with joint compound.

Shoptalk: JOB SLIGHTS

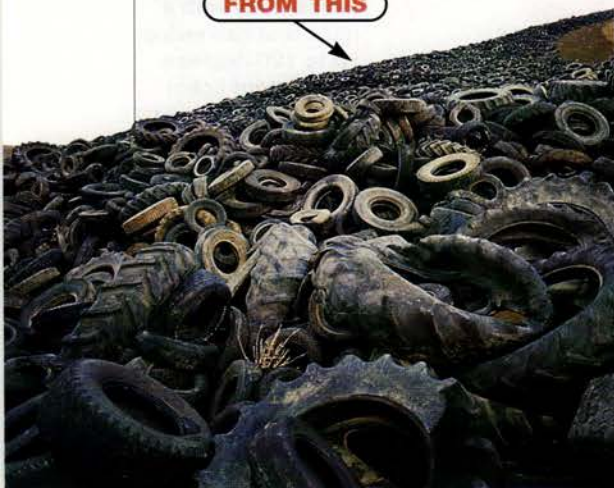
Recently we noticed “about a half-bubble off plumb” used to describe an eccentric Midwesterner in William Least Heat Moon’s *Prairyerth* and tried it out on *This Old House* contractor Tom Silva. He recognized it immediately. “Yes, I’ve heard that. It’s another way of saying somebody’s dumb, along the lines of ‘a few bricks shy of a full load’ and ‘he’s a little wavy in the kerf.’” Tom noted that concocting such phrases is a sort of verbal whittling that can spread quickly through a jobsite, particularly during lunch break. He was right. Within minutes, we came up with a few more: “He’s not ready for inspection,” “His ladder doesn’t go all the way up” and “In his case, a hard hat would be redundant.”

*It is the **human touch** in our buildings that holds our hearts and **energizes our minds.***

Duo Dickinson, architect

Reinventing the Wheel

FROM THIS



Every year in the United States, more than 255 million tires reach the end of their road. Many end up in rubber mountains and landfills, but many more—up to 178 million, according to John Serumgard of the Scrap Tire Management Council—get reused. And not just as playground swings and tugboat bumpers either. These days they’re burned for fuel, ground up and reconstituted as asphalt crack sealant and soaker hoses, and cut into strips for doormats, belts, wallets and a tie that makes gravy stains a thing of the past.

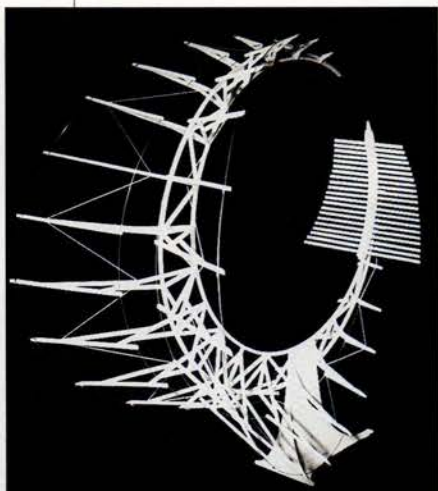
TO THIS



Home Tweet Home

When architect Bethany Ramey asked her client what building materials he preferred, he replied, "string, wax, yarn, trash, paper, hair, moss, wing nuts and waste products"—about what you'd expect from a bird. As part of her submission to the 1996 Green Birdhouse Design Competition in Austin, Texas, Ramey included an "interview" with the putative homeowner.

The contest, part of last year's Green Building Conference, awarded prizes to the most creative and resource-conserving, if untested, designs. Herewith, the favorites:



1. The grand prize winner, from Austin architect Patrick Alexander, uses a superstructure of steel wire coated with a mixture of powdered limestone and Portland cement. Attached to the outside of a house, it's designed to provide an "alfresco" nesting platform for barn swallows and blue jays.

2. The "audience favorite" winner, by Kathryn Hamilton and Scott Glazebrook, is a drinking fountain for mountain bluebirds. A channeled roof of recycled metal flashing directs rainwater into a reclaimed juice can, where it flows out through a rubber tube. A cork in the cistern attached to a lever above the house raises and lowers the tube to control the flow of water to the thirsty bird.

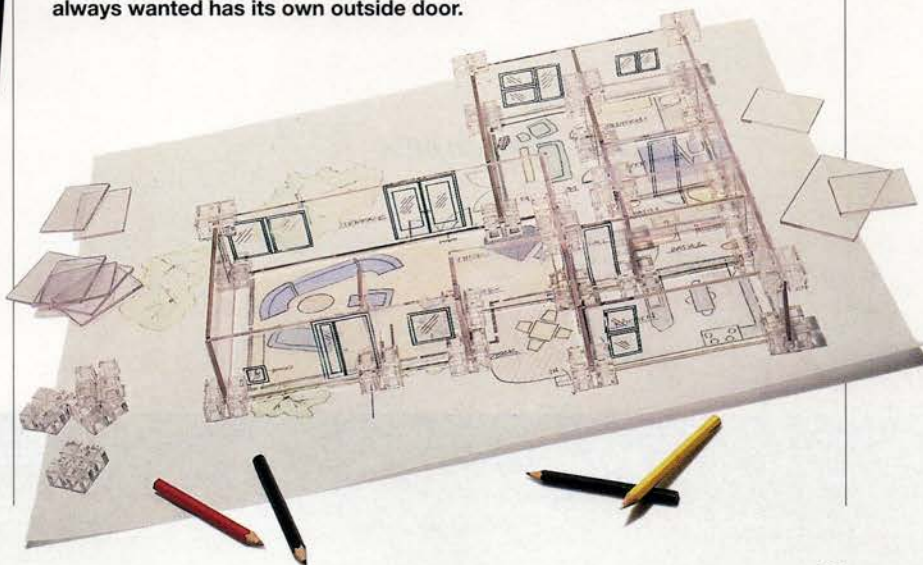


3. Ramey and David Sanford's eclectic entry (mounted for the exhibition on a bird-leg stand made of scrap rebar) is a magpie's paradise, constructed with castoff crayons, an old mop, broken computer parts, salvaged pharmaceutical vials and plastic straws picked up from a fast-food joint.



EARLY ARCHITECTURE

Preteens who possess the patience—and small-muscle control—that building design requires can have some fun with this kit. Using templates, they can create and even furnish their dream house, clubhouse or tree house. After developing a two-dimensional plan, they can raise plastic walls and make sure the bedroom they've always wanted has its own outside door.



Spring Break Samaritans

Last year, while his friends were in Cancun tanning their bodies over spring break, Christopher Brady was exercising his, hauling stones for a retaining wall and stuccoing and painting a two-room schoolhouse in a barrio north of Guayaquil, Ecuador. Brady and 45 other teenagers were working for Kingdom Builders, a program founded by the Congregational Church of Green's Farms in Westport, Connecticut. The ecumenical group sends high-schoolers around the globe to construct and repair buildings with people from the local community. The teens raise the money for travel and supplies; know-how comes from organizers John and Jeri Skinner. Brady, now in his second year with the program, doesn't mind giving up beach time. "Cancun is always going to be there," he says. "You might get a tan with Kingdom Builders too."



WILL YOU turn the corner?

Or keep heading down the same road?

Will you go the next mile?

Or be content

to travel

in the same circles?

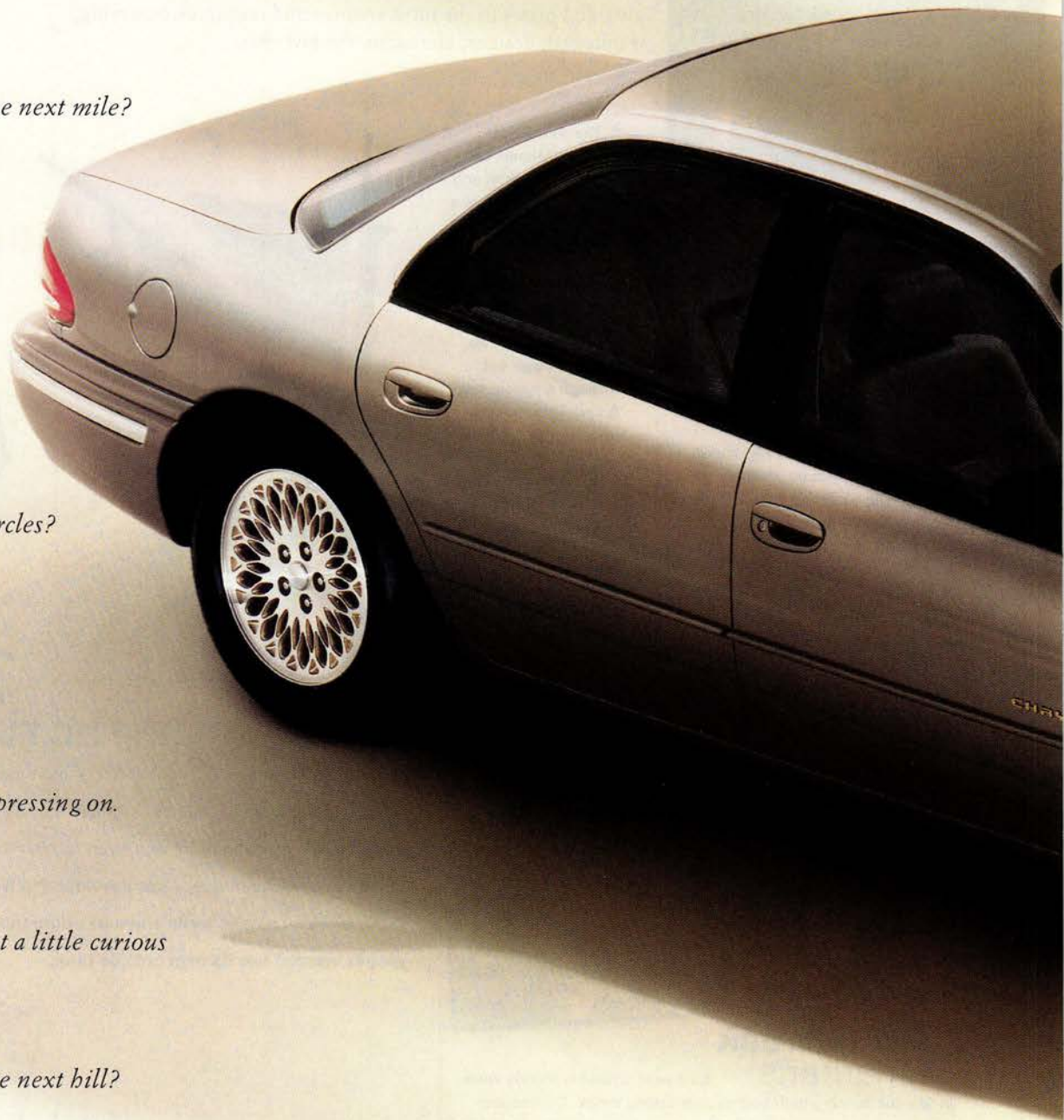
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Aren't you just a little curious

what's over the next hill?

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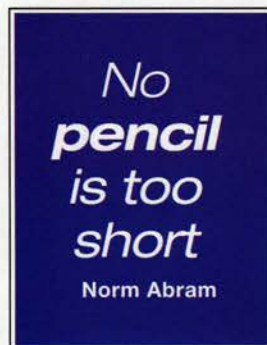
Fast Gas

Faced with frequent earthquakes and expensive labor, Japan has relied on flexible tubing for natural gas since 1980; installation takes half as long as rigid pipe, and it's much less likely to burst under stress. Now available in the United States, the 3/8- to 1-inch plastic-coated corrugated stainless-steel tubing can be snaked through a house's framing, making quicker work of potentially tough projects such as relocating a gas dryer. Says *This Old House* plumber Richard Trethewey, "It's a lot like wiring for gas."



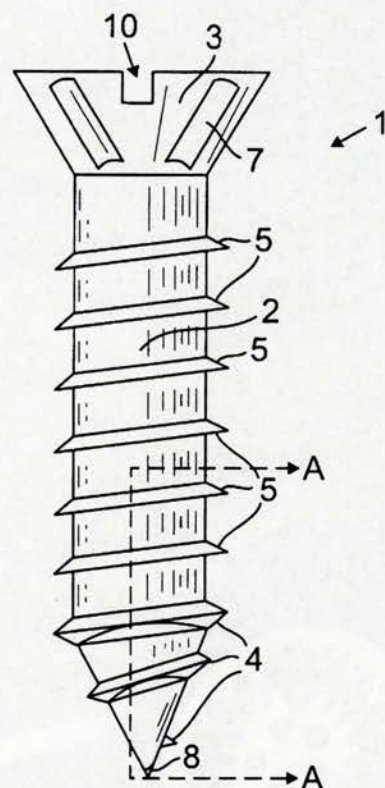
No-Brain Drain

This month's award for defective design goes to dehumidifiers with drain pans that don't drain completely. They have a knockout for connecting a drain tube, but it's on the side, not the bottom, which means the pan never really empties out. The resulting stagnation creates perfect growing conditions for the very scourge the appliance is meant to fight: mildew. Unfortunately, we've seen only a few models that aren't built this way, so unless you find or have one of those, don't be lulled by the false promise of a drain: Empty and clean that pan every few weeks.



A New Screw

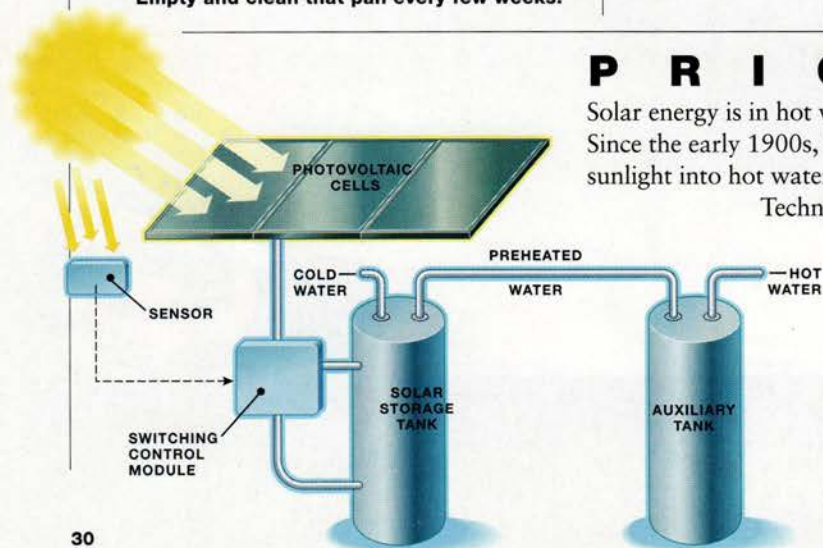
When Andrew Hollander of Bayside, New York, was a locksmith, he often used extra-long screws to install locksets. Yet even after slathering them with soap and drilling deep pilot holes, they would still be tough to drive. He wanted a screw that held tight but put up less resistance on the way in. One morning, in a shower epiphany, Hollander realized that while the threads at the tip of a screw tap the hole, the ones further up the shaft are just a drag. So he took a file to them and invented the "Drew Screw" (a nod to his nickname). His patented, "reduced-friction" design retains the standard thread profile at the tip (No. 4 below), but in all the others (No. 5) only the top half remains. Testing by Underwriters Laboratories proved the screw holds almost as well as traditional versions. With patent applications pending in Canada and Europe, all Hollander needs is a manufacturer to bring his wrist-saver to the world.



U.S. PATENT 5,570,983

PRICEY POWER

Solar energy is in hot water again, but this time the hardware is completely different. Since the early 1900s, flat-plate collectors and tanks-under-glass have been turning sunlight into hot water. Now researchers at the National Institute of Standards and Technology are doing it with photovoltaic (PV) cells. In a demonstration at the Florida Solar Energy Center in Cocoa, 120 square feet of cells produce enough electricity, says lead researcher A. Hunter Fannery, to provide about 73 percent of the hot water needs of a four-person household. But with the high cost of cells (more than \$7,000 for the Florida system), this power is far too expensive for most homeowners, and it will be years before it gets low enough to make PV-powered showers cost-effective.



Working the Web

GOOD STUFF AT GREAT PRICES

It's called Webonomics: Take away the high-rent showroom and glossy catalog by selling on-line and give deep discounts. Case in point is The Faucet Outlet's www.faucet.com, which has more than 38,000 faucets and fixtures at prices that beat most discount stores. (A stainless-steel double-bowl kitchen sink, suggested retail \$607.10, is electronically yours for \$455.33.) Popular products and clearance items appear with descriptions and high-resolution photos, but the rest of the listings are cryptic—want a CF 1749 T/S FCT 2V CP?—so scan catalogs or stores for model numbers first. North Carolina Furniture Online (ncnet.com/ncnetworks/fum-onl.html) features a different retailer each week offering Web visitors 5 to 10 percent off the already low prices found at the state's many furniture outlets. Wares are searchable by style and material. Film buff Marsha Derrickson cooked up www.pulp-kitchen.com to sell off excess inventory from her mom's restaurant business. Now she buys direct from manufacturers and offers commercial appliances and cookware at wholesale prices. The site also serves up a plethora of groan-inducing movie puns.



After years in the weather, most decks turn grimy and gray. To erase those signs of age, spray on a chemical cleaner, work it in with a stiff broom and then hose off. (Protect nearby plants if the cleaner contains bleach.) Once the wood is bright again, keep it that way by following the latest finishing recommendations from the U.S. government's Forest Products Lab. Paint and varnish won't last on a deck, but a penetrating oil (with mildewcide) rolled on every spring and fall will preserve the wood's natural looks and keep the gray at bay.

SMILE AND SAY CHI

Had trouble sleeping lately? Not getting along with the spouse? It may just be a bad mood—or maybe it's bad *feng shui*. According to the Chinese system of design, a house's energy flow—its *chi*—has a profound effect on the health, wealth and general well-being of its occupants. The idea is catching on—so much so that Donald Trump hired a *feng shui* consultant to advise him on his latest venture. We asked Nancy SantoPietro, author of *Feng Shui: Harmony by Design*, to comment on the current *This Old House* project in Tucson:

1. The small and maze-like entranceway inhibits the flow of energy, which can lead to stress and difficulty with decision-making. Expand the foyer or, barring that, mirror the wall opposite the front door to make the space appear larger.

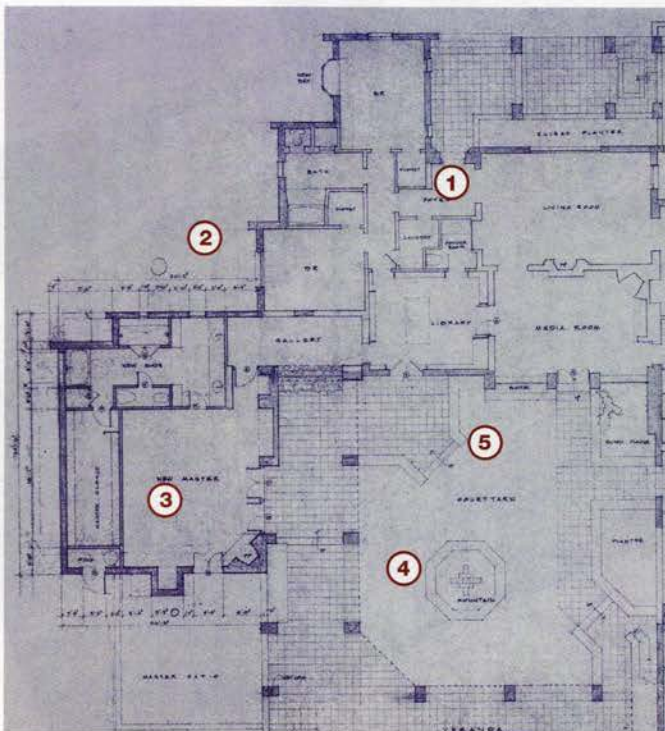
2. The addition of the master suite leaves a corner of the house unsquared—a problem since that corner is the area of the house that governs relationships. To symbolically close up the space, fill it with plants or other landscaping.

3. The bed is likely to go on the wall opposite the courtyard door, putting the Meigses in the direct path of energy entering the room, a potential source of sleep disruption.

4. The courtyard's eight-sided fountain is "auspicious." To activate its energy

potential, make sure it runs every day and surround it with plantings.

5. The courtyard itself is the "grounding force" for the house. Add colored lights around the periphery and wind chimes in the corners to raise the *chi*.



The Porches of Lehigh County

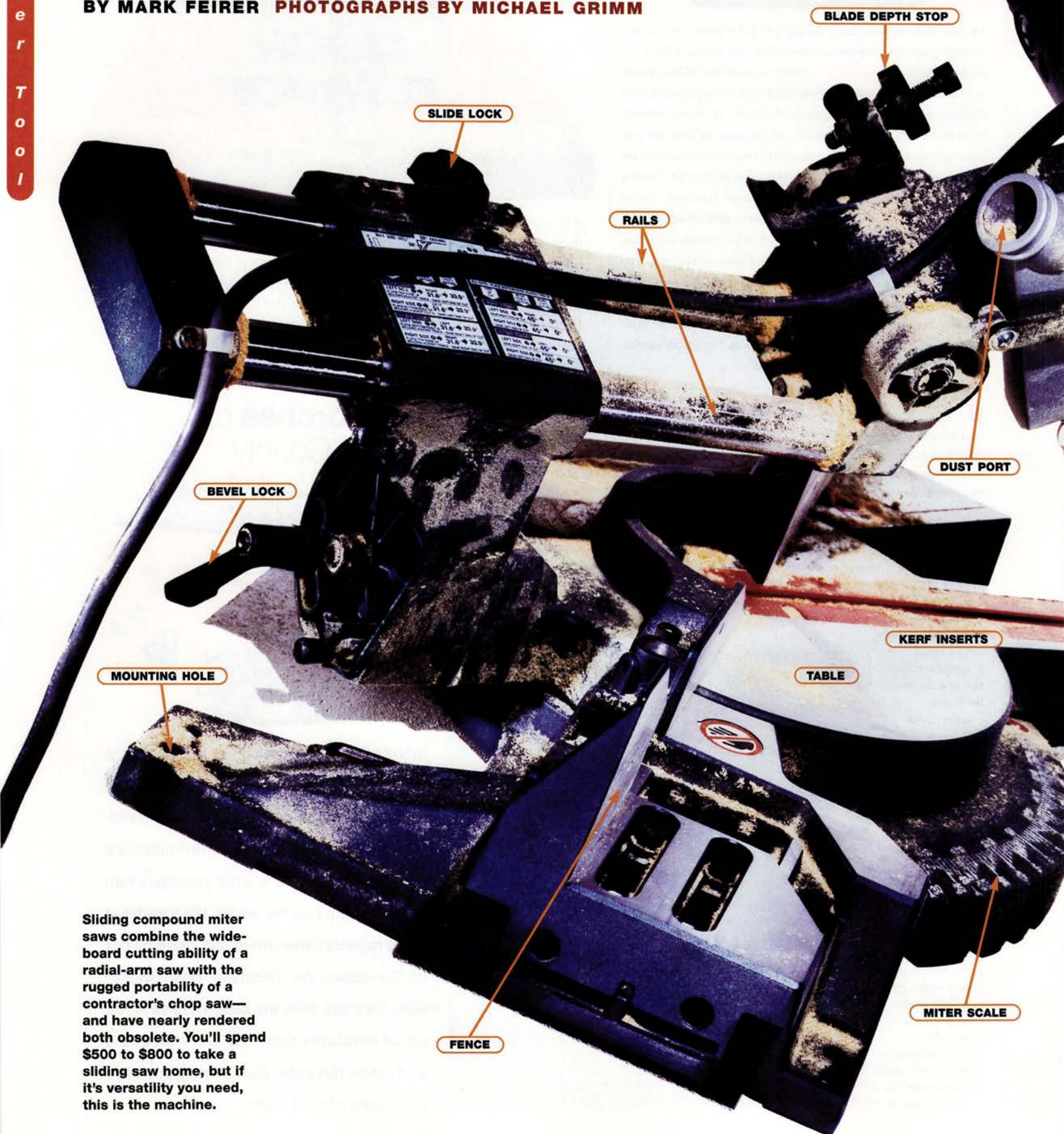


In the heart of Pennsylvania Dutch country, about an hour north of Philadelphia, most of the porches have an intriguing similarity: light-blue ceilings. Whether the houses are old or new, sky blue is what you see when you look up under the eaves. It's a tradition that's repeated elsewhere, but perhaps not for the reason the "Dutchies" give. Houseflies, they say, take the blue to be sky and, smart creatures that they are, don't land and make flyspots, those unsightly little reminders of their visits.

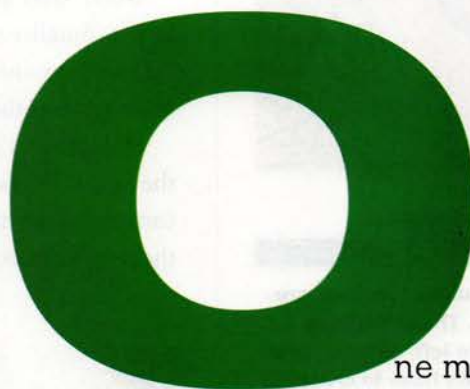
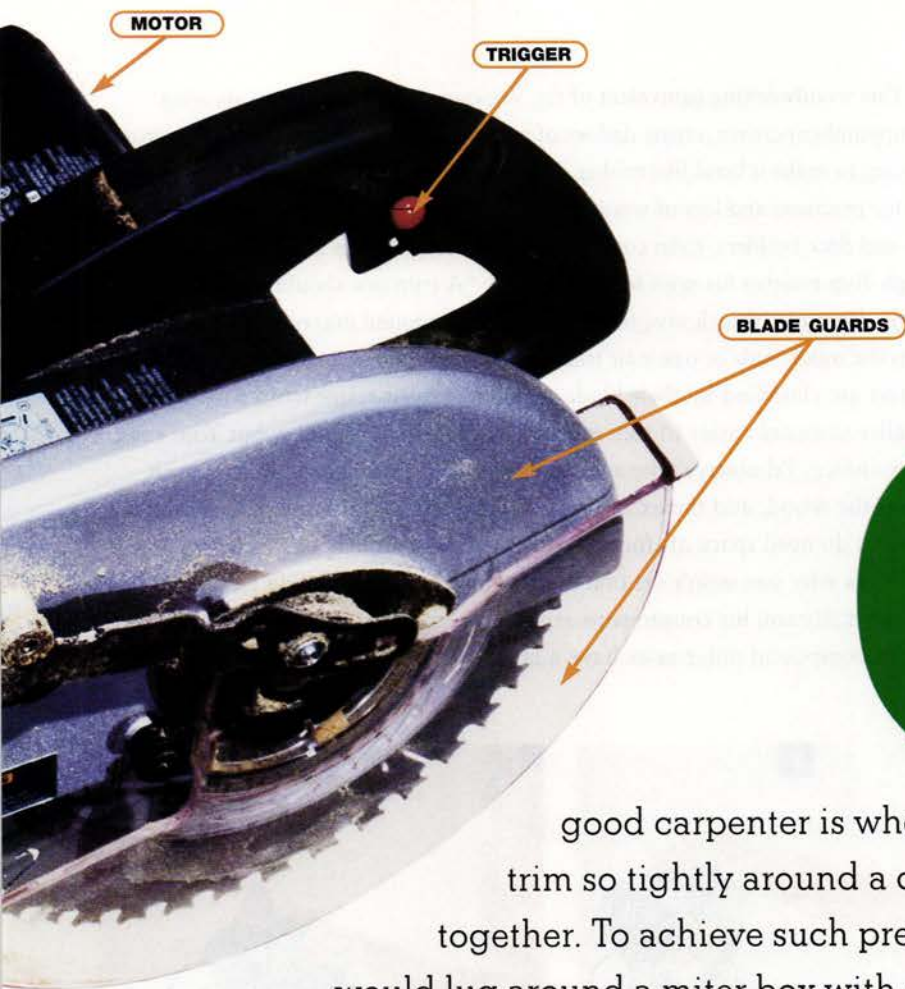
Slice and Dice

Sliding compound miter saws make short work of long trim

BY MARK FEIRER PHOTOGRAPHS BY MICHAEL GRIMM



Sliding compound miter saws combine the wide-board cutting ability of a radial-arm saw with the rugged portability of a contractor's chop saw—and have nearly rendered both obsolete. You'll spend \$500 to \$800 to take a sliding saw home, but if it's versatility you need, this is the machine.



One measure of a good carpenter is whether he can marry two pieces of wood trim so tightly around a corner they look as if they grew together. To achieve such precision in years past, a trim carpenter would lug around a miter box with a stiff, fine-toothed hand-powered backsaw locked into movable guides. *This Old House* contractor Tom Silva cut his first miters and bevels on this deceptively simple tool, which demands patience, a keen eye and an exquisite touch to keep the saw blade on track.

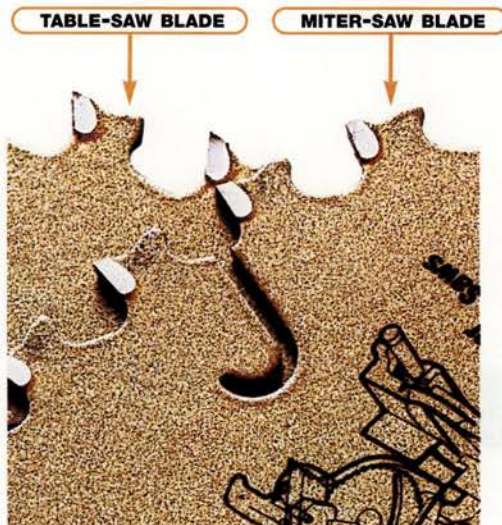
Now when Tom cuts trim, he grabs his power miter saw. With its blade spinning up to 5,000 rpm, the saw screams through wood, leaving glass-smooth, laser-straight cuts that would be impossible even with a perfectly tuned miter box.



The speed of a miter-saw blade also makes it easy to shave whiskers off molding so it fits perfectly on imperfect walls. Go back to a miter box? “Never!” Tom says.

The first power miter boxes (called chop saws for their slashing downward cutting motion) came out in the early 1970s, and Tom was among the first to buy one. His nine-inch Rockwell swung left and right to cut simple miters with ease—“a great tool,” Tom says. Next came the compound miter saw, which allowed the blade and motor to flop to one side. In a single pass, it could cut a compound angle—a miter on a bevel—the prerequisite for seamless crown molding. When Hitachi mated a compound miter saw to the radial-arm saw, it was a carpenter’s dream, with a motor that could pivot up, down and sideways as it slid back and forth on two gleaming

The motor on Tom Silva’s 12-inch sliding miter saw angles upward, so the blade can cut 45-degree bevels right and left.



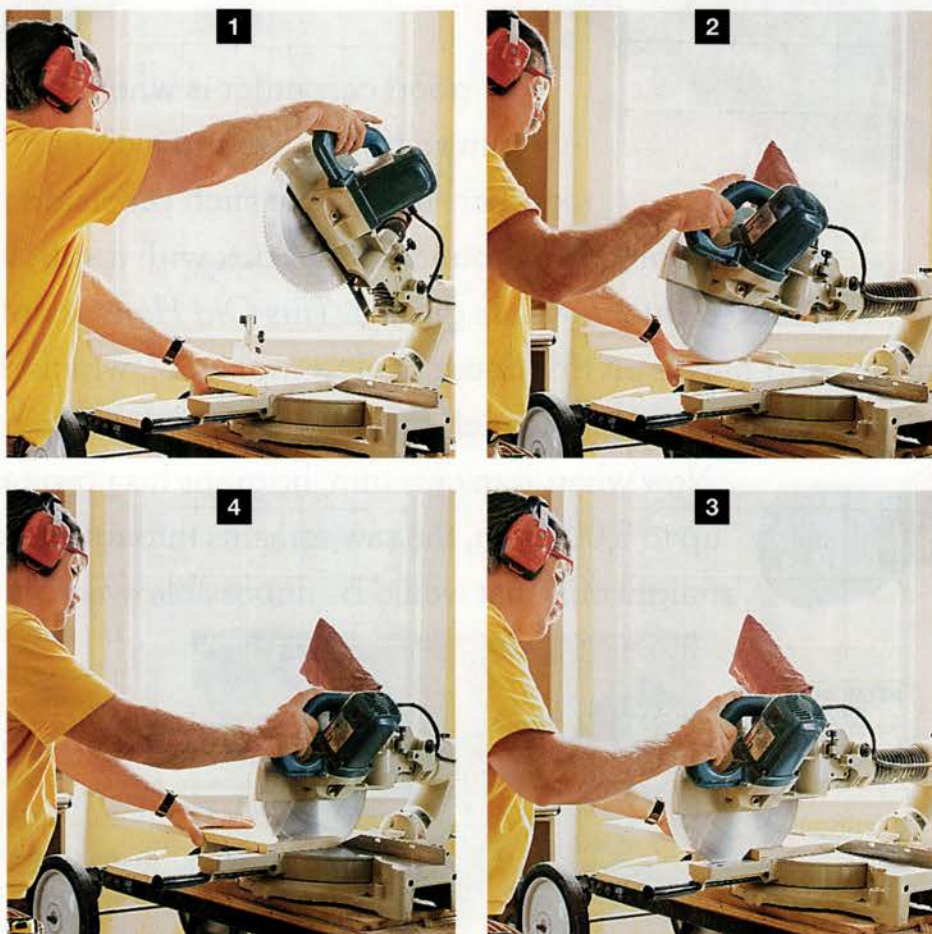
Good bite

Not all circular blades are created equal. Those for table saws, above left, and portable circular saws have to crosscut and rip quickly through everything from green framing lumber to plywood. Their teeth lean forward, in a compromise between speed and smoothness. Miter saws, on the other hand, dine on finer stuff—seasoned, slender sticks of oak, pine and poplar—and they only crosscut. Each tooth of a miter-saw blade, above right, stands straight or reclines slightly. This is called zero or negative hook angle, and it makes ultrasmooth cuts. More teeth mean smoother but slower cuts—and a costlier blade. Tom Silva keeps only two blades for each of his miter saws. His 40-tooth model crosscuts inexpensive trim and the occasional stick of framing lumber with reasonable dispatch and minimal splintering. But for high-end crown, Tom likes 60 or 80 teeth, for a cut so smooth it shines. Most sliding compound miter saws come with a carbide-tipped ATB (alternate tooth bevel) blade, which crosscuts brilliantly but leaves a slightly ragged cut on dado bottoms. For the smoothest dados, the best blade is a carbide ATB-R model, left, with a flat raker tooth (A) that cleans up after each pair of beveled teeth (B). Good-quality ATB blades cost about \$1 per tooth.

steel rails. This woodworking equivalent of the Veg-o-matic could crosscut shelving boards, compound-cut crown, create dados of any width and carve enough kerfs across plywood facing to make it bend like rubber. The tool gladdened the heart of anyone with a penchant for precision and lots of wood to crosscut, including trim carpenters, siding contractors and deck builders. Even commercial roof-truss builders have been known to use it, though Tom reserves his saws for finish work. “A trim saw should be left to do trim,” he says. With his 12-inch saw, for example, he compound miters miles of luscious crown, trims the rough ends of oak stair treads and plows dados into 1x12 shelf stock.

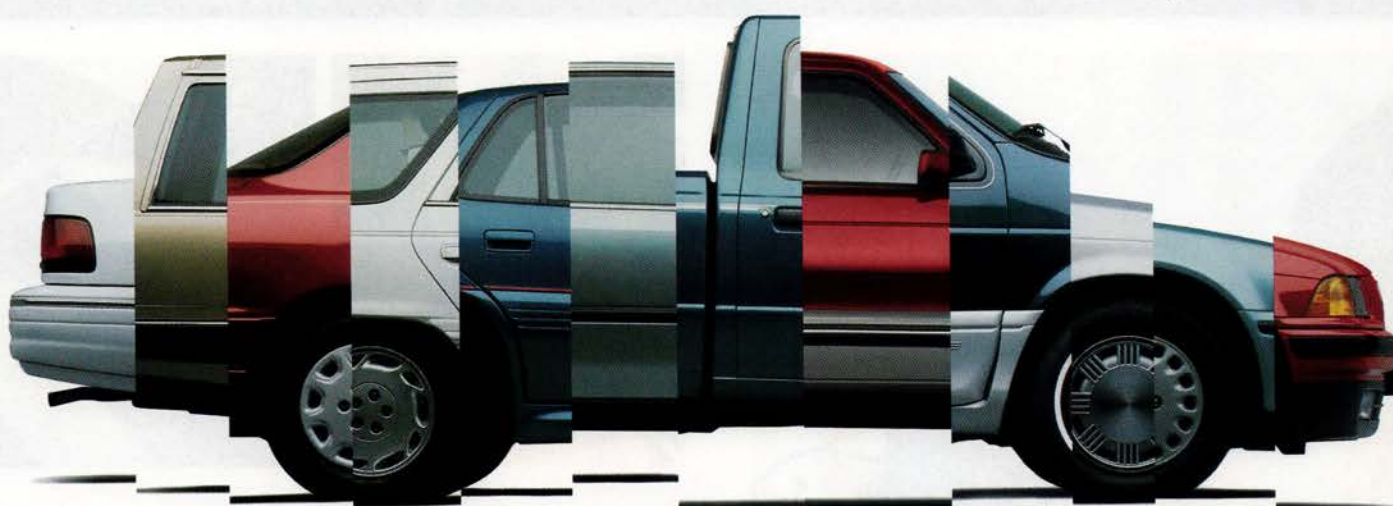
Miter saws are classified by their blade diameters; most range from 6½ to 12 inches. Smaller saws are easier to tote and can fit in most car trunks, but Tom says, “If I had my choice, I’d always take a 12-inch saw.” He gets smoother cuts with more teeth in the wood, and the extra cutting depth lets him muscle through 4x6s.

Sliding saws do need space aft for their slides, some as much as 24 inches behind the fence. That’s why you won’t see one in the workshop of *This Old House* master carpenter Norm Abram; his countertops aren’t wide enough. And Norm doesn’t like the way some compound miter saws have a large gap in the fence right behind the



Miter in motion

Sliding compound saws aren’t hard to handle—they won’t wander off course like circular saws, fall out of adjustment like radial-arms or spray you with sawdust like table saws—but the cutting motion takes some getting used to. The saw is pulled back (1), lowered (2), then pushed through the wood (3, 4), and lifted back to its starting position, all in a fluid, elliptical motion. Tom doesn’t pull the trigger until step 2, just before the cut begins. All sliding miter saws are unstable and must be clamped or bolted down before use.



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blade. This gap accommodates generous miter and bevel angles but lets short offcuts zoom through and sometimes ricochet off the back. Not necessarily dangerous, but it helps to be prepared. "If you're slicing off a small piece of trim to use as a mitered return," Tom says, "you'll have to hunt through the sawdust to find it." Some fences can be adjusted to close this gap. Another trick is to clamp scrap plywood to the fence before cutting: nothing but the blade will get past.

Tom prefers saws with a range of miter settings greater than

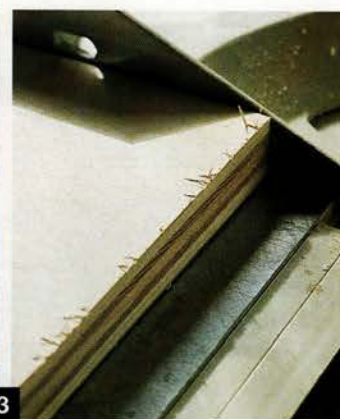
Attention all hands

If the outboard end of long stock isn't supported during a cut, the end being cut may lift and bind against the moving blade. At best, wood may be damaged; at worst, fingers could be severed. Blade guards and automatic blade brakes help protect careless hands, but brakes aren't found on all saws. For safety's sake, always keep one hand on the saw and one on the wood until the blade stops.

45 degrees—even an extra 5 degrees helps when trying to fit trim to a corner that isn't quite square.

Saw tables are fairly short, so long, floppy trim has to be supported during a cut. A number of ingenious portable stock supports are available, but even stacked 2x6 blocks will do if the saw is sitting on the floor. Tom's knees prefer another solution: a sturdy, wheeled cart with adjustable rollers on each end. If there's trim to be done, you'll find him at his cart, in a gathering cloud of sawdust, with his right arm pumping back and forth like an old-time miter-box pro.

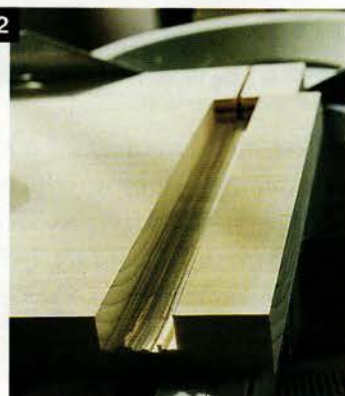
It crosscuts, it miters, it dadoes!



1. A trim carpenter always has to fight to fit molding on an old house: walls aren't square, surfaces aren't flat and the molding isn't forgiving. That's why Tom has to fuss with each joint and shave paper-thin slices off wood. His trick when installing crown molding is to make two cuts instead of one. The first, half an inch beyond his marked line, allows him to see exactly where the blade is cutting. (It's tough to eyeball an angled blade, particularly on the sinuous curves of crown molding.) With his second cut, he sneaks up on his marked line, splitting it down the middle. Then, after a trial fitting, he can shave off just a hair more by butting the crown gently against the teeth of a stopped blade, lifting the blade clear of the wood, then making his cut.

2. Making dadoes for a bookshelf calls for repetitive, overlapping cuts. Tom marks either side of the cut, slices through the right-hand line and moves the wood incrementally to the right as his repeated cuts widen the groove. Then he cuts through the left-hand line and moves the board repeatedly to the left to gobble up the remaining material. Standard alternate-tooth bevel blades leave behind rough-bottomed dadoes. For flat dado bottoms, fit the saw with an ATB-R blade (see "Good Bite," page 34).

3. When it comes to crosscuts, splintering and chipping out are common problems, particularly with plywood. Tom's technique, which isn't found in any manual, is to first score the wood slightly, no more than a sixteenth of an inch deep. Then he comes back and pushes the saw all the way down, finishing the cut.



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Serious Slicers

"Good tools make the effort easier," says Tom Silva, "but they don't give you the skill." That comes with experience. Even if you don't have Tom's experience, though, nothing beats a power miter saw for trim work. The original power miter saws only cut miters and crosscuts, but that's all you need for simple work around doors and along floors. They're light and cost as little as \$150. Compound miter saws can miter and bevel in one stroke, a must when cutting crown molding. This feature pushes the price to \$250 or \$350 for a good 10-inch saw.

Sliding compound miter saws are expensive—\$500 to \$800—but Tom figures the extra cutting width and ability to make dados is worth the cost. If you plan to carry the saw around, lift it a few times before you buy. Also look for a saw with an adjustable fence, which makes it easier to cut small pieces, such as mitered returns. The number of rails a sliding saw has isn't much of an issue, in Tom's view. "I really can't tell the difference between single-rail and double-rail models," he says, and he owns both types. "Get one that feels solid and slides easily."



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Cuts: A,B,C



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Cuts



90-degree crosscut



45-degree miter



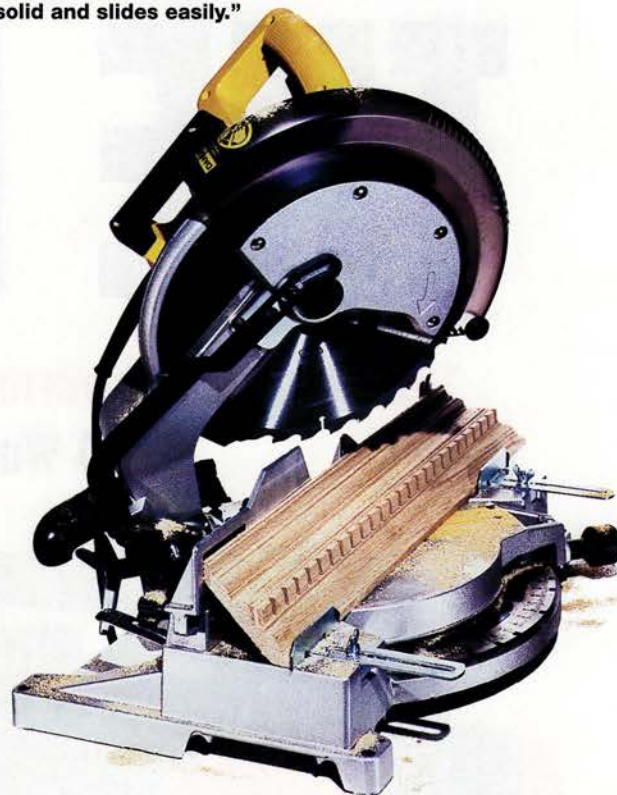
45-degree bevel



compound miter



dado



COMPOUND MITER SAW
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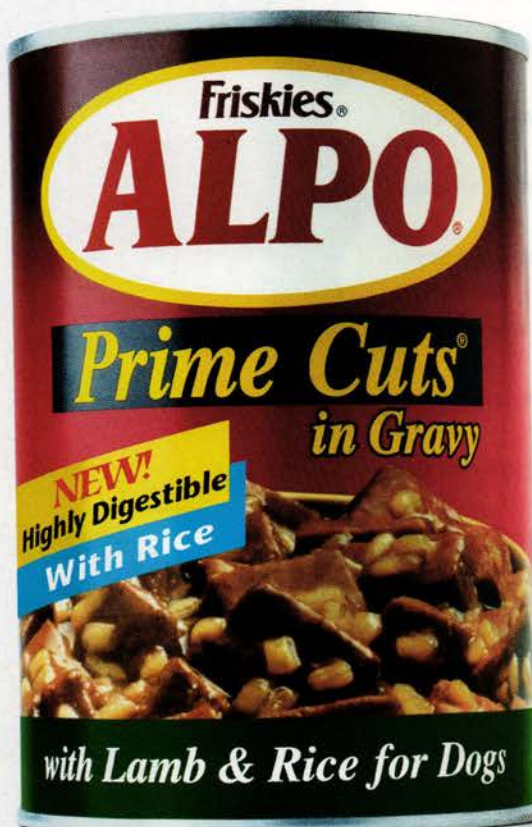
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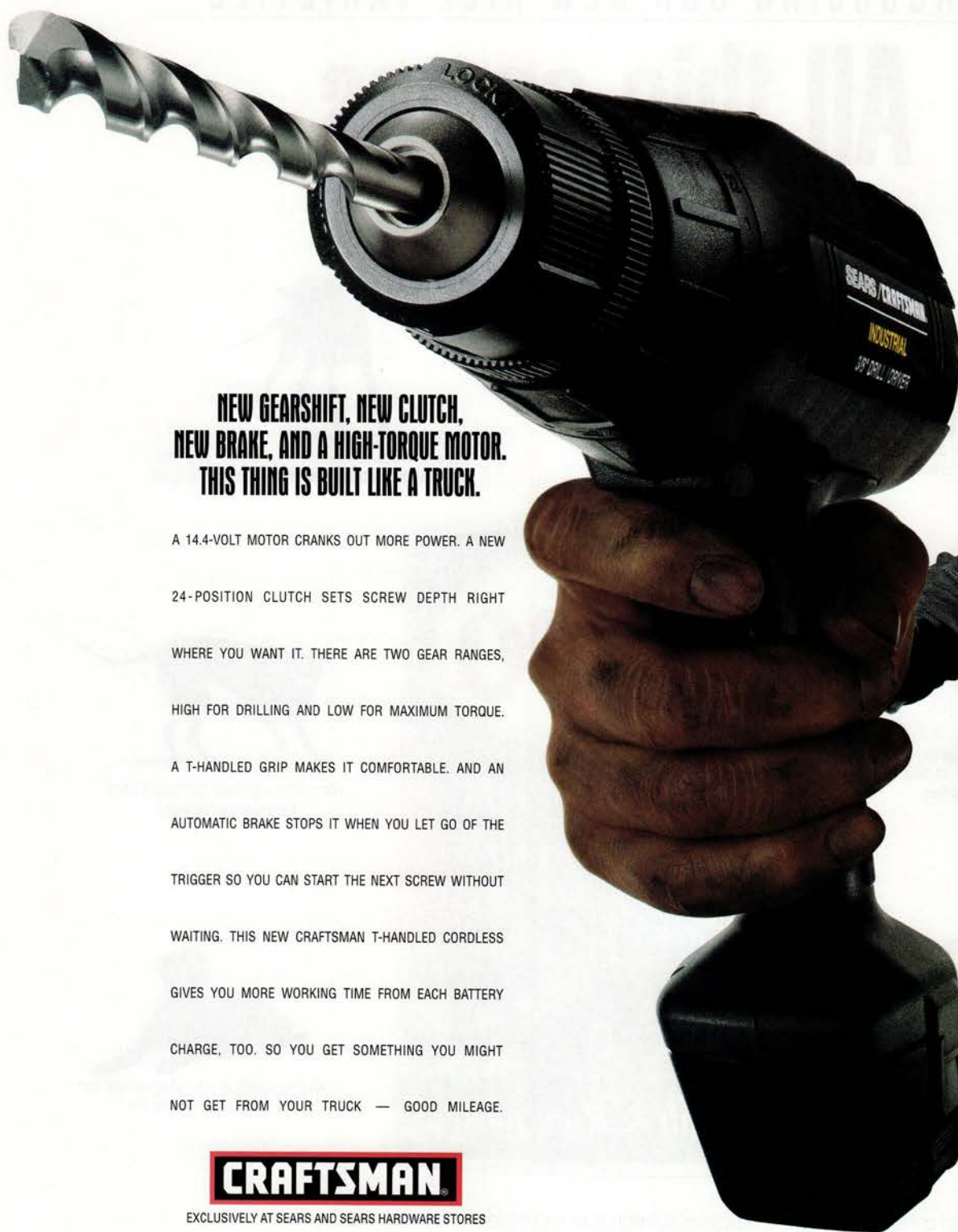
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BY JEFF TAYLOR PHOTOGRAPH BY KOLIN SMITH



Modern cat's paws began showing up on jobsites at about the time this ad appeared in the October 1953 issue of *Home Craftsman*.

Norm on claws

Norm Abram first used a cat's paw when he was 15, working with his father. It's not a tool that got picked up often, "but when you needed it, it was there," he says. To extract nails with heads on or just above the wood, Norm places the paw's tips flat on the wood near the nailhead. He then gives a tap with a hammer to snag the nail's shank in the paw's notch. When he rocks the handle back, the nail is history.

Buried nailheads have to be dug out. Norm holds the cat's paw tips about a quarter-inch away from the nailhead, angled about 45 degrees toward the surface of the wood. As he hammers the tips into the wood to get beneath the head, he pulls the paw's handle upright, scooping out the nail. "It can't be done in one blow," he says. Norm doesn't shed any tears about the divots cat's paws leave in the wood. "It's a rough, tough tool that's meant to be quick."

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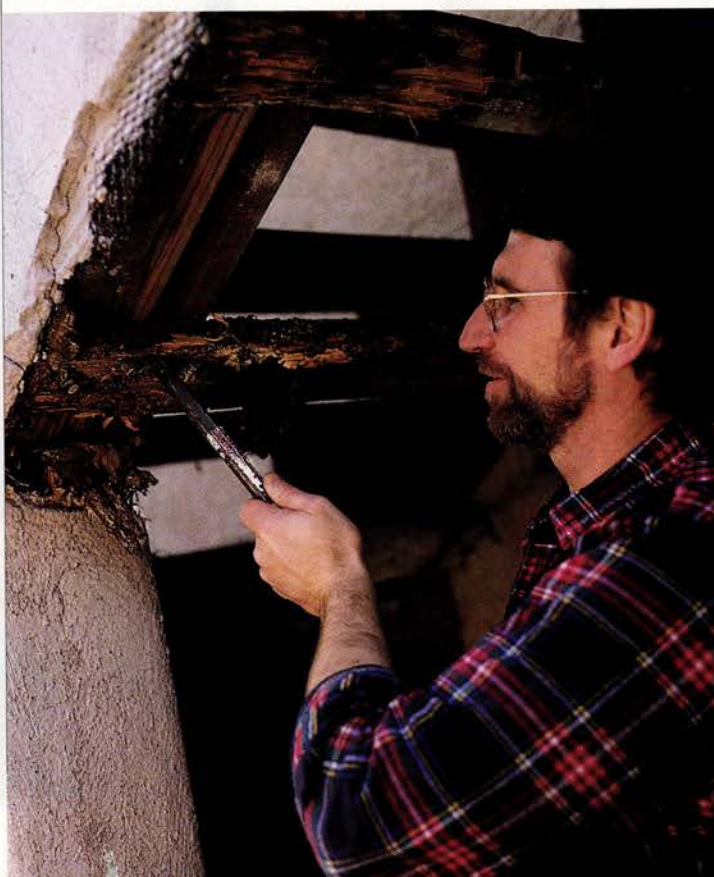
he act of driving nails is often set to the music of profanity, from bloody howls of unleashed eloquence when the hammer accidentally drives a thumb, to a muttered syllable when the nail bends. But if the nail is perfectly driven and set flush for all eternity in the wrong spot, mere words will not suffice or remedy. Reversing such blunders requires a special tool, of which there are several.

One of these is not the carpenter's hammer. The original bifurcated peen was invented by the Romans. *Erratum maximum*; immediately afterward, Rome fell. Yet somehow the shape of the hammer's claw seems ideal for pulling nails or wedging apart nailed boards, and it's already in your hand, so it's faster than the right tool. Carpenters have even put the fork of the hammer claw on a buried nail and struck the face with another hammer. (The eye patch became popular about the same time as this trick.) But a major consequence

of pulling nails with a hammer claw has been broken hammer handles.

The perfect nail-pulling tool is the cat's paw, an unbreakable steel bar with a spoon-shaped claw forged into at least one end. Modern cat's paws have two sets of claws, one each at the head and tail. The typical buried framing nail can be coaxed up with the curled kitty-paw-shaped head claw, but those driven deeply into inside corners require the tail, which can fit into spots with almost zero clearance. If nails resist full withdrawal, as galvanized ones invariably do, they can be yanked out the rest of the way with a flat bar, a crowbar or even tweaked out with nippers.

I know the cat's paw intimately. I own seven—three American brands and three Japanese, as well as a nameless paw with absolutely no markings. Which sounds like I foul up even hanging a picture, but in fact I learned to love my cat's paws because of a



former employer, one Brad.

If Brad had a clue, he hid it well. We, his crew, marveled at his ability to make incredibly mindless mistakes and blame them on us. For example, if we needed a load of studs in the morning, they would arrive at the end of the day.

My expertise with a cat's paw evolved because Brad always did the hanger layout, and he always did it wrong. Joist hangers, as a rule, are like staples: Once in place, they suffer from any attempt to remove them. In fact, few carpenters can remove a joist hanger without bending it in some irreparable way. Thanks to Brad, I learned how to slam the tail claw under the head of each hanger nail and pry it away from the metal about a quarter of an inch, enough to then remove the stubby nail with a flat bar.

One day, Brad nail-gunned himself through the web of his hand as he tried to toenail a stud to the top plate while standing on a ladder. Yes, I know. That's not how it's done. Walls are supposed to be assembled lying horizontal, then raised up. Several of us had warned him; to err repeatedly is dangerous.

Brad dropped the nail gun and began to yodel Maydays. You could hear him for blocks. He must have thought us brutal and cruel for laughing, but we were witnessing the injury we had prophesied.

He was using the only ladder on the site, so I climbed atop the wall clutching a cat's paw, earplugs and a cushioning block of wood. The nailectomy took five sweaty minutes, but I'm sure he thought it was longer. I used the tail claw of a generic cat's paw, the only one I had at the time. Any of my newer ones would have worked better: more efficient, less effort, fewer screams. Brad was just lucky I didn't use a hammer claw.

Claws that cleave

JAPANESE NAIL PULLERS (1, 2, 5, 6) have a pronounced L-shaped head with a defined hammer-strike surface. That bit of extra lever arm at the head pulls the nails out straighter than the traditional pawlike curve. Narrower claws make them the right tools for removing finish and ring-shank nails.

WRECKING BARS (4, 7, 9), which range from 24 to 48 inches long, will rip out even the most stubborn 20d spikes. Their bent or curved chisel tails can separate boards that seem inseparable.



PHOTOGRAPH BY BENJAMIN OLIVER

FLAT PRY BARS

(8) will remove nails, pull apart boards, raise doors or drywall sheets off the floor for hanging, or level base cabinets. On salvage jobs, a carpenter with a pry bar in each hand can loosen anything—siding, flooring, trim—with high speed and little damage. They're indestructible.

THE COMMON TWO-CLAW CAT'S PAW (10) lacks the leverage of its longer cousins, but it's handy for toting around a jobsite.

RAM PULLERS

(11) have parrot-beaked pincers, which are driven under the nailhead with the hammering force of the sliding, cast-iron handle. The handle extends to increase leverage, and the curved foot keeps the pull straight. It's the perfect tool for pulling nails when you want to minimize damage to the wood.

A U-SHAPED BRACKET

(12) replaces the tail claw on this cat's paw, used for twisting joists perpendicular. It looks ridiculous but works like a charm.

RIPPING CHISELS

(13, 3), nightstick lengths of steel stock, are powerful persuaders. Some have a teardrop nail slot in the tail. They're at their best lifting lids on wooden crates.



Aiming for Space

Putting up your own satellite dish isn't rocket science

BY WILLIAM G. SCHELLER PHOTOGRAPHS BY KOLIN SMITH



here it is, 181 degrees.

Now let me check the elevation. Fifty-one. That's it—we're looking right at it." As near as anyone can tell, Bob Camacho, standing atop a Tucson porch roof and manipulating an ovoid, 18-inch metal dish, isn't looking "right at" anything but the bright blue desert sky. Yet if he points to 181 degrees on the horizon, then raises his arm until it's 51 degrees above that spot, he will be aiming at a satellite—EchoStar. From its stationary orbit exactly 22,247 miles

This 18-inch dish can receive two different signals at once, a benefit in multi-TV households.



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900 SE Turbo Convertible

If driving a convertible is an expression of personal freedom, the Saab 900 SE Turbo Convertible speaks volumes. That's because it provides enough room for four full-size adults. It even has a folding rear seat for extra cargo space. And with a 185-hp turbocharged engine, the 900 SE Convertible delivers liberal amounts of fun. Apparently Consumer Review agrees. They named it a "Top Ten Sports Car" for the second year in a row.*



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*Consumer Review, 1995 and 1996. ©1997 SAAB CARS USA, INC.

above the equator, EchoStar is beaming 120 watts of digitally compressed television signal right at Camacho's finger. When adjusted, the dish will focus the 12-gigahertz signal onto a converter suspended 12 inches away. The converter amplifies the signal 100,000 times, reduces its frequency and feeds it through an RG-6 coaxial cable to a receiver sitting on a TV set downstairs. Turn the TV on, and the receiver can decode more than 120 channels.

Until 1994, the only way to tap into satellites was through expensive, damage-prone 6- to 10-foot fiberglass or wire dishes that looked as though they were receiving messages from the Crab Nebula. Now, inexpensive and unobtrusive 18- to 36-inch dishes capture the crystal-clear pictures and CD-quality sound from a new generation of direct-broadcast satellites. DBS is hot. Nearly 4.5 million new systems have been installed nationwide in three years—Tucson dish dealer and installer Ray Gallegos, Camacho's boss, averages more than 200 hookups a year. And with dish hardware prices currently scraping the \$200 level and heading lower, DBS is making inroads not just in unpopulated rural areas but even in cable strongholds.

The secret to getting space-relayed programming is a well-aimed dish. It must be pointing precisely at the satellite, unob-



Once hooked to the dish, the television can show how strong a signal it's receiving. But because there's a frustrating, 4-second lag when a dish is being aimed, the alternative is a portable signal-strength meter.

structed by buildings, trees, power lines and mountains. Otherwise the picture will fade, stutter, even cease altogether in cloudy, rainy or snowy weather. Mounting and aiming are straightforward, requiring little more than the ability to read a compass and drill holes. An experienced installer takes just 20 minutes to do the job.

Because all DBS satellites orbit above the equator, North American dishes, like sunflowers, face south. When Camacho mounts one, he knows the ballpark "look angle" by heart, but

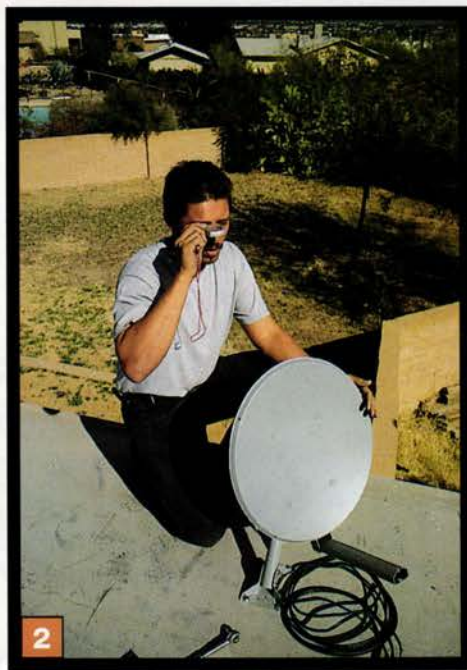
he must confirm that the view is clear. Here, he uses a compass with built-in inclinometer and sees no problem; the surrounding single-story ranch houses and trees won't offer any interference. If he were standing in hilly, forested Fairbanks, Alaska, where dishes must be pointed only 12 degrees above the horizon, clear views would be harder to come by.

His next objective is to plumb the top part of the mast, the bent tube on which the dish will be mounted. "If it's not plumb," he says, "it will throw off the elevation and azimuth [side-to-side] adjustments later." First Camacho drills one hole into a rafter, pumps it full of silicone caulk and puts one lag screw into the base of the mount just tight enough to hold it in place. Then he lines up the mast with the roof slope and plumbs

In search of azimuth



Before securing the base of the satellite mount to the roof, dish installer Bob Camacho plumbs the top of the mast with a spirit level. Homeowners who want to mount their own dish can buy an installation kit for about \$70. Kits include compass, level, cable and how-to video.



Using a compass, Camacho rotates the dish laterally to face its azimuth, the horizon point prescribed by the satellite service. Elevation is set with a built-in protractor behind the dish. Elevation and azimuth settings for every zip code in the country are programmed into the receiver.



Camacho's \$150 signal-strength meter enables him to make final, precise adjustments. A less sensitive \$30 "tweaker" for homeowners will do the same thing. Some dishes have built-in meters that flash with increasing frequency as they detect optimum signal strength.

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Satellite dishes can be mounted almost anywhere, including garden walls, above right, chimneys or even posts in the middle of the lawn. The one at far left is secured with lag screws to an arbor. On roofs, above left, the dish is lagged into a rafter and kept watertight with silicone caulk. *This Old House* contractor Tom Silva says silicone should fill every hole, seal the base and encase every bolt or screw head. "Use a whole tube if you have to," he says. "It's cheaper than replastering the ceiling." He warns against roofing tar. "It will crack." Dishes can't be mounted to tile or slate roofs. For these or any roof where a penetration is undesirable, secure the dish's base to the cornerboards or fascia trim at the eaves or rake.

its top with a bubble level. Only now is it okay to drill, lag and silicone-seal the base's remaining holes.

Camacho picks up the assembled dish, slips it onto the mast and begins tuning its aim in three steps. First he lines up the dish arm with its 181-degree azimuth bearing using his compass. Then he sets the elevation using the built-in protractor on the dish's back side. Fine-tuning is done with a signal-strength meter plugged into the converter on the end of the dish arm. A nudge here, a tweak there, and the meter's needle pegs itself to the right, showing dish and satellite are in "solid" contact. Camacho takes out his wrench and gently tightens all the bolts on the mast, watching the meter all the while to make sure the aim stays true.

Before getting off the roof, he protects the setup, and the circuitry downstream, from being sautéed by lightning. Two lengths of copper wire—one bolted to the base, the other fitted into a grounding block on the cable—lead to a grounding rod rammed into the earth. The National Electrical Code, used in Tucson, requires at least No. 10 copper wire for the dish and No. 14 copper wire for the cable. (See our story on lightning rods, page 104.) The converter

remains vulnerable, Gallegos says. If there's a static discharge from a strike, it will reflect off the dish and cook the unit. Converters cost \$100 to replace, "but that's a lot cheaper than having to buy a new receiver and television set."

Normally, Gallegos and Camacho run a dedicated satellite-dish cable into the house, bypassing any existing cable and fitting drip loops, grommets and caulk to the entry point to keep out water. "We don't risk hooking into old RG-59 co-ax," Gallegos explains. "It can't carry a high-frequency signal over any distance." This house, however, is a cinch. It's already wired, thanks to a deactivated but satellite-compatible wireless cable-TV hookup. All he has to do is connect the dish to the existing

outdoor cable box and hook the receiver to the same cable in the living room. "This is the kind of job the customer could have done using an installation kit," says Gallegos, "though we guarantee that the adjustments are all right on the button." To make sure, Gallegos plugs in the receiver and phones in the access code and customer information. Seconds later, voilà!—TV from heaven.

Dish wars

Consumers should choose carefully among satcasting's gang of four—DSS, EchoStar, PrimeStar and AlphaStar. Once the dish is on the roof, you're locked in, unable to change except at considerable expense. Programming is fairly uniform (all the usual network and cable channels), but the competing payment plans—lease/purchase options, sign-on bonuses and program startup fees of as much as \$300—are as baffling as the deals offered by long-distance carriers. Boasts about more

channels (nearly 200) doesn't necessarily mean more shows: many are pay-per-view or music channels. Unlike cable, which can hook into the interactive infobahn, satellite is a one-way street. It can't even show your local news...yet. EchoStar, now merging with Rupert Murdoch's News Corp., is promising 500 channels by next year, with some reserved for local stations. Cable companies are expected to wage legal counterattacks, keeping the war for our TV sets raging. Stay tuned.

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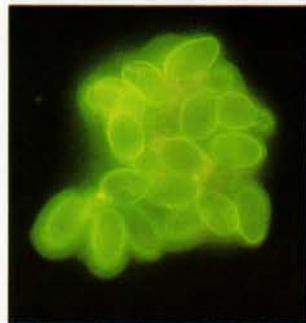
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If you want safe water, install a home purification system

BY BROOKE DETERLINE

C

Charles Waters's well is deep, sinking 20 stories into the bedrock of Vermont's broad, tree-filled Taconic Valley. Clear, cool, springlike water gushes from the well, testimony to the rugged purity of the nearby Green Mountains. To Charles and his wife, Cindy, it was just another predictably perfect part of their "little piece of heaven." Then one night several years ago, the bubble burst when their plumber called, shouting, "Stop drinking the water!"

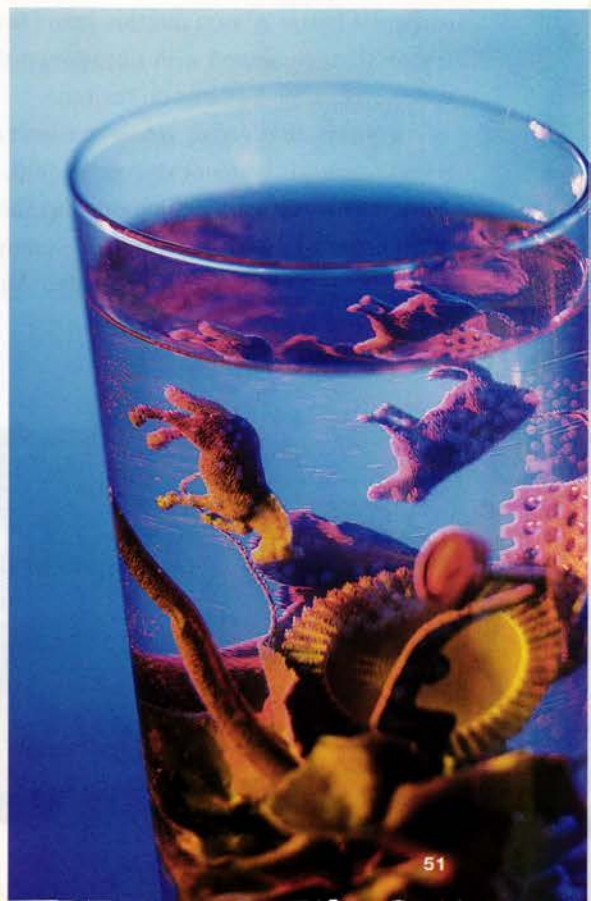


Cryptosporidium, here magnified 1,000 times, is a protozoan found in animal and human waste. It may be deadly to anyone with a weakened immune system.

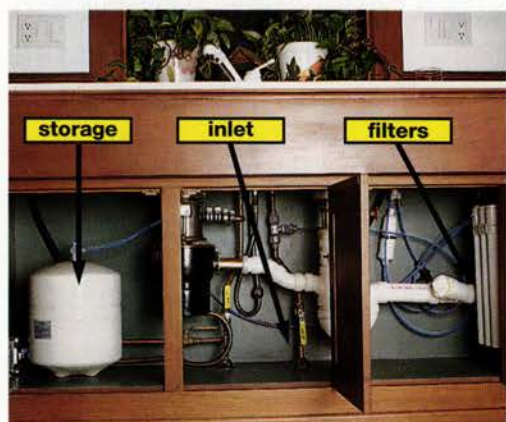
The perfect little well in the middle of the perfect little valley was apparently an imperfect distance from a neighbor's septic tank, and the water contained coliform bacteria. In effect, the Waterses and their two children had been drinking their neighbor's sewage. They learned this as a result of a simple \$15 test, required by the state because of some work a plumber was doing on their house. "I was particularly worried for the kids," says Cindy Waters, "because those were the years when they were growing so quickly." If not for the test, she might never have known. "The water looked and tasted fine."

About 15 percent of U.S. households pump from private wells. Most are unregulated and the water is rarely tested. The rest of the nation gets its water from municipal systems. Although city water is usually tested daily, or even hourly, its safety cannot be taken for granted. The Environmental Protection Agency (EPA) reports that last year 1 of every 10 people hooked up to municipal systems consumed water that didn't meet safety standards, although the vast majority of them suffered no ill consequences. About a million people became sick from drinking contaminated water, and at least 800 died. Research in 1995 by the National Resources Defense Council found that 54 percent of city drinking water that had been filtered contained cryptosporidium, a dangerous parasite. In 1993, 400,000 people in Milwaukee became ill from cryptosporidium ingestion, and 104 died. The system was contaminated when runoff from heavy storms overwhelmed the filtration plant.

Breakdowns in city water systems occur nationwide and, predictably, are unpredictable. No region of the country is unaffected. In only the last three years, the Washing-



Clean water act



Norm Abram suspected something was wrong with his well water when he found "bright green stains in my bathroom fixtures." Tests indicated the stains were from acidic water, which can leach copper from pipes. Testing also showed high concentrations of calcium and magnesium, the chemicals that cause hard water. Norm put a whole-house "point-of-entry" system in his basement to neutralize the acid and soften the water. Every month he pours a 50-pound bag of sodium chloride (table salt) into the softener tank, and once a year he gives the acid-neutralizing tank a shot of calcium carbonate. For "an extra margin of safety," he installed a reverse-osmosis unit under his kitchen sink, left. Treated well water enters at the bottom of the center cabinet and is routed to the three filters (vertical pipes at right that include a sediment filter, carbon filter and the reverse-osmosis unit), then to a storage tank in the left cabinet.



ton, D.C., water supply has exceeded federal safety guidelines for bacteria five times, the Las Vegas water supply has been contaminated by cryptosporidium (19 deaths resulted), Silicon Valley's water supply has been threatened by toxic chemical leaks, and some Georgians have been asked to boil their water on several occasions because of fecal coliform contamination.

Overall, says Paul Berger, an EPA microbiologist, "our drinking water is among the safest in the world, but problems do occur, and with our growing population, and with development near watershed areas, the problems may only get worse." The best way to be certain your drinking water is pure is to install a private purification system. That's what *This Old House* master carpenter Norm Abram did this year. He chose a reverse-osmosis system that, combined with filtration, produces safe drinking water every time he turns on the tap.

As Norm discovered, safe water isn't cheap. A whole-house reverse-osmosis system can cost \$6,000, but a simple under-the-kitchen-sink unit feeding one tap shouldn't cost more than \$900 installed. Still, any filtration system can seem inexpensive compared with buying bottled water. And bottled water isn't

necessarily any safer than city water. In fact, despite the pristine scenery on labels, bottled water can legally be nicely packaged tap water.

Although reverse osmosis is probably the best overall choice for protecting your home water supply from unknown contaminants of any kind, there are a bewildering number of purifiers on the market that eliminate specific contaminants, such as lead. The only way to find out if your water is safe is to have it tested. A comprehensive test by an EPA-certified laboratory can cost from \$200 to \$500.

In wells, nitrates are, after bacteria, the most common contaminants. They can be naturally occurring in the surrounding soil or they may be the by-product of animal waste or fertilizer. Nitrates cause blue-baby disease, deadly to children. Lead and radon are also common in wells. The EPA estimates that 8 million people have undesirably high levels of radon in their water,



This ultraviolet treatment system processes about six germ-free gallons a minute.

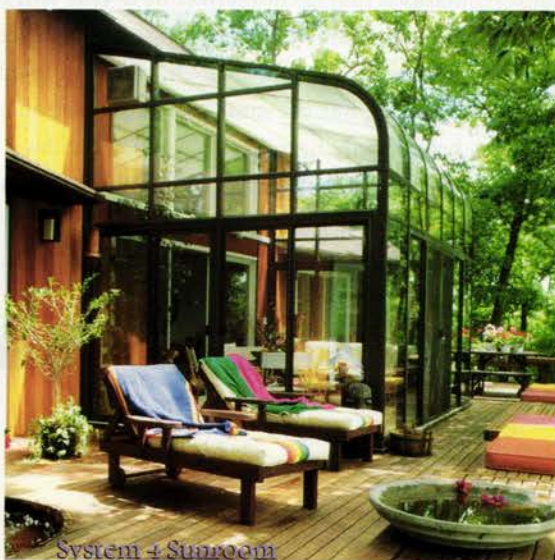
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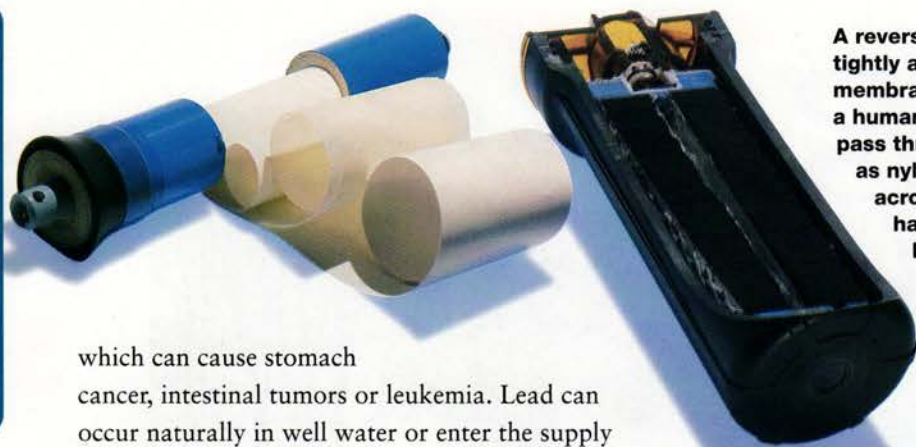
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A reverse-osmosis filter, far left, is made of two sheets wrapped tightly around a plastic tube. The first sheet is a plastic-based membrane with holes each no larger than $\frac{1}{40,000}$ the diameter of a human hair. The holes allow water molecules, and little else, to pass through. The second sheet, made of an inert material such as nylon, acts as a spacer that keeps unfiltered water running across the membrane. A typical activated carbon filter, left, has more than 100 acres of surface area to trap particles. Eventually, it clogs and must be replaced.

which can cause stomach cancer, intestinal tumors or leukemia. Lead can occur naturally in well water or enter the supply through lead pipes or copper pipes soldered with lead. The metal, found in the water of 15 percent of homes tested by the EPA in 1993, can cause severe neurological damage in young children.

To treat these and other specific problems, purifiers use four basic strategies: disinfectants, filtration, distillation and radiation.

The most common disinfectant is chlorine. Metered into the line like the flow from a giant IV, chlorine kills most bacteria and some viruses. However, chlorinated water has been found to contain cancer-causing by-products called trihalomethanes, and federal regulations that go into effect next year will limit the amount of chlorine municipal water systems may use. One alternative to chlorine is ozone gas, which, when bubbled through a tank of water, has the same germicidal action as chlorine and leaves behind only harmless oxygen molecules.

Filters block impurities such as asbestos, some metals and man-made organic compounds like benzene.

Distillation systems filter water by heating it to steam and then condensing it back to water, leaving behind heavy metals and pathogens. It can take five hours for the drop-by-drop apparatus to make a gallon of clean water.

Ultraviolet radiation, the system Charles Waters settled on to kill bacteria, uses ultraviolet light to deactivate the DNA of pathogens, halting their reproduction. Although ultraviolet will kill many bacteria and viruses, it doesn't affect parasites such as cryptosporidium or giardia.

The most effective water purification system is reverse osmosis, which uses semipermeable membranes to screen out most contaminants. (Unfortunately, the membranes also screen out beneficial minerals such as fluoride.) Like most water purification systems, prefilters and afterfilters are needed to trap gases such as radon and some organic compounds such as trichloroethylene. Reverse osmosis also flushes at least a gallon of water down the drain in its filter purging process for every one it sends to the spigot. All of which may be worth the peace of mind a reverse-osmosis system offers, not to mention what it



will do for your coffee-making. "Both my daughter and I think the water tastes better now," Norm says.

Ozone equipment is relatively easy to install, inexpensive to maintain and safer than chlorine.

No system gets everything

Contaminant	MCL*	Ion Exchange (Cation Water Softener)	Ion Exchange (Anion)	Activated Carbon Filters (Granular)	Solid Block & Precoat Adsorption Filter	Reverse Osmosis	Distillation	Activated Alumina	Ozone	Disinfection (chlorine, UV light, ozone, chloramines)	Boiling	Ultraviolet (UV) Radiation
arsenic	0.05 mg/L		•			•	•	•				
asbestos	7 MFL			•	•	•	•					
atrazine	0.003 mg/L			•	•	•						
benzene	0.005 mg/L			•	•				•			
fluoride	4 mg/L					•	•	•				
lead	0.015 mg/L **	•			•	•	•					
mercury	0.002 mg/L		•	•	•	•	•					
nitrate (as N)	10 mg/L		•			•	•					
radium	5 pCi/L	•				•	•					
radon	300 pCi/L			•				•				
trichloroethylene	.005 mg/L			•	•		•		•			
total trihalomethanes	.1 mg/L			•	•		•		•			
bacteria and viruses						•	•			•	•	•
cryptosporidium/giardia	NA				•	•	•				•	
metallic taste		•				•	•					
objectionable taste				•		•	•					
objectionable odor						•	•					
color		•	•	•	•	•	•					
turbidity	0.5-1.0 NTU ***											

*maximum contaminant level **EPA action level ***performance standard



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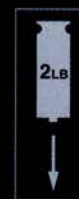
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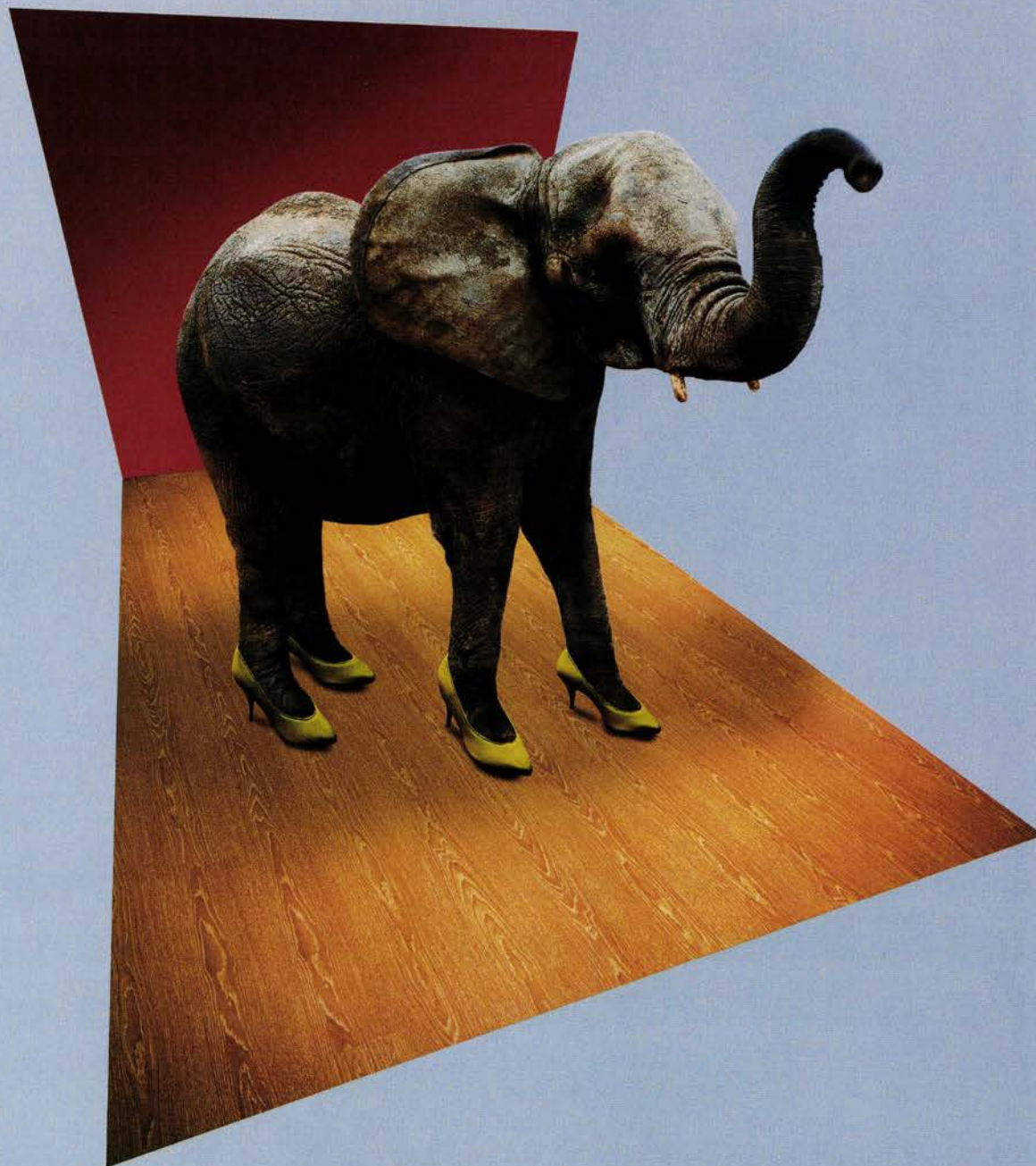
*Overstrike test conducted by striking hammer handle against metal object. © 1994 The Stanley Works.

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Ceiling fans pump life into still air

BY JOHN KELSEY PHOTOGRAPHS BY KELLER & KELLER

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eetering atop a 10-foot stepladder, *This Old House* electrician Paul Kennedy is poking his pliers into the vault of his family room's cathedral ceiling, getting ready to mount a fan. "This is going to look great," Kennedy predicts, as he twists on wire nuts. "It'll make this room a lot more comfortable too."

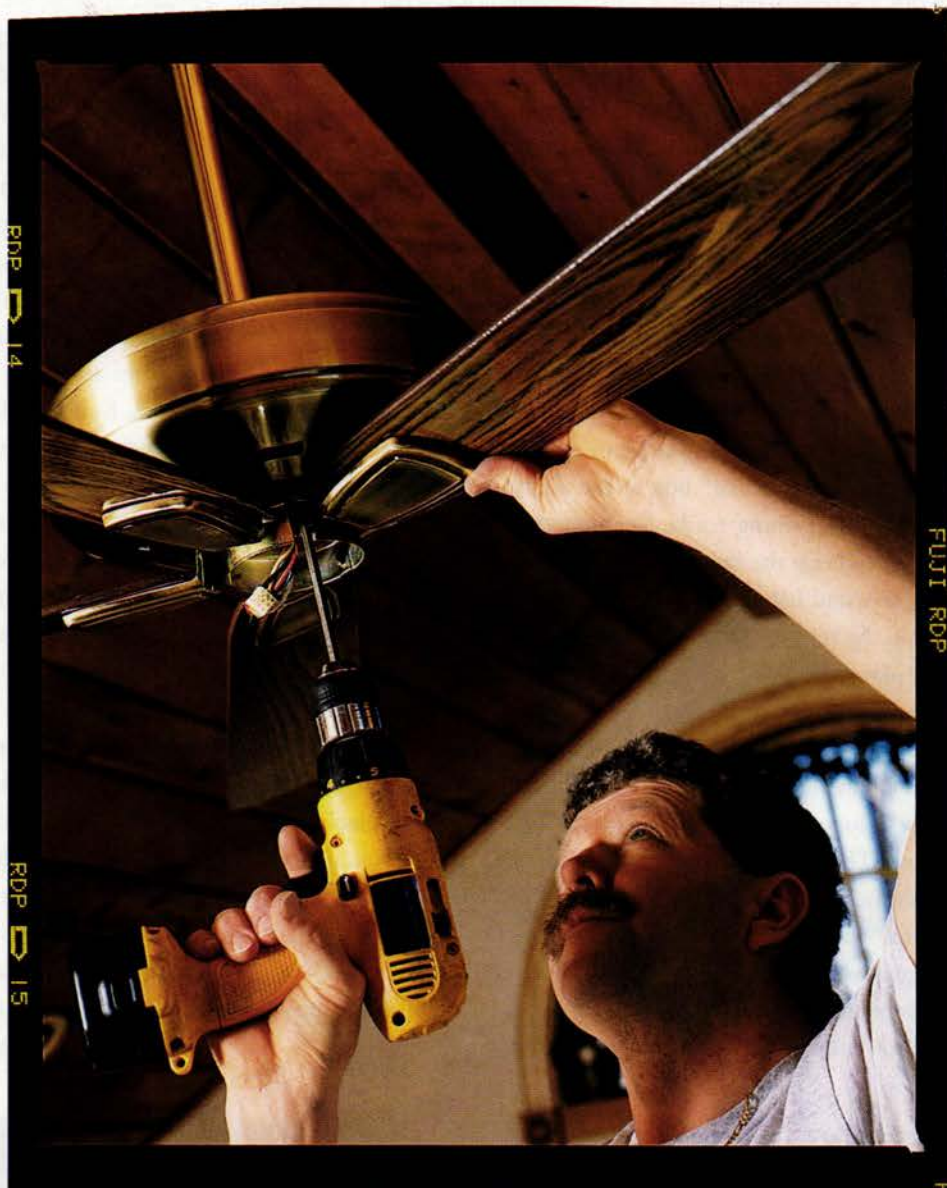
Fans were one of the first appliances; they sprouted from ceilings in the late 19th century almost as soon as electricity arrived in town. Air-conditioning nearly killed them off in the 1950s, but the energy crisis of the 1970s brought them back again. Now an estimated 100 million fans hang from ceilings in the United States, and 14 million new ones are sold every year.

The fans don't actually cool the air, of course, they get it moving, which amounts to much the same thing as far as skin is concerned. In a 1.7-mph breeze—roughly what a fan on high speed generates—people feel as comfortable at 82 degrees as they do in still, 79-degree air. Users can save 15 percent on energy costs if they take advantage of that 3-degree benefit by running more

fan and less air-conditioning. Even snowbound northerners, who want to move heated air off their ceilings, have jumped on the fan wagon.

Like every other appliance on the market, ceiling fans come in four basic grades: promotional, good, better and best. The difference comes down to motor weight. Fans with heavy motors cost more—up to \$250—but last longer, work harder and run quietly for days and weeks without overheating. (Lesser types can't go more than four or five hours without needing a rest.) You can pay more for style, but you won't get

Attaching the blades is the final step Paul Kennedy takes when installing a ceiling fan. If the fan wobbles a lot, he can balance the blades like his car tires, with stick-on lead weights.



more fan. The number of blades matters less than their pitch and span. Wide-diameter fans with steeply pitched blades—up to 15 degrees off horizontal—move more air at lower speeds, which is more comfortable and less distracting than a rapid flutter.

Once a fan is chosen, Kennedy says, nearly anyone who can work a screwdriver, twist a wire nut and not fall off a stepladder has the skill to put it up, as long as a wired fan box is in place. (If there's no wiring, an electrician is called for.)

Fan boxes are metal outlets screwed, not nailed, to a joist or framing member. The 1996 National Electrical Code requires every new ceiling outlet to be fan-ready, but in older homes such boxes are rare. Kennedy's solution, when he can get to the ceiling from above, is to nail a chunk of 2x4 between the joists and screw the fan box to it. Otherwise, he slips a fan brace—a telescoping metal bar—through a small hole in the ceiling and buries the brace's spikes into the joists. The fan box then hangs from the bar with a U-bolt. To keep his 20-pound fan from taking an unscheduled plunge to the floor, Kennedy fastens a low-profile "pancake" box to the ceiling beam.

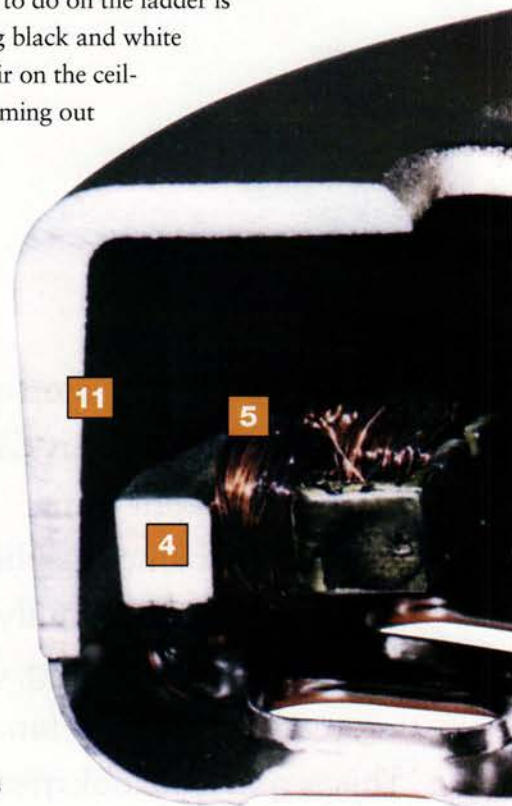
With everything ready, Kennedy trips the circuit breaker, then heads up the ladder, where he bolts the ceiling plate to the fan box and fishes the wires through the plate's hole. Down again, he retrieves the fan, minus its blades, hangs it on the ceiling plate's hook and starts twisting together the black and white wires with wire nuts.

It takes only three wires to safely power a fan: a white, a black and a bare copper ground. Wiring is mostly a matter of matching wire colors: Common white goes to fan's white, hot black to fan's black. The bare copper ground, once bolted to the box, mates with the green wire on the ceiling plate. Ceiling boxes often have additional colored or striped wires that run to the wall switch. Kennedy normally hooks these to the fan's light circuit—he figures people who swat a wall plate in the dark aren't looking for a breeze—and lets the pull cord control the fan.

For Kennedy's cathedral ceiling, remote control is more practical than pull cords. Using a push-button control, he can signal a hidden, doughnut-shaped receiver unit to stop, speed up or reverse the fan from anywhere in the room. He says he'll mount the control unit on the wall like a regular switch "so I don't get mixed up with the TV remote."

The remote also makes installation simpler because it needs only two wires, a black and a white. Kennedy wires the receiver unit to the fan while it's on the floor—black to black, white to white, and red to the fan's violet-light circuit. Once the fan is fastened to its plate, all he has to do on the ladder is join the receiver's remaining black and white wires with the matching pair on the ceiling. Any additional lines coming out of the ceiling get capped.

After attaching the blades, Kennedy deftly hides the wiring in the canopy and twists it over the ceiling plate. He climbs down for the last time, flips on the circuit breaker and hunts up the remote. He pushes its buttons. The lights come on, but the fan seems to hesitate. Then it revs up, and Kennedy spreads his arms into the cooling breeze and grins. The fan is totally silent. "That proves it was expensive enough," he says with a laugh.



Hang it high

- 1.** A remote-control unit, the white disc on top of the fan, is the only practical way to operate the appliance on a cathedral ceiling. It also simplifies the wiring.
- 2.** Ceiling fans would be all but impossible to install if Kennedy had to juggle the motor in one hand while twiddling wires with the other. Thanks to a hook on the ceiling plate, the fan hangs loose, leaving his hands free to twist the wires together with wire nuts.
- 3.** All Kennedy has to do one-handed is make sure the wires stay inside while he screws the fan canopy to the ceiling plate.



Cast-Iron Cooling



This cutaway view of a fan motor—actually a 1980s redesign of a turn-of-the-century cast-iron model—shows a split stator with the two discrete windings of copper wire that give it three speeds. Every few years, owners had to clamber up a ladder and refill the oil cup so the bearings would stay lubricated and quiet. Most fans sold today run on K-55 induction motors. The stators and rotors are still cast iron, but the housings are lightweight alloy and the sealed bearings never need oiling. An occasional trip up the ladder is still required, though, to keep the blades dusted.

- 1 Down rod attaches here
- 2 Oil hole
- 3 Rotor
- 4 Split stator
- 5 Copper winding
- 6 Ball bearings
- 7 Oil cup
- 8 Modular lamp connector
- 9 Switch housing
- 10 Fan blades go here
- 11 Housing
- 12 Shaft

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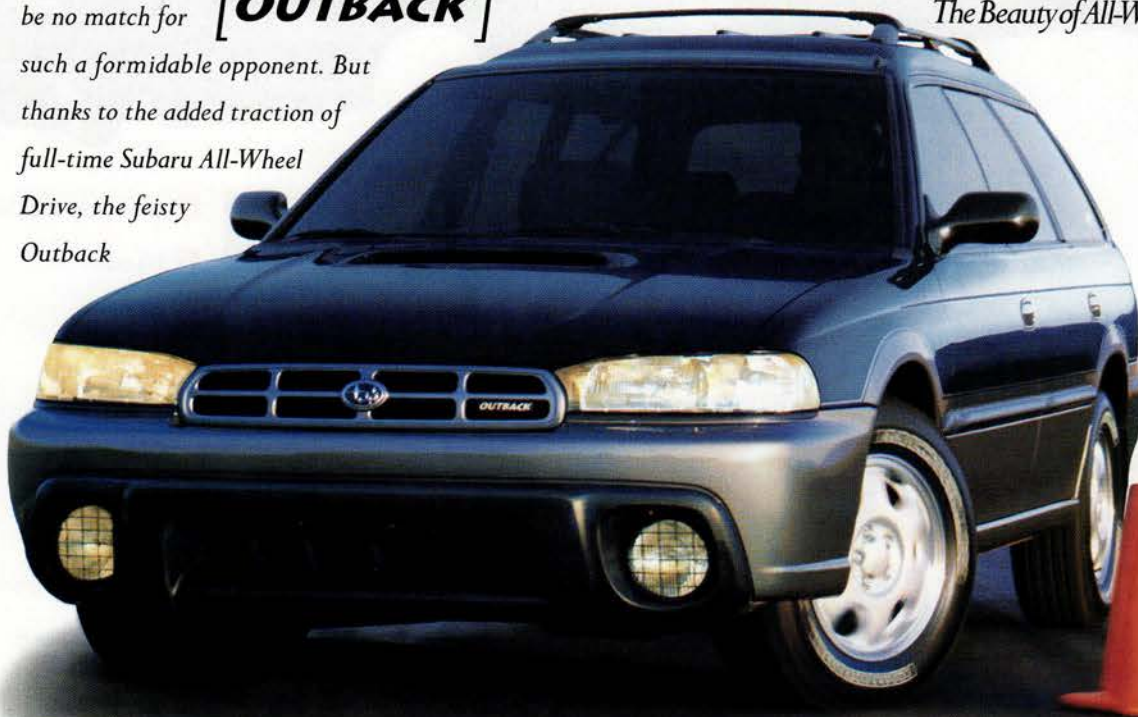
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"This Room Looks Funny"

Understanding the subtle art of proportions

BY STEVE THOMAS

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mericans are gluttons for space," says Jim Meigs, owner of the spring TV project house in Tucson.

"Maybe it's the frontier mentality, but people just seem to

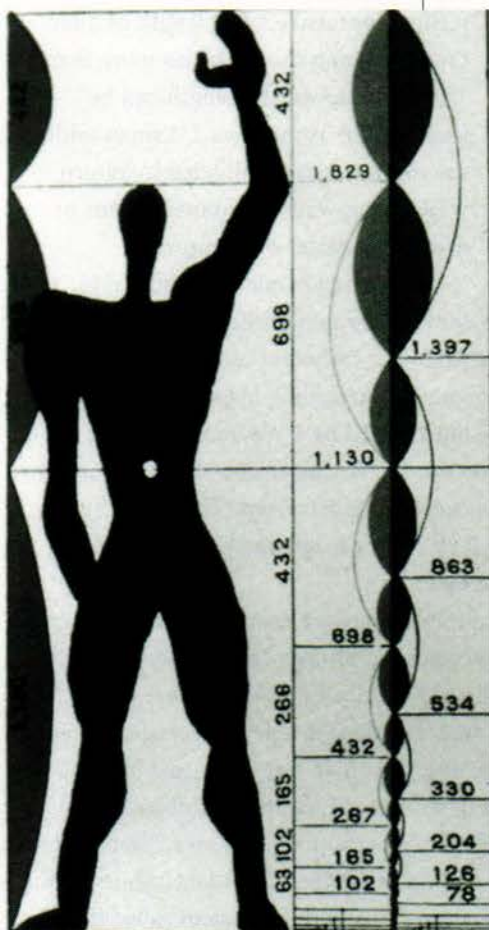
want more." Meigs, an architectural designer, says the majority of homeowners he works for want the most space they can get for the least money. Meigs often finds himself counseling clients that proper proportions—not raw space—will make them happier.

He likes to cite a simple rule of thumb: No new room should be bigger than the largest existing room in the house. Like a typical homeowner, though, he bent his own rule by adding a new master-bedroom wing slightly larger than the living room. To compensate, he wrapped the addition around a mature eucalyptus tree, which helped break up the additional floor space. "The last thing you want to have happen," Meigs says, "is for guests to arrive after all the work is done, and someone says, 'Oh, this is where you added on.'"

Refined judgment about proportions usually comes with the experience an architect gathers over many years.

Few homeowners add on more than several times in their lives. Yet there are principles of proportion everyone can learn.

Ancient Greeks and Romans developed an elaborate system of proportions called the orders—Tuscan, Doric, Ionic,



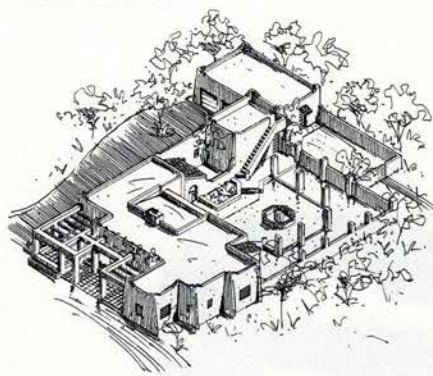
Architect Le Corbusier's Modulor was a system of proportions in millimeters, based on the dimensions of a human figure. He used it to design everything from apartment buildings to furniture and was known for carrying a tape measure with him everywhere.

Corinthian and Composite. Within each order, strict mathematical rules regulated the size and proportional relationships of every element of a structure, including columns, capitals and entablatures. Many of these rules were based on the Golden Section, which dictated that a line should be divided so that the short segment is to the long segment as the long segment is to the whole. In other words, if the main room in a building is 30 feet wide and 50 feet long, the anteroom should have the same proportions—say, 15 by 25 feet. During the Renaissance, architect Andrea Palladio elaborated on the classic principles. He proposed, for example, that the height of a flat ceiling should be equal to a room's width, and the height of a vaulted ceiling should be one third greater than the room's width.

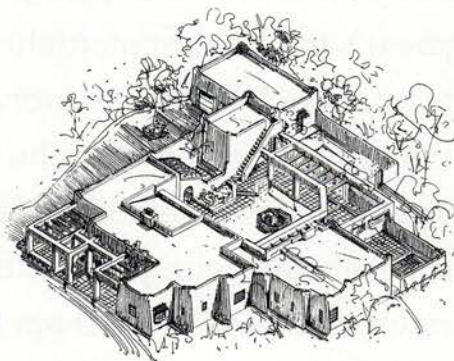
Until World War II, a wide selection of building elements based on the orders—columns, bases, capitals and moldings—were mass-produced for American houses. Interiors of expensive homes were often richly detailed with these elements, and even more modest homes featured baseboards, wainscoting, chair rails and cornice moldings proportioned by classic principles. But after the war, the need for cost-effective housing superseded good design, and the proliferation of the tract house marked the end of classical proportions in common architecture. Gary Brewer, an architect in the office of Robert A.M. Stern, a New York firm specializing in traditional house design, laments that most tract houses ignore classic proportions and make the worst mistake of all—maximizing the amount of square footage at the least cost. Moreover, the detail embellishments in old houses—copious amounts of molding and trim—also helped define proportions. Except for anemic one-piece baseboard molding where floors meet walls, trim is rare in postwar American homes. So proportion-minded designers now must base many of their judgments strictly on the dimensions of rooms.

If you want to expand a living room, for example, Brewer suggests you start by considering how furniture will fill the space. "We create a floor plan on which we note the placement of the windows, doors and the fireplace," he says. "Then we use furniture groupings as building blocks." The typical sofa is seven feet long and, combined with a coffee table, end tables and wing chairs, the group will take up a space roughly 11 feet square. There should be no less than three feet of clearance between groupings. The size of the room is determined by the number of

Proportions at work



Jim Meigs altered his Tucson home, above, by adding a master-bedroom suite, visible at right-hand corner below. He sheepishly admits the addition is too large to be in perfect proportion with the rest of the house.



groupings necessary to fill the space.

Dennis Wedlick, a New York architect who specializes in residential design, says the entire existing floor plan should be looked at without considering what the rooms are used for now. You might discover that you can swap the family room for the living room, or move the kitchen to the family room and the living room to the former kitchen. This will help point out where additional space is really needed and may allow you to confine your remodeling to the house's existing footprint, a far cheaper solution than adding on.

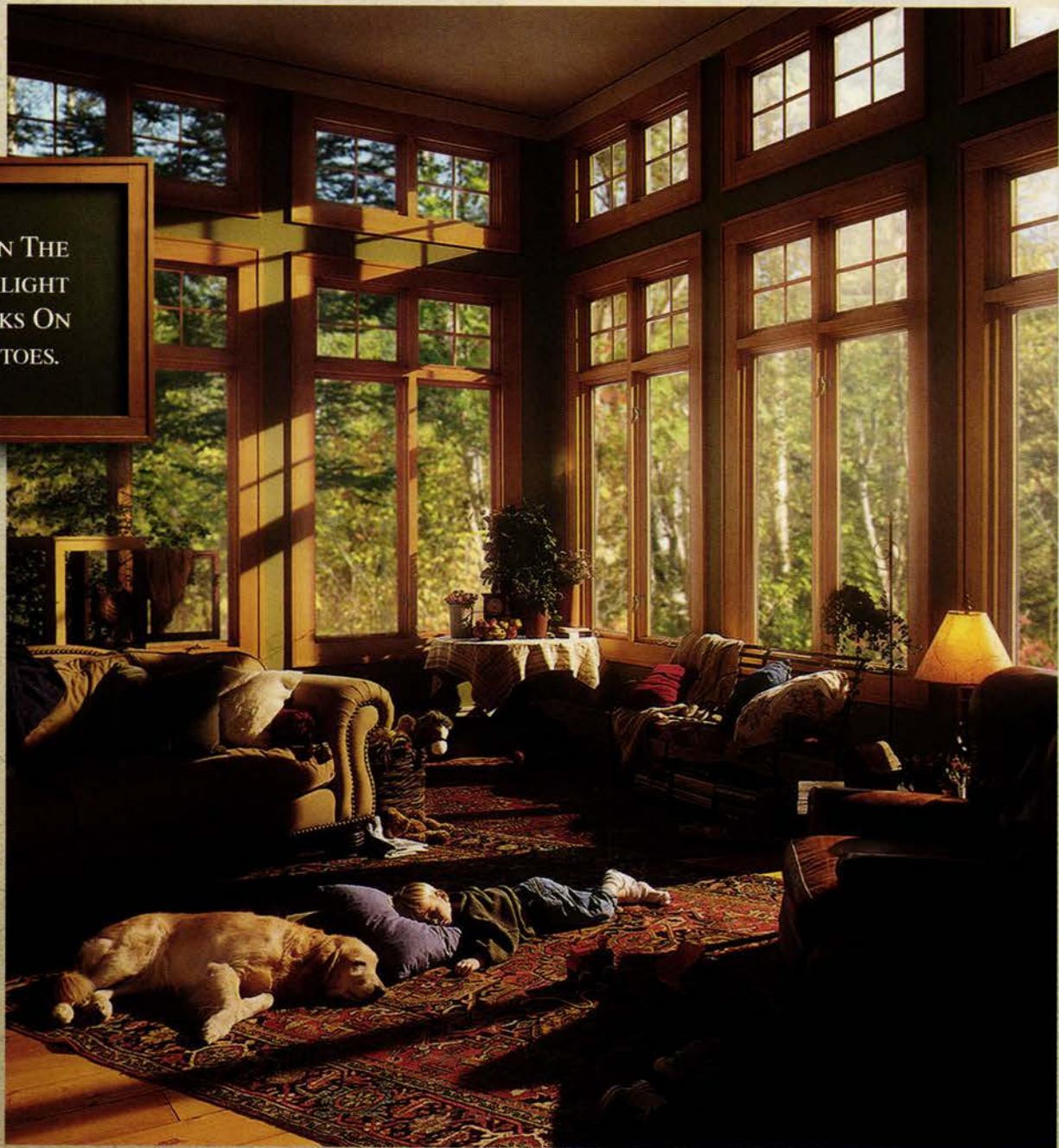
Wedlick has several basic proportion guidelines: The width of a room should be no more than $1\frac{1}{2}$ times the ceiling height. (To go wider than that, the ceiling has to be raised to keep the room from feeling oppressive.) The length of a rectangular room should be no more than $1\frac{1}{2}$ times the width. Length can be increased to as much as $2\frac{1}{2}$ times width if the room is visually divided by return walls, wing walls, columns, screens or even large pieces of furniture.

Flat ceiling heights, Wedlick says, should not exceed the width of a room without the use of elaborate wall trim. In designing with cathedral ceilings, several elements can be used to create a faux ceiling height for the eye—the break at the eaves, the line created by transverse beams or the lower chord of roof trusses. The arrangement of rooms can also affect how ceiling proportions are perceived. The dramatic impact of a 12-foot ceiling can be heightened by lowering the ceiling in the room leading into it.

Graham Gund, who transformed a Lexington, Massachusetts, ranch house into a showpiece TV project, cautions, however, that rules should not be followed blindly. In his own house, Gund built a powder room in a tower. The floor is only six feet square, but the walls, which tilt inward, rise up 25 feet or so, to a bank of windows that peer out to sea like the lens of a lighthouse. "This space violates every rule of proportion," Gund says, "but I did this intentionally to create a sense of drama." Even Le Corbusier, who spent his career developing a proportioning system called the Modulor, rejected the notion that it was better than gut instinct. "I will fight against any formula and any set of instruments which take away the least particle of my freedom," he said. "I want to keep that freedom so intact that at the very moment when the golden figures and the diagrams point to a perfectly orthodox solution, I may reply: 'That may be so, but it is not beautiful.'"

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Who Says What Your House Is Worth?

An appraiser does—unless you get involved

BY PATRICIA E. BERRY

K

athy Hughes was getting a divorce. The deal she struck with her husband allowed him to buy her half of their farmhouse, so they needed an appraisal to find out what it was worth. A real estate agent told her it could sell for \$200,000. But the appraisal came in at \$164,000.

Before long, Hughes found out why. When she stopped by the house, the basement and bedrooms were messy, the air stale and musty. Interior painting her husband had agreed to do hadn't started. A separate cottage was littered and looked, she said, "like a rural slum." First Hughes got mad. Then she got busy. Three months later, after a thorough cleaning and some fresh paint, a different appraiser valued the property at \$204,000.

Joe Sodano has seen it all before. "People can create the impression that a house is not in good condition," he says. Sodano is a partner in Professional Appraisal Associates in Summit, New Jersey, and has been valuing houses for 20 years. "An appraiser with a trained eye should be able to look beyond the superficial cosmetics to determine whether a house has been neglected."

But as Hughes's experience illustrates, it doesn't always work out that way. There is room for error throughout the appraisal process, from measuring the house to coming up with its market value. Considering

its potential impact on a real estate deal, neither buyers nor sellers should simply sit back and wait for the results.

Lenders require appraisals to verify that a house is worth

what the buyers are willing to pay for it. They want to be certain of recovering the loan principal if they have to foreclose and sell the property. That's why an appraisal that doesn't meet or exceed a contract selling price can stop a mortgage application, force a smaller loan or raise the down payment. It's the same with any other financing backed by real estate, including equity loans and mortgage refinancing: If there's no problem with the borrower's credit, approval hinges on the appraisal.

Recently, Sodano appraised a 1906 Victorian in Chatham, New Jersey, for a bank. He had already checked city hall tax

records and knew all about the house's sales history and assessed value. Now his job was to look at the property as if he were a buyer about to make an offer. Sodano toured the whole

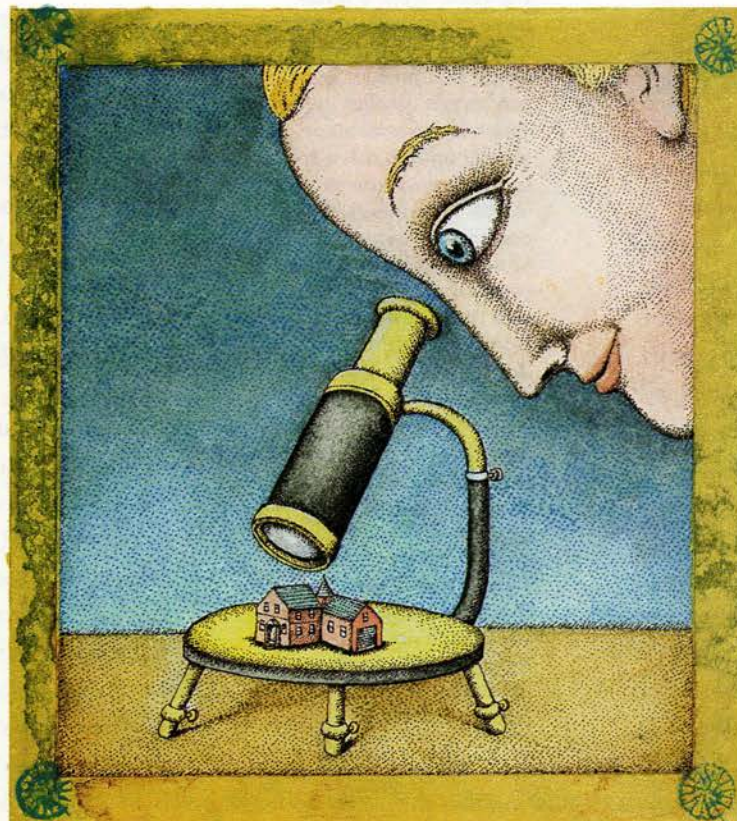


ILLUSTRATION BY PETER SIS

house, but his inspection was cursory. "You do the appraisal assuming the house is structurally sound and all the mechanical components are in good working order," he says. He noted that the house's turn-of-the-century features—the wraparound porch, pocket doors, several fireplaces, plaster ceiling details—were all in good shape. He also noted some new features: Victorian wallpaper, a first-floor powder room and a heating system. The house had a good location near schools and mass transit, but the 1950s kitchen and the lack of a full bath on the third floor were negatives.

On a worksheet, Sodano sketched a floor plan of the house. He measured the rooms and the outside walls. His client, the lender, also required interior and exterior photos. When he got back to his office, he re-created the floor plan on his computer and then began searching for one of the most important ingredients of market value: comparables, called "comps," which are supposed to be similar, nearby properties that have sold recently.

"The toughest part of the job is nailing those comparables," says Jeanne Tomb, chairman of the appraisal committee of the National Association of Realtors. "Ideally, they're a day old," she says, "but usually that's not possible."

That's particularly true for old houses, says Sodano, "which don't tend to turn over quickly." In those cases, he expands the search outside the immediate area, accessing the same computerized multiple listing services that real estate agents use. For the Chatham house, Sodano found two comps close by but had to search sales records in the next town to find a third. In his report, which he completed within a week, he appraised the house for about 20 percent more than the loan request. The bank was satisfied, and the buyers got their mortgage.

Sodano has a simple recipe for getting a good appraisal: "The house should be in its best market condition at the time the appraisal is conducted," he says. "We're not talking about making beds and picking up kids' toys. Make sure windows aren't broken or cracked, that the woodwork is painted and that thirty-year-old wallpaper isn't hanging on the walls. And do some small modernizations. A twenty-five-year-old cooktop, for instance, isn't all that expensive to replace. Pride of ownership is definitely worth something."

Kevin Kinney, the principal of a New York appraisal firm,

suggests homeowners go even further by putting together a fact sheet that tells about additions and renovations, new appliances and any other factors that enhance the house's value, including major maintenance and repairs and when they were done.

"Sometimes they don't want to do the work," he says. "They figure it's my job and don't understand that it's for their benefit. The more information the appraiser has, the more accurate the appraisal is going to be."

Some lenders even encourage involvement by allowing the customer to pick an appraiser from an approved list. When Gerry Insolia had to relocate to Atlanta, his employer offered to buy his New Jersey house. He was supposed to select three

appraisers from a list, and the company would pay him the average of the two closest amounts.

Insolia decided to quiz everyone on the list. He wanted to learn how much work they had done in the area, how familiar they were with the current market and in particular how much weight they would give to his house's quiet side-street location. The two appraisers he finally picked came in with exactly the same price, one that Insolia found acceptable. There was no need for a third appraisal.

A proper appraisal should produce an accurate number, but if it comes in low, you've still got options. First, ask for a copy of the full report. By law, the lender has to honor this request. Read it carefully for things the appraiser may have missed, like a new roof or heating system. Check for basic errors too, like three instead of four bedrooms or incorrect lot measurements. Carefully study the comps to be sure they came from truly similar houses in the immediate area. If not, try digging up others, like a house sold by an owner that wasn't on the multiple listing service.

To challenge a report, approach the lender directly. For FHA or VA loans, there are appeal forms for stating your case that allow attaching up to three alternate comparables. And while some appraisers won't budge on their initial reports, others may be more flexible. "There may be sales or things that an appraiser missed or wasn't aware of," says

Sodano. "If there's a sale that's legit and it really supports a higher value, why wouldn't I consider it?"

If you still aren't satisfied, it may be possible to get a second appraisal. Some lenders allow it if you pay the \$300 to \$400 fee. Failing that, however, you may just have to take your borrowing business elsewhere.

Instant appraisals

The latest degradation of the appraisal process is speed: appraisals take less than a day instead of the usual five because the lender uses a computer instead of a person to do most of the legwork. From a database of tax information, the lender can get a quick estimate of a property's market value. The human appraiser simply does a drive-by to make sure the house is still standing. But a computer obviously can't assess the particulars of a specific house and its neighborhood. Gone, says appraiser Jeffrey Otteau of East Brunswick, New Jersey, is the "check and balance that tells borrowers whether they're paying too much for a property." Homeowners and borrowers-to-be should ask lenders exactly how they'll appraise a property and, if they don't want the digital version, they should request a live one.

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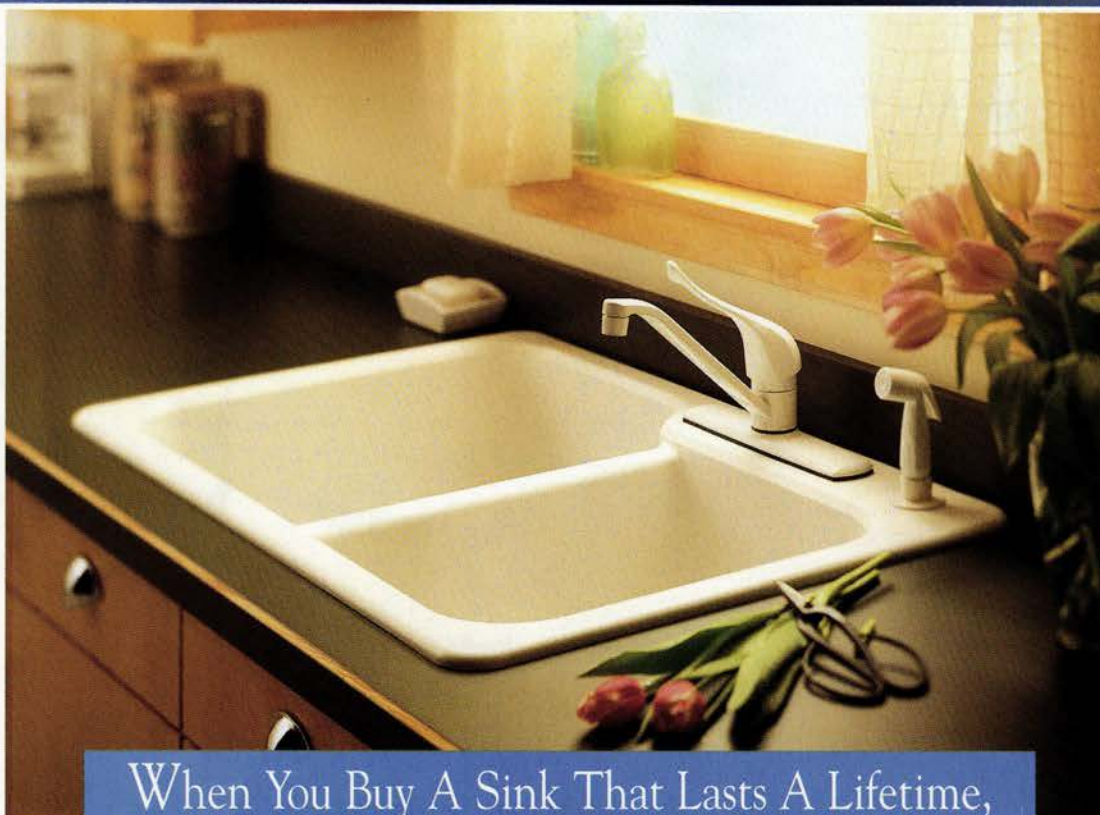
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When Jim Meigs bought his house 18 years ago, he wanted to build a shaded entryway that eased the transition from the

harsh desert exterior to the home's protected interior. He envisioned a pergola, or portal of columns and beams, planted with vining plants, alive with the sound of running water from a fountain. His house is Pueblo Revival style, a design inspired in the 1930s by big-screen Westerns. A parapet wall rims the flat roof, and at each of the building's corners the wall steps up, making the front facade look like a Hollywood version of the Alamo. For the new entryway, Jim decided to skip the drawings and build a full-

scale mock-up, stacking up concrete blocks to form columns. It was hot work, and frustrating because he couldn't get it right. For weeks he toiled away in his spare time, piling and unpling blocks. Then, in a dream one night, Jim spotted his hero, Frank Lloyd Wright. The architect was watching him from the water tower of the old El Conquistador Hotel nearby. Next thing he knew, Wright was strolling across the front yard.

"Frank Lloyd Wright is coming!" Jim shouted to his wife, Colleen. "Put some coffee on." Wright said he'd prefer tea.

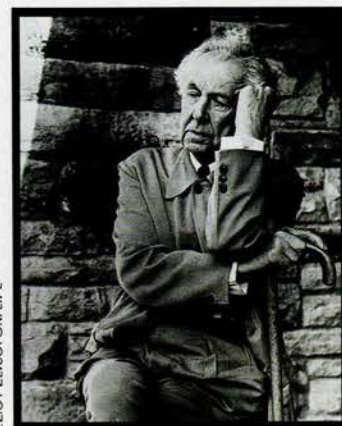
Jim told his spiritual mentor he just couldn't crack this design. Wright pointed to the roofline and told him to paint the parapet sky blue. Jim awoke, baffled. What could the blue paint mean? About dawn he realized the great architect was showing him the real problem: Jim hated those Pueblo Revival step details—the blue paint would make them disappear against the sky. Wright had always been a source of inspiration to Jim for two reasons: his insistence on carrying out his novel but oft-criticized ideas, and his teaching that architects should understand the soul of a building and let that soul determine the design elements. In the weeks that followed the dream, Jim realized he needed to accept that the soul of his house was Pueblo Revival, and that the right thing would be to let that soul shine through. His house was one of only two Pueblo Revivals in the neighborhood, which was listed on the National Register of Historic Places. Wright was telling him to stop trying to change the house's identity: Let the step details show and design the new entryway around them. So Jim stopped trying to obscure the parapet and lowered the profile of the portal. Old and new flowed together. And he never forgot that lesson. Now, 18 years later, he has adorned the upper walls of the new master wing with a parapet and steps to match the existing structure.

As we finish the house, I like to imagine that Wright is watching over us from the water tower of the old hotel. When we're done, we'll make a fresh pot of tea, just in case the great architect wants to come over and have a look.

—Steve Thomas

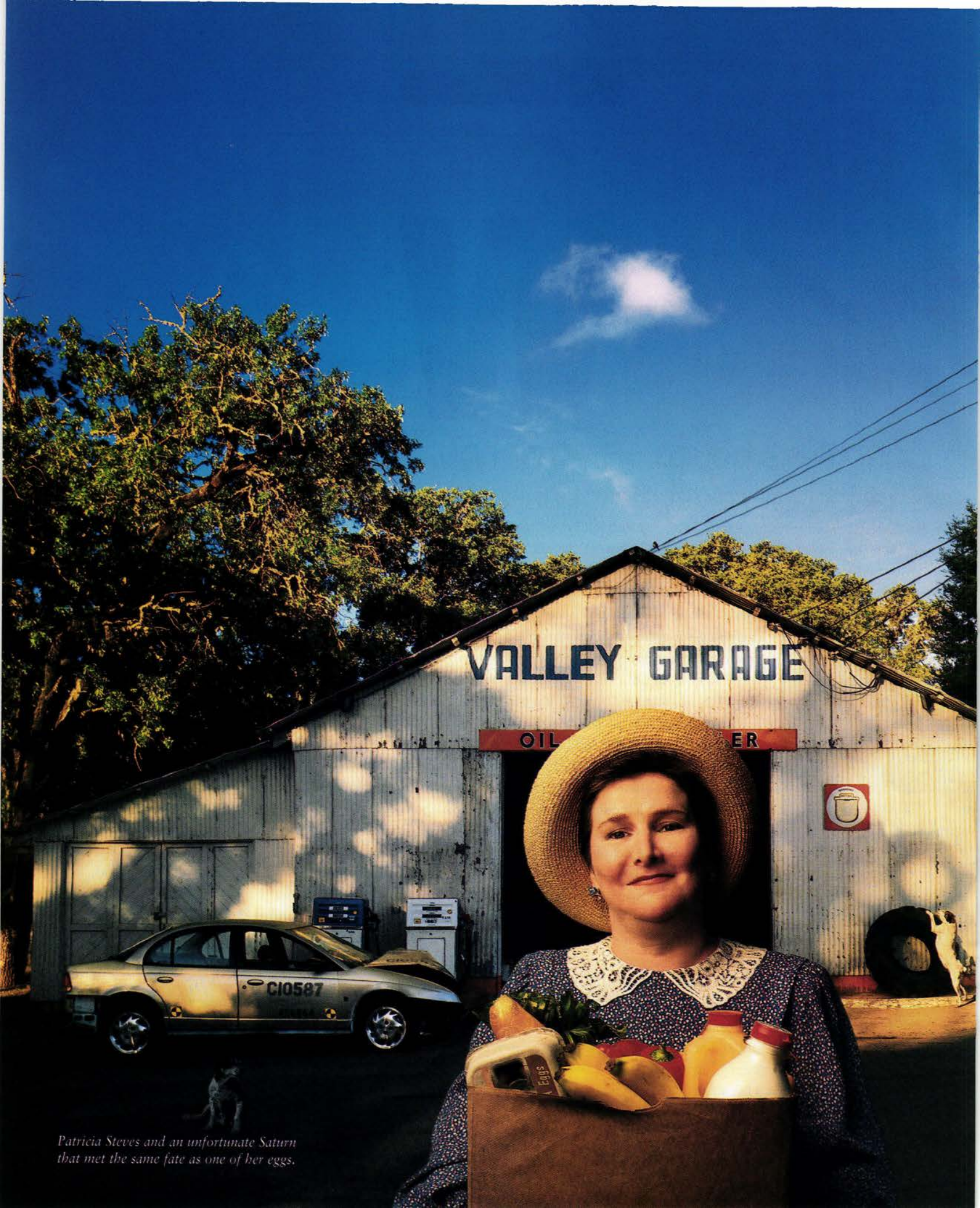


Meigs and architect Alexandra Hayes, keeping true to the soul of a new house.



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Frank Lloyd Wright



*Patricia Steves and an unfortunate Saturn
that met the same fate as one of her eggs.*

“It even saved our groceries.”



“All right, we did lose one egg,” admit both Patricia and Roger Steves. But considering the accident they were involved in, they don’t seem to mind. You see, while on the way home from the grocery store one afternoon, they were rear-ended by a pickup truck and the front of their Saturn was pushed into the car in front of them.  Luckily neither Patricia nor her husband was seriously hurt. They did, however, fear the worst for their parcels since the trunk was now “trying very hard to become part of the back seat.” So you can imagine their surprise when they discovered that, with the exception of one unlucky egg, their groceries were as unharmed as they were.



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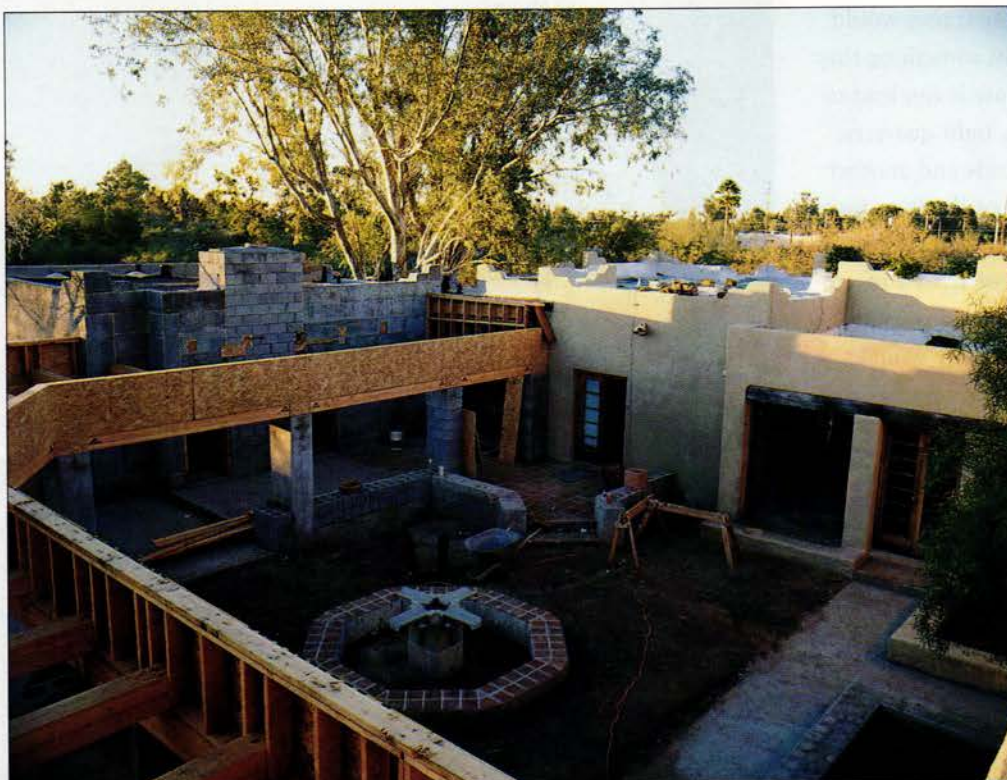
PATRICIA STEVES' 11-EGG FRITTATA RECIPE—Ingredients: 1 cup of diced onion, 1 cup of diced green pepper, 2 cups of diced ham, 11 eggs. Sauté onions and peppers until cooked, mix in ham, divide mixture in half and keep warm. Then beat 6 of the eggs with a fork, stir in half of the filling mixture and season to taste. Pour into preheated omelet pan. Flip into another pan when bottom of the frittata is set. Cook another 1 or 2 minutes. Repeat with other half of ingredients. Serves 6.

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Heave ho: Norm Abram helps raise a new rafter for the Meigeses' porch. "The teamwork and quality of workmanship have made this project an absolute delight," says *This Old House* producer Bruce Irving.



Homeowner Jim Meigs says the courtyard is “rigid and formal now” but will be more inviting when the walls are covered with morning-glory vines.

TEAM Tucson

Give too many people too much to do in too little time and watch the fun

What is this, a worksite or a theme park full of happy elves? At *This Old House*'s spring TV project in Tucson, members of the construction crew trot around with grins on their faces, unloading each other's materials, pitching in on every chore, sharing tools and extension cords. “You look over and the electrician is helping the plumber,” says homeowner Jim Meigs, an architectural designer who has spent plenty of time on construction sites. He's amazed. “People say, ‘Excuse me!’”

“Usually you don't have the crowd,” says tile-setter Dave Kelley, cheerfully smearing mastic on the shower/steam room wall while three feet away a carpenter, shims bristling from his pockets, hangs a closet door. Around the corner, plumber Dan LaBlue double-checks the steam-shower connections, and in the new master bedroom, plasterers Gilbert and Fred Chavez trowel

on a scratch coat while cracking jokes in English and Spanish.

It seems the entire crew decided, “You've gotta cowboy up,” as they say in Arizona—meaning get it together and buckle down. “They're whistling while they work,” says Judy McCaleb of McCaleb and Company, the contractors.

Maybe every construction job should start with a party. Before work began here, Judy's husband, John McCaleb, invited the subcontractors and their crews for a get-together. McCaleb got up to speak. Normally a renovation like this would take eight months, he said, but because of *This Old House*'s short shooting schedule, it would have to be done in three. And the design wasn't even finished. “If Jim and I were doing this house for somebody else,” Judy McCaleb said, “90 percent of the decisions would already be in the plans. Here, it happened so fast

By Jack McClintock Photographs by Kolin Smith and Kristine Larsen

Jim had to make them on the fly."

Not only that: All the trades would be there simultaneously, something they ordinarily dislike because it can lead to territorial competition, tight quarters, borrowed extension cords and another worker's dust or spray or fluids or foot-prints getting in the way.

So the party was more than a social event; it was a good-natured warning. "We made it clear everybody would have to work on top of or next to or underneath some other trade," says project manager Tony Hayne.

When Meigs arrived at the site early each morning in his jeans and blazer, half a dozen members of the crew would be lined up for decisions: What color paint in the dining room? Where do the library lights go? What's the master-bath tile? What do we do about roots in the sewer line? What color is the stucco? Is the kitchen window big enough? What pattern do you want on the textured driveway? How about landscaping? The roof? The crack in the garage wall?

With unusual grace, Meigs made hundreds of such decisions

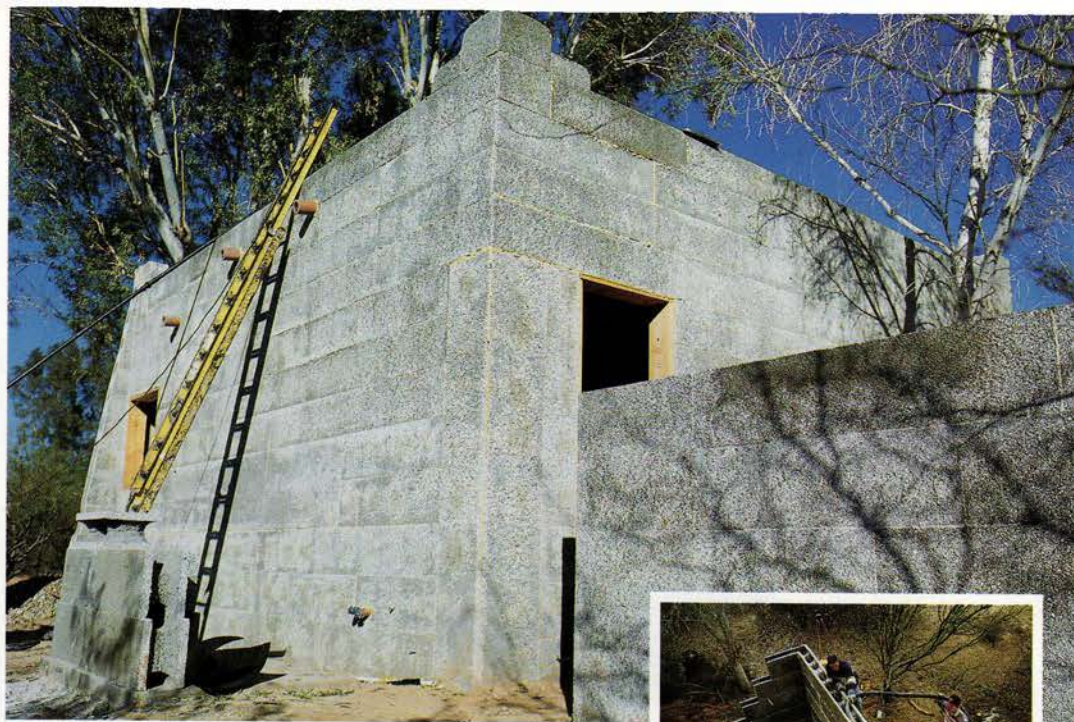
on the spot, all amid the digging, hammering, sawing, plumbing, plastering hordes.

Work began at the southwest corner, where remodeling contractor Greg Golish and his team tore out the old bathroom footing (unearthing the rusted frame rails of a Model A Ford) and poured the new foundation. Golish finish-troweled the con-

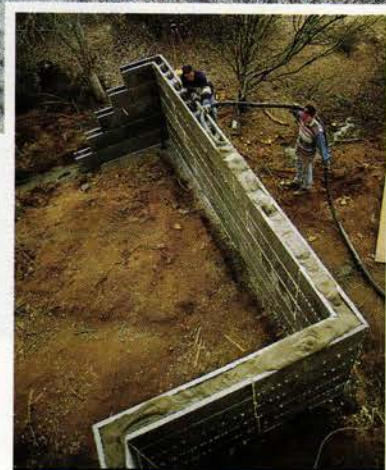
crete pad for the Endless exercise pool and then, after a cottonwood tree limb broke off and fell on it, cursed and troweled it smooth again.

The master-suite walls went up fast. Instead of the original fired adobe blocks, McCaleb's men used a system of 10-foot-long blocks of recycled polystyrene mixed with cement and additives, with holes for rebar and grout every 15 inches both ways. The walls insulated well (R40 with stucco outside and plaster inside) and were easy to work—crew members could cut the forms with a chain saw. Once, as concrete was being pumped into the wall, a block simply burst open (a faulty seam, McCaleb later concluded), and everyone leaped to form it up with plywood.

Plumber Dan LaBlue faced the challenge of endowing the house with three complete water systems: the hard city water, good enough for the garden, fountain and pool; softened water for baths, dishwasher and washing machine; and a special luxury—reverse-osmosis-purified water for drinking. To plumb



RIGHT: To enclose the new master-bedroom suite, the crew built walls of polystyrene blocks and pumped them full of concrete grout. **ABOVE:** A crenellation at the top corner of the suite was added to mimic the way real adobe degrades from exposure to wet weather.



In the courtyard, Steve and Norm confer with Greg Golish (center) and other workers. "None of us knew each other before this job," Golish says.

A Sign of the Times

The original owner of the Meigses' house, the late Arthur Hazeltine, came to Tucson in 1905, stepping off a train from Kansas in the middle of the night. "The moon was full and I looked out the window...at the palm trees around the old wooden depot," he told a reporter years later. When Arthur and his wife Alice built the house three decades later, Tucson had grown from a population of 10,000 to about 34,000. But the place still had a sleepy, rural atmosphere.

The Hazeltines sold the house in 1943 to Meyer and Esther Feldman. Their son Stanley Feldman, now 64, was out walking

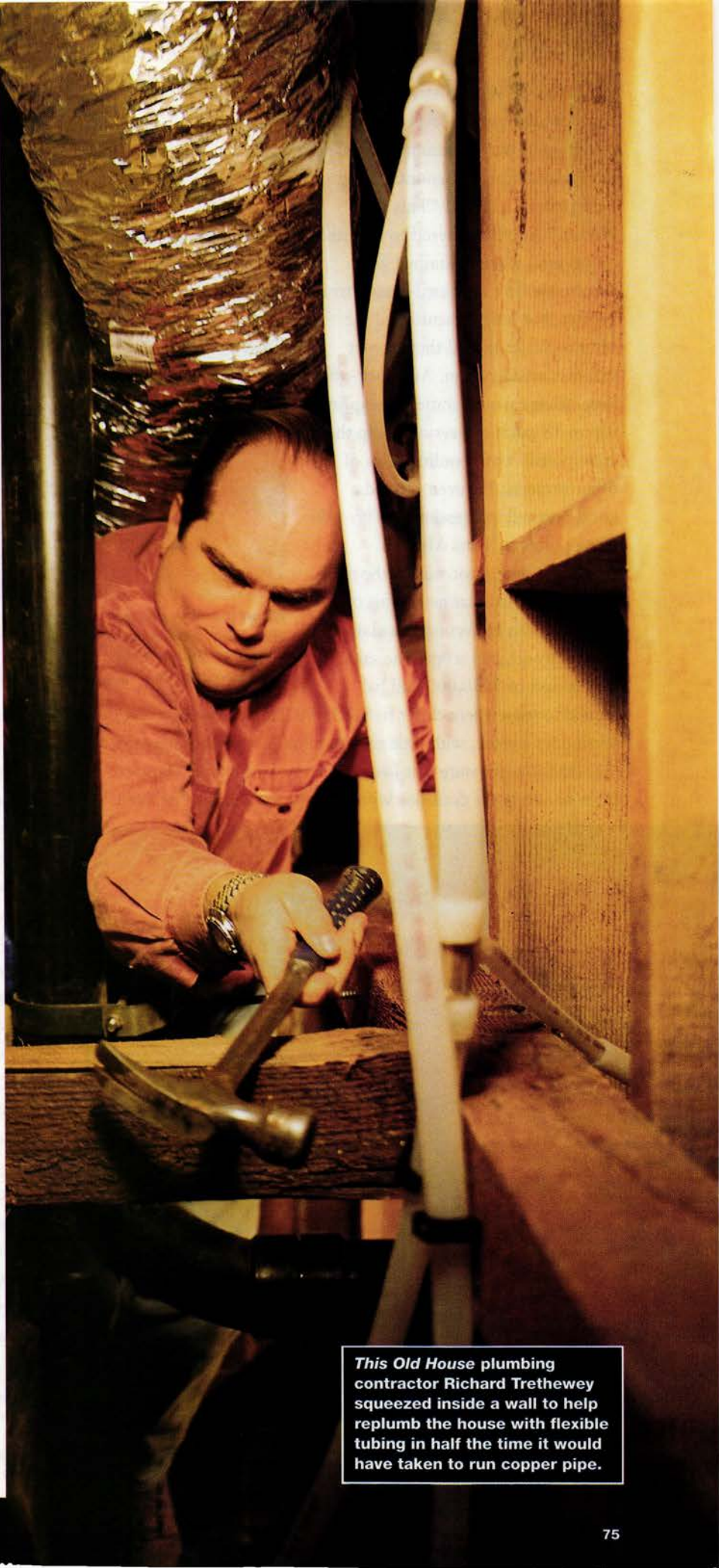
in sweats and a baseball cap recently and stopped by to reminisce with Jim Meigs about his boyhood home. Shortly after the Feldmans moved into the house, Stanley recalled, his father erected a mailbox with the family name prominently displayed in wrought-iron script. Within days, the neighbors sent a delegate to explain that they weren't really anti-Semitic and didn't mind living near a Jewish family, but putting up a sign was going too far. The mailbox stayed, said Feldman, who recently stepped down as chief justice of the Arizona Supreme Court. He still lives in the neighborhood.

tight old spaces, *This Old House* plumbing contractor Richard Trethewey suggested LaBlue use a flexible tubing system little known in the United States. It insulates better than copper, Trethewey argued, and its built-in shape-memory provides a unique connecting method: flare an end, drop in a brass connector, and within minutes the tube returns to its original size, seizing the connector and sealing the joint. If the tubing kinks, a little heat straightens it out again. LaBlue, a lifelong copper snob, was skeptical. But after snaking the plastic tubing as easily as a garden hose around corners, under the house, through the walls and over the roof—simply popping in fittings with an expander tool as he went—he changed his mind. “It’s a phenomenal product,” he said.

Golish’s next task was stressful: installing steel lintels above doors or windows that were being widened. The lintels had to support tons of weight and, in some places, a heavy roof parapet added to the load. Golish propped the ceiling with posts, hoping they would take most of the tonnage, and sawed a half-inch horizontal crack above the door or window. “You could see daylight all the way along,” he said. “I worried a lot.” Then his crew slid an L-beam in from each side, with the legs inward. They connected the two beams with side-to-side steel rods welded into predrilled holes, creating a single unit. Finally, they built masonry walls to support the beams at either end and knocked out the posts, hoping everything would hold. It did—four times in four places.

To cope with the summer heat in Tucson, the Meigses wanted a cooling system more environmentally friendly than conventional air-conditioning. So they chose a gas-fired “chiller,” which recirculates plain water, refrigerated by ammonia. Even though the chiller was about 60 percent more expensive than conventional air-conditioning units, the gas company in Tucson offered inviting rebates to make it more economical. The system had to be installed in stages, with various plumbing and framing jobs done in between, so air-conditioning contractor Marshall Dennington and the other trades worked together.

“Television and a pat on the back brings out the best in every trade and every personality,” Meigs observed—although there were exceptions. One day the plasterers got so distracted watching host Steve Thomas tape a scene that their plaster set up in the mixer and they had to start over. But Meigs and McCaleb had chosen tradesmen they trusted. Meigs was always calm, serious, good-natured and ready to listen. When Golish suggested finishing the bay window seat in 11-year-old Elizabeth’s room with oak flooring, Meigs said, “Great idea!”



This Old House plumbing contractor Richard Trethewey squeezed inside a wall to help replumb the house with flexible tubing in half the time it would have taken to run copper pipe.

Dozens of visitors strolled through daily, and Meigs was as hospitable as if they'd been invited. One gave him a tape of a country song he'd written, entitled "This Old House." Another offered to donate an original work in stained glass. The house isn't a stained-glass sort of project, but Meigs mentioned the offer to Colleen, and they gave it serious consideration. At knock-off time, Meigs would sometimes spring for an 18-pack of beer and help the crew polish it off, trading tales of other projects. He even offered a good-natured impression of *This Old House* director Russ Morash.

Meigs's demeanor was all the more impressive given that he had his own worries. "The project had escalated beyond its original scope," he said. The budget of \$150,000 had ballooned to somewhere closer to \$180,000. He was on site every day, seven days a week, with little time to mind his own business when the television exposure was inviting more of it his way. He sometimes had to make decisions with less information than he liked.



When the new chiller cooling system arrived, the plumbing and carpentry crews helped unload and install it. "Nobody ever said, 'That's not my job,'" says air-conditioning contractor Marshall Dennington.

Gathering specifications, he delayed deciding on an exterior stucco finish, and McCaleb said later, "We spent two weeks in limbo on that."

Meigs found himself nervous about some of his rushed design choices. Had he let the master bedroom grow out of scale? (Morash jokingly referred to it as "the ballroom.") Should he have specified operable doors in the courtyard-facing gallery instead of an enormous sheet of tempered glass? Should a door lead directly from the master bedroom into the walk-in closet, or was Colleen right that going through the bath was fine to preserve the simplicity of the walls?

As the March 9 move-in date approached, the project began to look complete. Dennington and LaBlue bought Golish a new heavy-

duty Sawzall to replace one that was borrowed so often it broke, and they were pondering what to have engraved for him on a commemorative plaque.

Colleen had planted a garden of flowers and vegetables. The courtyard beams were in place and she'd decided that morning-glory vines would soften their starkness; the vines were already sprouting. In three cabinet shops, the black walnut library shelves, mesquite kitchen cabinets and alder master-bath vanity took shape. The master-bath window perfectly framed its north-facing view of an historic tower, just as Jim Meigs had planned. With the plastering finished and primed white, the new rooms' clean, strong shapes had emerged. The tile was going down in the courtyard. The stucco truck was parked out front. The paving contractor was waiting to install the stamped concrete pavers—in a configuration called Roman Cobble—on the driveway.

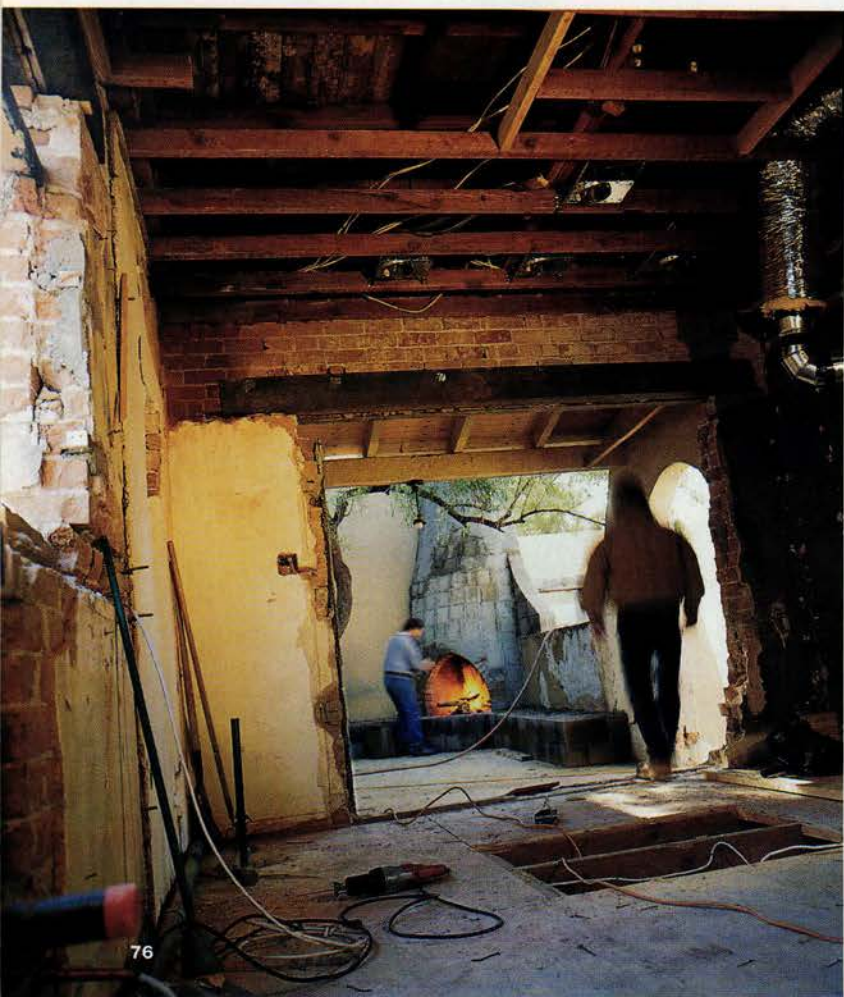
"It looks like we'll have the moving truck coming in one end of that driveway as the paving truck goes out the other," John McCaleb said. "But we'll be done."

It was a remarkable feat that would never have happened without Meigs himself being there all day, every day, creating the conditions for a kind of miracle. Not only would eight months' work be finished in three, but everyone involved in the construc-

While the new kitchen was still a shell, a beehive fireplace in an adjacent outdoor kitchen was a convenient place to take off the chill.

tion would walk away feeling they had never worked faster, better or had more fun on the job. "This has been a lesson in how well it can go," Meigs said.

And the job would end as it began, with a party.



Plaster Perfect

The most dramatic rooms in the Meigeses' house have coved ceilings. Instead of ceiling meeting wall at an abrupt angle, they marry in a sweeping curve. In an earlier era, plasterers had to build up the curves with plywood gussets, lath and chicken wire.

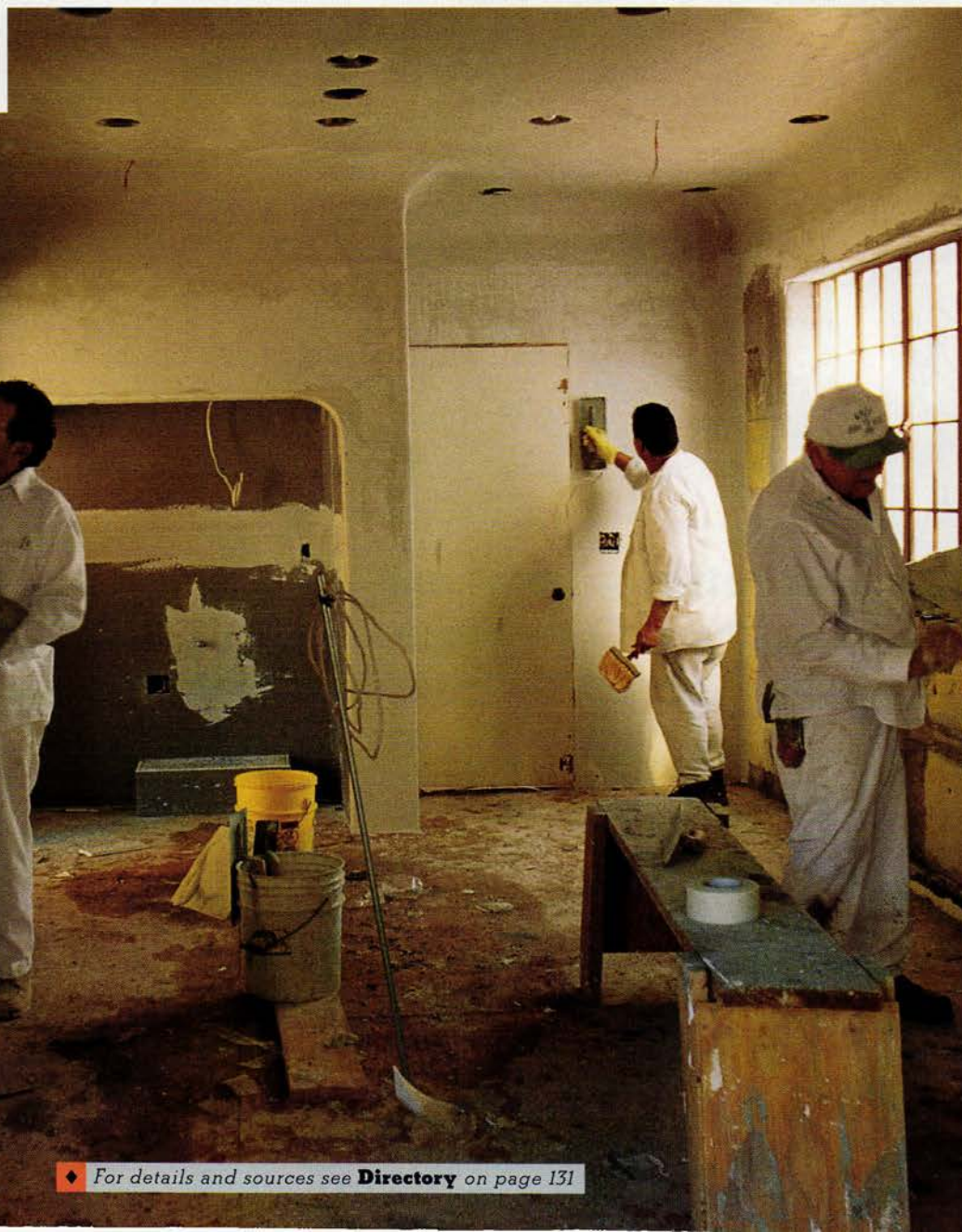
These days, polystyrene forms provide the shape, but the work still requires traditional care.

To create the coved ceiling in the Meigeses' new bedroom, plasterer Gilbert Chavez, left, cuts a precurved form to size with a handsaw, trimming it with a knife and mitering it to fit together in the corners. Using a small trowel with rounded ends, he smears on plaster as if it were paste and sticks the foam to the ceiling and wall. Then he tapes all the joints, slitting



the edges when necessary to make it follow the curve. When the foam is in place, he moistens the adjacent wall and ceiling with a water-dipped paintbrush—a dry surface may draw water from the curing plaster and make it crack. Then Chavez lays down a thin scratch coat of plaster, carefully filling and smoothing the joints where foam meets wall and ceiling. Plaster straight from the bag is too “buttery” for his taste, so he adds two or three handfuls of 30-weight silica sand for texture and workability. The scratch coat is needed to achieve a uniform surface that dries at the same rate without cracking. Chavez follows with a smooth veneer coat. To even out large expanses, he reaches for his darby, a four-foot-long trowel with a handle near each end, and sweeps it over the wall.

Adding texture is the final step. He doesn't try for a full coat now but applies small amounts of plaster, sweeping it on in a motion like that of an automobile windshield wiper, leaving parts of the smooth coat showing. Chavez works quickly, in segments, starting at the top and moving downward. If the plaster starts to set up, he dips his paintbrush into a bucket of water and flicks droplets onto the surface. He uses a smaller wet brush to smooth inside wall corners and, delicately, to round the inside corners of the coved ceiling, giving it a handmade, sculptured look.



The team of plasterers work on a tight deadline to round out the remodeled kitchen.



mesquite

From a pathetic, gnarly excuse for a tree—the best a desert can do—comes rich, dramatic kitchen cabinetry few homeowners will ever know

C

BY JACK McCLINTOCK

abinetmaker James Vosnos switches on his bandsaw, and a low whine fills the shop as the big machine's 16-foot, six-inch blade begins turning on its three-foot wheels. Vosnos seizes a hunk of mesquite an inch thick and five inches wide and sets it on edge against the resaw fence, splitting it into a pair of three-eighths-inch-thick leaves. Then he opens them like a book and sees, sketched in twists



ABOVE: Sawn into boards, reassembled and stacked to dry in the desert sun, a hard-hearted mesquite log begins to bare its soul. OPPOSITE: The yellow pods of the craggy mesquite tree are edible. But Native Americans had to outwit desert pack rats to harvest them.

and knots on the amber-hued wood, the skull of a longhorn bull—a Georgia O’Keeffe desert motif hidden within a tree.

Mesquite is expert at concealing its internal beauty. Hardly the straight, tall, noble tree one might expect of a source of fine cabinetry, it seems stunted and hunched, little more than a twisted shrub that rarely tops 40 feet. The trunk is blackened, gnarled and bent, as if scorched by fire and then assaulted by centuries of apocalyptic storms. Yet the tree is vigorous, often sinking its roots 150 feet deep in quest of water.

Historically, ranchers regarded mesquite as a trash tree, a water-gulper, a foe. But these days Southwesterners are willing to pay premium prices for mesquite cabinets and furniture. The heartwood is prized as a building material because it resists decay. And it is stable; once milled flat, straight and square, it stays that way—for centuries, Vosnos says—without maintenance. Still, a mesquite trunk is rarely as much as a foot in diameter, and a straight piece four or five feet long becomes a treasure to be hoarded for a special project.

Mesquite’s character lies in its wild patterns. The grain may sweep along, then veer into an eddy and curl back on itself, or flare into a series of ripples, or split open to make a canyon,



Cabinetmaker James Vosnos assembles the frame of the Meigses' kitchen island, which has an epoxy-filled knothole prominently displayed in the center pilaster. "That's why people like mesquite," Vosnos says. "It tells a story."

or explode into a black-rimmed knot-hole. And that's on a good piece. "Finding a square foot of clear mesquite is rare," Vosnos says. "But the educated client wants to see some defects—worm holes, voids, knotholes. It adds to the charm."

For their new kitchen, spring TV project homeowners Jim and Colleen Meigs desired the sculptural look of Spanish furniture built of mesquite and set against white plaster walls: 12 feet of cabinets along the east wall, embracing the

sink; a 9-by-9-foot floor-to-ceiling cabinet across the room to the west; and a 6-foot-long island in between. There would also be an 18-inch-wide cabinet next to the stove on the north wall. In designing the pieces, with their pilasters, cornices and built-up moldings, Vosnos took his inspiration from a Mexican floor cabinet owned by contractors John and Judy McCaleb. Before he's finished, Vosnos will spend at least 600 hours transforming unruly mesquite into a roomful of refined furniture.

He begins modestly, by making full-scale layouts on sheets of Masonite, drawing up a list of parts to be manufactured and ordering custom-made molding knives. Then it's time to choose the mesquite. For this, Vosnos drives through the desert to the

Too much barbecue, too many rustlers, too little mesquite

When the Spanish arrived in the Sonoran Desert in the early 1700s, mesquite trees grew up and down the washes, and indigenous Yuma, Pima and Papago people depended on their golden pods for food. In early summer, the ripening pods were mixed with grass seeds and formed, to Spanish nostrils, an evil-smelling dough.

Cows and horses helped mesquite to spread, because the rock-hard seeds germinated better after traveling through an animal, and the tree was soon familiar from California to Texas. Vast acres of

mesquite were burned to warm early miners and fuel their silver-stamp mills, leaving a degraded desert behind.

But mesquite is a survivor. It is also a nurse, producing millions of flowers every season, fixing nitrogen with its roots and sheltering twice the number of plants in its shade as thrive just outside. The endangered saguaro cactus, for instance, cannot survive its youth without the protection of a mesquite, ironwood or palo verde tree.

Ranchers past and present cleared mesquite for pasture, though recent stud-

ies suggest that on good land, raising it for fuel and furniture is more profitable.

Today, the threat comes from America's 12.3 million outdoor barbecue grills. Since mesquite-grilled meats became popular in the 1980s, rustlers have stripped the wood from at least a half-million acres of Sonoran Desert in the United States and Mexico to make charcoal. Such wasteful, indiscriminate mesquite gathering imperils not only a source of fine furniture wood but also an entire Southwestern ecosystem.

Sonoran Hardwood Sawmill in Tumacacori, 45 miles south of Tucson. There, Richard Maul slices logs lengthwise on a big outdoor horizontal bandsaw and stacks the resulting boards to air-dry. In its raw state, mesquite reveals its reluctance to be tamed. The stacks of lumber look like a medley of scrap. Few boards are longer than four or five feet, and many are as bent as boomerangs. Moreover, the rough-sawn surfaces are furred, so the grain is hard to discern—although the knots and voids are evident enough. Vosnos chooses largely by intuition; he has developed an eye for mesquite, he says, but there are always surprises. Months later, on the day the imaginary skull of the longhorn bull reveals itself in the door panel, he would remark of his selections, “The worse the board looks on the outside, the more personality it has once you open it up.”

Vosnos ultimately selects 600 board feet of mesquite (price: \$5,500). He labels the 12 logs A through L, marks each of the eight or nine “splits” from each log A-1 through L-9 and trucks them to his shop. Because mesquite should air-dry one year per inch of thickness, and Vosnos’s choices had baked in the sun at the sawmill for only eight months, he stacks the wood in his electric kiln for three more weeks, until the moisture meter reads 6 to 8 percent. During the down time, he finishes the full-size layout drawings from which he will work.

When Vosnos opens the kiln 21 days later, he sorts the rough boards, deciding which ones will become which parts of the cabinetry, trying to visualize the best way to recombine them. There are hundreds of parts to make, from the stiles and rails of 40 doors to the pilasters on the fronts and sides to the dozens of tiny bits of molding, trim and appliqué.

“I had to choose the most important wood first to end up with the nicest pieces where I wanted them,” he says. He likes, for example, to have the arrowhead-shaped grain flares pointing upward. Knotholes get filled with tinted epoxy—not to blend in but to contrast—so Vosnos now begins to think where they will look best. Because most of the raw lumber will be relatively narrow once it’s ripped and squared, he knows he’ll have to glue up the narrow stock to create wide



What do you see? Mesquite's grain patterns are a Rorschach test in wood.

expanses, and he sets aside the few, precious longer boards for the doors of the spectacular floor-to-ceiling cabinet. Over the next few weeks, the parts come together in Vosnos's mind, piece by piece, but it is frustrating: "I'm the kind of guy who says, 'Turn on the machine, let's get some dust flying!'"

Finally, he rips the wood to rough width on a table saw, squares up the pieces on the jointer, planes them to thickness, and chops them to length on the radial-arm saw. Sparks sometimes fly as the saw blade bites mesquite, and Vosnos wonders whether they come from detritus on the surface of the planks or from silica drawn up into the heartwood by the tree's roots. He knows he must change blades twice as often when working mesquite. And the hazards are real: Conflicting grain patterns make the boards want to chatter and bounce on the table as he saws them to size. Sometimes the wood gets so hot it smokes, and the scent makes Vosnos think of a barbecue: "I was ready to get out the burgers."

Vosnos marks each piece, categorizes and stacks until he has a shop full of neat piles and can move on to the most challenging—and, to him, satisfying—portion of the job: the joints. "Making good, strong, long-lasting woodworking joints is my fetish," he says. "I'm famous for disregarding profit to make them."

The 40 doors, each with a book-matched panel, are connected at the four corners with mortise-and-tenon joints, and when Vosnos finishes each one, the parts fit together so tightly, without glue, that he needs a mallet to knock them apart. Although most cabinetmakers today use European adjustable hinges, Jim Meigs has specified butt hinges, so each door has to be mounted precisely, with no margin for error. That makes



Mesquite is a tough, ornery wood to work with, so Vosnos is always ready for trouble as he pushes a plank across his jointer. Mesquite is so hard it dulls the jointer blade twice as fast as any other wood.

movement," Vosnos says. "They really bring it to life."

Vosnos finishes the surfaces with three hand-rubbed coats of tung oil, turning the wood a lovely honey-amber-ale hue and bringing out the figures in the grain. He's pleased with his work on the island cabinet. In the center pilaster there's a big black knothole. He had spotted it months before at the sawmill, and since then has carried it and a thousand other unruly details in his mind until he finally placed it where it is, carefully cleaned and filled with dark-tinted epoxy. Now he's eyeing the most challenging cabinet of all: the enormous one that will dominate the kitchen's western wall. There, he says, he will unfold an entire log into cabinet doors—resawn, book-matched and standing upright in sequence, a single mesquite tree's inside story exposed to human eyes.

Vosnos smile; precision gives him pleasure.

Every visible inch of the cabinets is rugged, beautiful mesquite. But because it's so expensive and difficult to work, Vosnos meticulously constructs an underframe of alder and three-quarter-inch plywood on which the exterior mesquite can be built up in layers, like icing and decorations on a cake. Often he glues a length of plywood edgewise to a length of mesquite, fixes the combined piece to a cabinet, leaves the mesquite exposed and then covers the plywood with more mesquite, building up layer after layer of appliqué. Mesquite is so hard that even a bit of molding the size of a child's thumb stops a nail gun's brads flush with the surface. So Vosnos has to return and countersink them later with a hammer and nailset. As he progresses, he adds layers of mesquite molding up to six levels deep in some places. "They give the piece what I call its



The finished kitchen island: After about a year, natural oxidation will turn the pale wood a rich reddish gold.



Concrete. Liquid stone. As intriguingly cleft as a granite scarp in Maine, or as pebbled as a Maui beach. Concrete flows, fills, follows its nature. Transcendent floors are made by those who know how to exploit its invisible molecular dance: crushed, roasted lime slowly reclaiming water and reverting to crystals of limestone.

Colors glow from within or skitter across the surface. Butter yellow. Spilled, aged Bordeaux. Glassine obsidian. Patterns cut into the jelling surface form squares, diamonds, crosshatches, broken slate. Carved gray channels surround blocks of deep ocher. A surface stubbled with round, river-washed stone takes on the image of a dry streambed flowing from foyer to solarium.

Concrete floors seem a modern invention, but they reach back in America, particularly in the desert Southwest. Here, they fit: cool underfoot and well-suited for adobe dwellings that swell up out of the earth. In 1783, the builder of Mission San Xavier del Bac, seven miles south of Tucson, fashioned a floor of crushed lime and water mixed with red volcanic sand. From 1928 to 1956, Swiss-born architect Joseph T. Joesler covered Tucson with concrete-floored homes. Joesler made his floors oxblood-red, inspired, perhaps, by the peasants who raked real ox blood into the dirt floors of their homes to stanch the dust.

The spring TV project house in Tucson, built in 1930, originally had no interior concrete floors. But it did feature an oxblood-colored concrete patio that had been enclosed in the 1950s. True to fads of the day, its Eisenhower-era owners had slapped ugly white linoleum on it. Worse, they'd chiseled tiny divots into the concrete to help the

ABOVE: Jim Meigs was inspired by this poured floor in the powder room of his brother Tyler's Tucson home. It features 12-inch squares with 2-inch inlaid Mexican tiles.

RIGHT: Add 150 pounds of iron oxide colorant to 10 tons of concrete, mix, and it comes out a warm, deep red.

poured

linoleum's adhesive stick. The current owners, Jim and Colleen Meigs, put tile over the linoleum 13 years ago. But, as part of the extensive revamping now underway, they wanted to return to basics, to the original 1930s look. So they had the old slab jackhammered out and a new, red concrete floor installed. Once finished, this enclosed patio will be the media room, housing a television and stereo system.

It's a big job, but worth it. Perhaps the most telling attribute of a poured floor is this: Concrete is a synonym for real. Watching the crew coax the Meigses' new floor into place, *This Old House* host Steve Thomas said, "I like the fact that it's an honest use of the material." He contrasted this floor with more typical ones of fragile hardwood strips or vinyl skinned over plywood. "I want a floor like this in my house."

BY BRAD LEMLEY PHOTOGRAPHS BY KOLIN SMITH

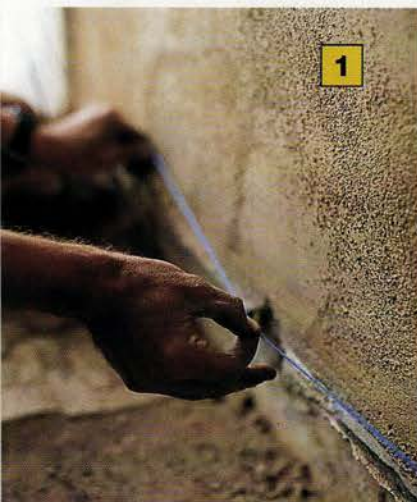


d floors

Evoking the elegance of a Greek temple
for a third the cost of hardwood

LAYING DOWN 10 TONS OF FLOORING

"You need strong hands to do this work," says Dean Carson, 66, who has been installing concrete floors for 35 years. Steel nerves also help. Moment by moment, concrete gets harder, and mistakes mutate from worrisome to irrevocable. Although challenging, it's surprisingly inexpensive. Carson charges \$4.50 a square foot. A floor of oak strips, properly installed over a concrete slab, can cost three times that. A crew of five, including Carson's son, John, and grandson, Mark, begin by wheel-



barrowing away the last remaining chunks of the original 1930 slab, which had been jackhammered up a week earlier.

1. After peering through a transit level, the crew snaps chalk lines on the walls to mark the finished height for the new, 240-square-foot floor. **2.** Then they wheel in fill dirt specially formulated to be compactible and rake it smooth. With a motorized tamper, they mash it down to roughly four inches below the finished-height chalk line.

3. To deal with Tucson's ubiquitous termites, exterminator Trent Rowley soaks the compacted fill with 80 gallons of blue-tinted Dursban TC, a broad-spectrum insecticide rated to last five

years. The aim: to keep the bugs from tunneling under the slab and munching on studs and ceiling joists. While the bug man finishes up, Dean Carson heads outside to help John and Mark add iron oxide colorant to five cubic yards of concrete churning in the mixer truck. Meigs specified the deepest possible red, so the Carsons dump in 150 pounds of coloring. In Dean Carson's view, that's the highest concentration that can be added without weakening the concrete. The dye resembles chili powder. "I like to wear gloves when I handle it," he says. "It stains your hands, and it takes three days to get it off." During the 30-minute wait to ensure the colorant is thoroughly mixed, Carson's crew lays six-inch steel reinforcing mesh over the compacted fill. Then, with heaves and grunts, they begin wheeling in the first of 42 wheelbarrow loads of deep red concrete. "For a bigger job, we'd pump it," says Carson. **4.** Starting in the corner farthest from the wheelbarrow's entry, some crew members dump the rust-colored mass while others roughly level it with floats. As general contractor John McCaleb and Steve Thomas look on, John Carson pulls an eight-foot hollow aluminum bar—a screed—across the wet concrete, bringing it to the finished height. Once all five yards—about 10 tons—are dumped, leveled and screeded, Mark Carson starts tamping the floor. Using a metal screen mounted on handles, he shoves the large rock down and brings the milky water, sand and concrete, known as cream, to the surface. Then, in a continuous, graceful motion, he "bullfloats" it: alternately pushing and pulling a four-foot-wide strip of aluminum mounted to a long handle, creating a smooth, flat surface.

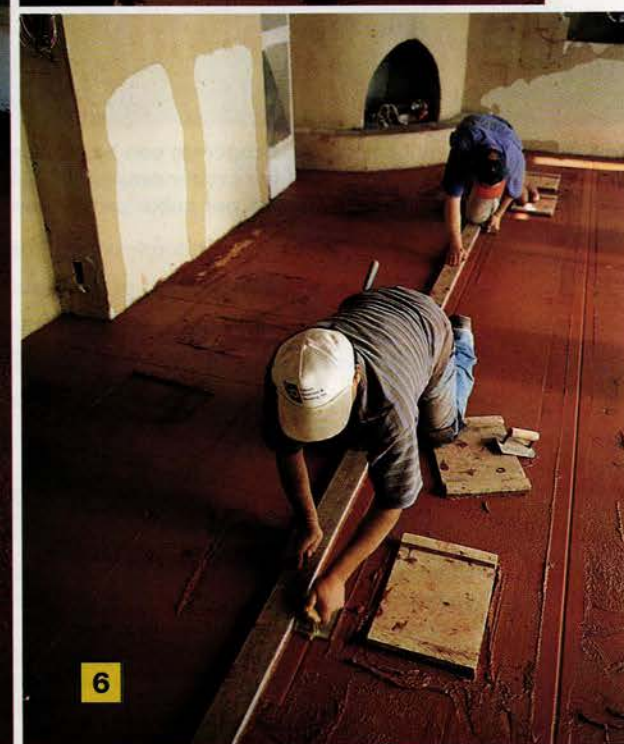




4



5



6

5. Meigs asked for scoring in two-foot squares, with a plain, foot-wide border. Using a tape measure, and kneeling on boards to avoid sinking into the ever-hardening concrete, the crew marks out 25-inch squares. The extra inch is needed to make the squares fit properly within the border. **6.** Some workers score half-inch wide, V-shaped grooves into the wet concrete with specialized trowels. At the same time, others work on the flat spaces between the grooves, their trowels describing long, elegant arcs. When the concrete is fairly stiff, crew members slice two 1½-inch-deep control joints across the whole width of the slab. “Concrete shrinks as it hardens, so it will always crack. There’s no way to avoid that,” says Carson. “With the joints, we’re trying to get it to crack where we want it to.” Generally, he puts

in such joints every 12 feet, but here, they are installed just six feet apart because the room’s irregular shape will put extra stress on the shrinking slab. His crew covers the joints with V-grooves made in fresh cream. If hairline cracks appear in the bottoms of the grooves, they will be virtually invisible.

Carson and his crew pack up and head for home when the trowels rasp ineffectually over the rock-hard floor. The next day, they cover their work with builder’s paper and cardboard to protect it, as work on this house is to continue for at least two more months. When the whole house is finally renovated, the protective paper will be peeled off and the floor lightly sanded with fine-grit paper and sealed with two coats of paste wax, which penetrates well and buffs to a rich gloss.

THE COLORS OF CONCRETE

Most concrete coloring agents are made from synthetic iron oxides—chemically, they're similar to the rust on an old Chevy. The available colors cover the full spectrum, but it's important to keep in mind that most concrete is naturally gray. "When you add yellow, you don't get a bright yellow, you get a buff color," says Ramon Gutierrez Jr., a technical service representative for Davis Colors in Los Angeles. "It's difficult to get bright colors with gray cement."

Homeowners who yearn for a cheery slab can specify that the concrete be made with white cement, a special variety made from calcium deposits that are free of mineral discoloration. Although it increases the cost of the concrete by 50 percent or more, it lets the true color show through.

Whether the cement is gray or white, the amount of colorant used determines the intensity of the hue. "Color doesn't weaken concrete as long as the amount of coloring agent remains under 10 percent, by weight, of the amount of cement in the mix," says Gutierrez. For each 94-pound sack of cement, one should add no more



John Carson pours colorant in a concrete truck's hopper. It must churn for 30 minutes to ensure thorough mixing.

Virtually any color of concrete can be achieved by mixing colorants in the proper proportion. Adding color costs about \$15 to \$25 per cubic yard of concrete.

than 9.4 pounds of color. Concrete contractor Dean Carson, conservative by nature, never adds more than six pounds of color per sack of cement. Mixing in small amounts of color, such as one pound per sack of cement, creates a swirling, subtle, mother-of-pearl look.

Color is usually mixed with the wet concrete in the truck, but it can instead be scattered across the surface of the hardening gray slab and troweled in—then it becomes possible to gouge out lines of contrasting gray, creating a tile effect. Gray concrete can also be painted. Thinned latex, applied with rags then coated with protective polyurethane, creates an elegant faux marble.

AN ARCHITECT'S FAUX BLUESTONE

Michael Graves, one of America's preeminent architects, has never regretted his decision 20 years ago to decorate his home in Princeton, New Jersey, with a poured concrete floor. The 5,000-square-foot building was originally a warehouse, constructed by Italian masons in 1926. "The Italians had built it like a Tuscan barn," Graves says. Graves was also inspired by the many poured concrete floors Frank Lloyd Wright had installed in his projects, particularly those in the Fallingwater house in Bear Run, Pennsylvania.

Because the concrete floor already in place was rough, a smoother layer of plain gray concrete was used as a topping. This new layer was gently daubed with rags soaked in thinned blue latex, then coated with polyurethane. He scored four-foot squares into it with a concrete saw. The result, right, is breathtaking: like massive slabs of quarry rock marbled with complex, subtle veining. "Everyone who comes into the house comments on the floor; they've never seen anything like it," he says. "The faux finish makes it almost a bluestone."

Moreover, he appreciates the floor's practicality. "If you're worried about

spills, kids making scratches and tracking in sand or anything like that, it's wonderful. It really is tough."

One potential drawback is that concrete can be chilly underfoot. Graves recalls a girlfriend who complained because it was uncomfortable roaming around in her bare feet (she's moved on, he says, for other reasons). But he does not consider the cold to be a problem.

"I usually wear shoes," he says. "And if it is bothersome, you can install radiant heat."

Some contend that concrete floors have an obnoxious solidity—walking on them is wearying, falling hurts—but Graves feels "that's mostly psychological. The minor difference in the give between concrete and wood doesn't matter from a practical standpoint."

Still, a concrete floor isn't right for everybody. The floor made sense in Graves's renovated warehouse because of its large scale, industrial roots and neoclassical Mediterranean design. Conversely, a concrete floor in a filigreed Victorian drawing room wouldn't work. "Above all," says Graves, "you have to consider the aesthetic of the house."



Carson's crew spent six hours on hands and knees, making four sweeps across the floor. Each time, they corrected the flaws made by crawling across the floor the previous time, until, finally, their trowels no longer made an impression.



an
american
craftsman

coppersmith

*Larry Stearns transforms thin sheets of metal into elegant
finials and weather vanes that touch the sky*

PHOTOGRAPHS BY FRANK W. OCKENFELS III


Smoke rises in signal puffs as Larry Stearns touches the bar of solder to the hot iron, turns the iron face down and watches the molten tin and lead flow like a

BY WALT HARRINGTON *glowing silver waterfall onto the copper beneath. There is a quick sizzle, and the sudden scent of hamburger cooking, as the paste flux burns away. The copper has already been heated to 414 degrees Fahrenheit with the iron, and the solder sweats into the seam like water climbing the roots of a tree. Stearns brands the hot iron to the seam for an instant, just long enough to let a gray, pencil-thin line of liquid solder bleed along the seam's outer edge. He lays the solder bar on the workbench, returns the iron to its perch, takes off his leather gloves and examines the octagonal cone he is constructing for a three-foot-tall finial. When finished, it will adorn the top of a roof. "Not bad," Stearns says, running his fingers along the now hard, cool and perfect line of solder. "No one will see that seam when it's thirty feet off the ground, but I'll know it was done right."*

Larry Stearns is a coppersmith. The word sounds quaint today, imported from a past of Victorian row houses and Queen Anne mansions whose peaks and spires often



For each copper ornament Stearns makes, including this 3-foot-tall scroll finial, he asks himself three questions: "Is the piece as well made as it could be? Is it built to last? Does it look good?"



Wearing heavy leather gloves, Stearns snips a sheet of copper to make an octagonal cone, taking care to cut the metal cleanly so its edges look good and so he doesn't leave tiny fishhooks that could cut a hand like a razor blade.

boasted decorative finials or weather vanes. But for years, from his shop on Machia Hill in the Vermont forest outside Burlington, Stearns has made a modern living at an antique craft.

A 16-foot-high Stearns weather vane sits atop Boston's Arlington Street Church; for Chicago's St. Ignatius Preparatory School he made a 14-foot-high repoussé finial; and the city hall in Lancaster, Pennsylvania, carries his Tower Belvedere, a replica of a leafed, copper-clad dome that took 4,000 pounds of copper and 500 pounds of solder to build. These aren't mass-produced hardware-store ornaments; these are sculptures—metal creations cut and bent by hand and pounded into their designs by hammers of 50 sizes and shapes.

"I love copper," Stearns says. "To take a flat sheet and bring it to life, to see it transformed, is terribly gratifying." Stearns, now 40 years old, smiles, knowing that he, too, has been transformed by the strong, lustrous, malleable and corrosion-resistant metal that man has molded into weapons, tools and decorative objects for 6,000 years.

"I used to be a party-loving roofer," he says. "I did a quality job, but I never thought about doing anything in terms of more than how much money I was going to make. I had pride in my work, but it was an egotistical pride—I can do this! It was not the right attitude." He pauses to ponder exactly what he means. "I lacked humility. Ultimately, that leads to an attitude of 'That's good enough,' an attitude that says people don't know the difference between good and bad quality—if they like it, I like it. For me, the change came when I realized that what I do in this life is important to nobody else but me. I don't sign my work unless I'm asked. It's not the person, it's the work that should last. That's the humility I had to learn."

As he works on the finial this morning, in a shop filled with hand-operated machines that crease and cut, roll and spin copper, Stearns is surrounded by weather-vane patterns as traditional as a trotting horse and as whimsical as an Egyptian warrior. Giant sheets of salmon pink copper, with reflective surfaces that make tall, thin men look short and squat, go boi-yoi-yoiing as they are moved from storage to workbench. His assistants, Dody Bleau and Warren Tice, hammer dissonantly on other projects. But Stearns is oblivious to the distractions and focuses on the finial, which will one day grace the roof of a computer magnate's mansion on Long Island.

Using the ancient Pythagorean theorem, Stearns has already transferred a two-dimensional rendition of the finial into a three-dimensional pattern. He has cut a fan-shaped, .0216-inch-thick sheet of copper to match the pattern, bent it from bottom to peak along eight 40-degree hip lines and spot-soldered the resulting octagonal cone at a point halfway between the top and bottom of the overlapping hip run. This copper cone, 23 $\frac{3}{8}$ inches across at its base and rising 19 $\frac{1}{2}$ inches to its peak, will be the finial's bottom. An 8-inch-diameter cylinder will cover its peak and rise like a stovepipe 14 inches, although only 7 $\frac{1}{2}$ inches will be visible, with the rest giving structural support. Half-round ornaments will encircle the cylinder at its base and at the top of its exposed rise. Above the upper half-round will rest an octagonal, outward-sweeping soffit that will rise 2 $\frac{7}{8}$ inches. Atop the soffit will rest an 8-inch-high octagonal cone. At its truncated peak, appearing to balance delicately, will be a 3-inch-diameter ball.

In the way that an engineer's sketch can't evoke the final towering majesty of a church steeple, mathematics

RIGHT: Stearns eyeballs the finished pieces of a custom finial before soldering them in place.

BELOW: Warren Tice uses a hot iron and a solder bar to finish connecting the seam of an octagonal cone that will be the base of a scroll finial.



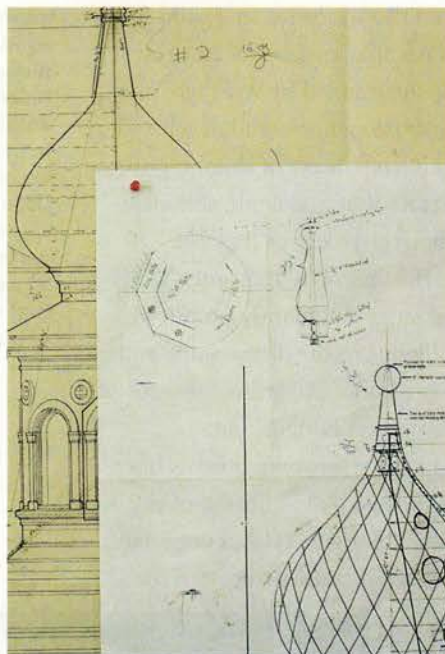
can't evoke the eventual beauty of Stearns's finial. It will glint in the sunlight like a bright new penny until the rain calls from within it a vague and then deep green patina that will take 20 years to mature. The finial will be strong enough to withstand winds and storms for more than 100 years, outliving its creator.

"When I'm doing this it's meditative," says Stearns, as he puts his gloves back on, takes up the hot iron and the solder bar and poises like a surgeon over the open end of the large octagonal cone. "The repetitiveness is calming. The further you get into it, the more addictive it is."

The single spot of solder Stearns has pressed at the center of his cone's closing hip run is melted smooth. He has tacked the cone there because the iron's heat must be distributed equally along the hip's length otherwise heat expansion will cause the

RIGHT: Tacked on a wall in Stearns's workshop is a drawing of an onion dome that will go on a house in upstate New York.

BELOW: Dody Bleau places a finished finial atop the dome, which is made of more than 200 diamond-shaped pieces of copper.



copper to buckle. Now, smoke rising and flux sizzling, he tacks the seam at its peak and base, continuing to split the difference between tacks until he has created a single, gleaming line.

"It looks good," he says.

This finial, with its mostly flat surfaces, will take Stearns a day's labor—eight hours. To build the 16

large, three-dimensional leaf pods that surround the base of Lancaster City Hall's dome, Stearns hammered for more than 500 hours. The edges of the leaves had to curve naturally, and the veins that run along each leaf lobe had to look delicate and alive. Stearns shaped them by hammering copper into "negative forms"—the concave sides of bowl-shaped wooden casts of all sizes. He used oval-shaped hammers, hammers with pointed tips, hammers with chisel tips, hammers with slight curves and hammers with large curves. In the way that a cloth napkin would have to be pleated and folded with fingers to fit inside a salad bowl, the copper had to be pleated and then smoothed with hammer strokes.

People think of copper as a solid material, but it's malleable. Although hammering work-hardens copper and makes it brittle, heating the metal to at least 392 degrees and cooling it—annealing it—softens the copper for further sculpting. The base of Stearns's St. Ignatius repoussé finial in Chicago, for instance, has copper



ribs that curve both horizontally and vertically. During hundreds of hours of hammering, each rib had to be annealed four times before Stearns could fashion the proper compound curves. "I read somewhere that Michelangelo said he stayed fit mentally and physically because of the hammer," he says. "I can understand that now. Hammering is good for the soul. I go into another place—hammer and anneal, hammer and anneal. I get possessed. I can go on for hours."

Stearns didn't always take his work so seriously. An A student in high school, he went to college, dropped out and began working as an itinerant roofer. While installing a copper roof on a Long Island mansion, Stearns met a Czechoslovakian sculptor who was creating statues for the estate and a second man who was the project's contractor. In his spare time, Stearns went to Manhattan art galleries with the sculptor, who derided the pop art they often saw. In one gallery an artist displayed a leather couch surrounded by a red movie theater rope.

"Trash!" the sculptor declared. In his view, the artist couldn't have made an emotional connection to that piece of junk; connecting emotionally to one's work was the sculptor's definition of art, whether you were painting pictures, carving stone or installing a copper roof. At the same time, the contractor for whom Stearns worked kept telling him work wasn't only a way to make a living but a path to life's meaning. Put yourself into what



The 10-foot-tall *Blind Justice* that used to reign over the courthouse in Troy, Ohio, looms over Stearns's workshop awaiting repairs that include resoldering split seams, patching bullet holes and rebuilding the statue's right hand and the sword it once held. **INSET:** The coppersmith's own hand rests on one he fashioned to practice making body parts for the sculpture.



you create, he said, because your creations aren't only objects; they are archeological evidence of your humanity. You can go through life lazy and kicking and screaming, he told Stearns, or you can go through life with passion for what you do.

Stearns could feel something stirring. "Before, I always felt like I was doing a job. I didn't like it. I wanted to turn over a rock and find a pile of gold and retire to a Caribbean island." Then one day, imbued with his mentors' preaching, he was atop the mansion's roof trying to figure out how—without cutting, splicing and caulking the roof's copper sheeting—he could sculpt the metal with his hammer up the rise, across the run and around the corner of about 50 steps that were part of the masonry chimney. He had no idea. Then, on the roof that day, he simply knew the answer. He began to hammer and smooth the copper in a way that allowed it to turn and curve without wrinkling, to flow into itself like water. He hammered and smoothed, losing track of time. It remains the second most thrilling moment of his life, ranking behind only the birth of his son.

"It's hard to put into words. I had this emotional feeling in my chest. I knew that this was a revelation of some kind. I didn't know what, but I did know that if I hadn't begun to care about what I was doing, I would never have discovered it. It was so

incredible. It was the turning point in my career. And I was doing it because of this new attitude." He knows it sounds wifty, but it was as if the work spoke to him, decided to reveal its

answer. Stearns felt humbled, awed and exhilarated. "It's in here," he says, touching his chest. "It's like a drug, an emotional high."

When Stearns returned to Vermont a decade ago, he was still installing roofs, but he was also building his shop on Machia Hill. Today, keeping up with orders for his signature line of weather vanes and finials, which begin at \$380, as well as creating far more expensive custom pieces and doing historic restoration work, keeps him and three workers busy year-round. Epiphanies like the one on the Long Island roof are rare.

But sometimes, such as the other night when Stearns worked alone on a mock-up of a custom whirligig, he feels a trace of the original passion, the emotional connection to his work that changed his outlook forever. That night in the shop, he lost track of time, looked up and

saw that four hours had passed. He felt refreshed.

"At those moments, I feel like an artist," he says. He has stacked the now finished octagonal cones, cylinder, half-round ornaments and the soffit on the workbench in their final order, stood back, studied his work and decided it is good. "I don't think it matters what you do. Some doctors are artists, some are just walking through. People who are motivated work with all their hearts. On the journey of life, that's the definition of an artist."



TIPS FROM THE MASTER COPPERSMITH

Before buying a rooftop weather vane or finial, Stearns says, make sure it isn't made of mixed metals. The main components of a copper ornament, as well as the nails, screws or clamps used to secure it, should be all copper. Likewise, a brass ornament should be all brass and an aluminum one all aluminum. The reason: Moisture can result in an electrolytic reaction between dissimilar metals and lead to corrosion. This is a common problem, for example, with inexpensive copper weather vanes that have directional indicators made of iron. Such weather vanes may fall apart within 10 years, Stearns says, while ones made entirely of copper can last 100 years. The mounting mast of a weather vane should be made of stainless steel. And it should never be screwed directly to the roof. The mast's shaft should pass through a hole in the roof and be bolted to the interior framing. Some type of weatherproof flashing should then cover the hole to ensure it is watertight even before being properly caulked. Beware if the person selling a finial or weather vane is unable to provide technical information about mounting and how well the ornament will withstand high winds and stormy weather. "There are some hackers out there," Stearns says. "Ask questions."



A cupola and weather vane with cutouts of the sun, moon and stars welcomes visitors to Stearns's workshop near Burlington. OPPOSITE: Inside, Stearns keeps a collection of patterns and templates for finials, weather vanes and roof ridge decorations.

Why Is My House Peeling?

The trouble with new paints and old houses

This Old House painter John Dee calls his neighbors Robert and Andrea Bowler “the epitome of diligent homeowners.” They bought their postwar Colonial in May two years ago, and a month later Andrea was down at the local hardware store, picking out new beige paint to lighten up the gloomy exterior. Soon Robert was up on the ladder, hard at work. “It wasn’t easy,” he says. “I scraped the whole house, rented a water gun, primed everything. I put two coats of paint over that. I did it when I got home from work, I did it on Saturdays. It took me the whole summer. It looked so good.”

BY JEANNE HUBER PHOTOGRAPHS BY ANNA PALMA



The paint on the house Dee rents went from bad to horrendous. When he moved in, there was a coat of latex over several coats of oil, and it was beginning to peel. He recommended stripping it down to bare wood, but the landlord didn't want to spend the money. So Dee scraped off all the loose paint, spot-primed and repainted. Before long, the south wall looked like a disaster zone. Above, Dee confers with paint-company experts about the peeling paint.

But within a year, as the Bowlers watched in horror, their labor-intensive paint job—and everything underneath—was flaking off in leathery sheets. The paint detached with such determination that some chips were embedded with cedar splinters from the underlying siding. Layers of paint that had bonded to the house for decades came loose.

"You can generally tell if you have a house that is going to peel if you probe around a bit," Dee says. "But my neighbors had no previous paint problems, and they went by the book."

Dee has understandable sympathy for the Bowlers: Not long after his house was repainted, it began peeling so badly the south wall looked like a head of hair after a botched perm. "It's a total blowout," he says.

About 1 in 10 paint jobs goes awry, says David Chupka, a technical manager for the Sherwin Williams Co. Often it's because of cutting corners—not sanding, not scrubbing, painting just before a storm, ignoring long-term moisture penetration. But people who own old homes can do everything they're told by paint salesmen and follow labels devotedly and still wind up with paint that peels. If they've hired someone to do the work, at prices that can rival the cost of a new car, peeling paint can begin to look like paper dollars floating off with each breeze.

William C. Feist thinks he knows why. The problem can occur when an old house with multiple layers of oil-base paint is coated with a modern water-base paint, says Feist, who headed the federal government's house-paint research program for 20 years. "The homeowners decide to upgrade and put on good latex paint. But that last coat of a new type of paint can be sufficient to cause a catastrophic failure, often right down to bare wood."

WHEN PEOPLE in the paint industry have a problem, they often consult with the chemical company that supplies them with the ingredients they put in their cans. In the United States, almost

all paint companies turn to Rohm & Haas and its Paint Quality Institute in Spring House, Pennsylvania, near Philadelphia.

There, in a six-acre field draped with two miles of odd-looking fences, 25,000 paint samples are in a contest with time, weather and the sun. On a blustery day last winter, the institute's technical director, Walter J. Gozdan, led the way through this maze, happy to talk about the intricacies of what people in the paint business like to call coatings.

Essentially, he says, there are two kinds of house paint: oil (also called alkyd because of the alcohols and acids used to make

a synthetic oil) and so-called latex (which, it turns out, has no rubber in it). Both consist of three main components: a pigment, a binder that glues the pigment to a surface as the paint dries and a solvent that makes the mixture loose enough to brush on.

Oil paint forms a tough, plastic film as the binder reacts with oxygen in the air. The binder can be a natural oil, such as linseed squeezed out of flaxseed, or oil modified with alkyds.

Latex paint forms a flexible film as water evaporates and the once-floating spheres of binder and pigment move closer together and fuse. Latex paint was invented at the end of World War II using synthetic rubber as the binder. Today the binder is most often a pure acrylic, a vinyl-acrylic or a vinyl-acetate.

The critical difference between oil and latex paints is that they do not cure in the same way. Oil paint never stops curing. As it

ages, it continues to oxidize, becoming more and more brittle. Latex cures in about two weeks and stays pliable. Oil paint generally adheres better to problem surfaces because the oils are small enough to seep into the wood or microscopic openings in old, even chalky, paint. The resins in latex paint are generally too big to seep into anything. But that can be advantageous. The gaps between the larger particles in latex paint allow water vapor to pass through. This makes latex less likely to peel from homes with excessive interior moisture.

As Gozdan pauses near the middle of the paint maze, he points out how all this theory translates into reality. At a series of mock-ups of window frames coated with oil paint, he jabs a



When a paint job costs \$40,000—as it did on this 5,529-square-foot Victorian in Concord, Massachusetts—you just pray it lasts. The walls and trim were scraped to bare wood, primed and coated with two layers of oil paint imported from Europe.

finger at stringy hairline cracks on some of the wood and deeper, squarish cracks on others. Both, he says, are evidence that the oil paint has become too brittle to keep up with the expansion and contraction of the wood. Then Gozdan walks to a nearby section where dozens of three-foot-long pine boards are painted with white latex from a variety of manufacturers. Some boards are gleaming, but after just three years outside, others are almost bare—a sign, he says, that manufacturers tried to cut corners by using cheap ingredients.

No, Gozdan won't say which brand is which. That's not the point anyway. The lessons here are that latex outperforms oil and that expensive all-acrylic latex works better than less expensive latex with vinyl-acrylics. "The most expensive paint," Gozdan says, "is the cheapest in the long run."

Rohm & Haas has a vested interest in this position: Paint gave it a postwar market for acrylics, which had been going by the ton into Plexiglas airplane windows. Still, one of the few independent paint research centers in the country, the U.S. government's Forest Products Laboratory in Madison, Wisconsin, agrees. The lab compared oil and latex paints on its own test fences strung across a windy hillside. "We have twenty-year-old latex that looks as good as if it were new," says chemist Mark T. Knaebe. The side of a typical house, he says, should get more protection from two coats of latex over a primer coat than it would from two coats of a modern oil paint over a primer.

No wonder paint salespeople tout the benefits of latex. But what many don't realize is that all the tests that find latex to be superior have been done by painting over bare wood clapboards or over wood that had only one or two coats of old paint. No one has tested what works best over many layers of old paint. Most houses built before 1950, as well as many newer ones, are covered with multiple layers of oil paint.

When Gozdan is asked how this might affect the

A perfect paint job

Spring is a great time to repaint, says Mark T. Knaebe, a chemist at the Forest Products Laboratory in Madison, Wisconsin. "I like it because you can be fairly sure you'll finish the job before it gets too cold." As coauthor of *Finishes for Exterior Wood*, a new book summarizing the lab's 75 years of paint research, Knaebe knows a quality job takes plenty of time.

He recommends starting with a quick test to determine the extent of the work. First, choose an inconspicuous place where the paint is worst.

Clean the surface, let it dry and paint a small patch. The next day, press on a Band-Aid and then quickly pull it off. If the tape is clean, it's safe to repaint after scrubbing the whole house. If the tape pulls off all the paint down to bare wood, the house needs to be stripped before it's repainted. If just new paint comes off, the old paint is too chalky and you'll have to coat the whole house with an oil primer first.

For houses with some flaking but not enough to require stripping, remove loose paint with a scraper or a power washer, taking appropriate precautions if you suspect the old paint contains lead. Sand all

bare wood and exposed paint edges or the new paint will be thin there and will chip in no time. Scrub the walls with water and kill any mildew by using a solution of one part household bleach to three parts water. Rinse and let the wood dry.

Most painters would simply prime and then paint at this point, but Knaebe recommends coating bare spots with a water-repellent

preservative specifically labeled as compatible with paint. The repellent will limit shrinking and swelling of the siding due to moisture. Three sunny days later, you can prime the bare spots or coat the whole house. (If you've stripped all the paint, latex primer is recommended.)

Apply the finish coat soon. Soaplike compounds can form on oil primers in as little as two weeks. If there is a longer delay, scrub and rinse

before applying the top coat. With an oil-base paint, one coat will probably be enough. Two coats will probably be needed with latex, Knaebe says. Before painting, check the air temperature and the weather forecast and make sure they're compatible with the weather guidelines on the label. Weather that is too hot, too cold, too humid or too windy can undermine the best prep work.



When Michael O. and Phyllis J. Hunt bought this 1858 Greek Revival in Lafayette, Indiana, they ripped off asbestos shingles and found thickly painted yellow poplar underneath. Michael, who runs the wood research program at Purdue University, followed the advice of the Forest Products Laboratory and restored the old siding with new paint.



After removing the old paint with a rotary grinder, Michael Hunt coated the wood with a water-repellent preservative, then a latex primer. He finished up with two coats of latex paint. Five years later, there is still not a flake in sight.

Six signs of failure



ALLIGATORING

CAUSES: Natural aging of oil paint; undercoat was wet; or top coat is harder than the base (such as alkyd enamel over latex).

REMEDY: Strip to bare wood, prime and paint.



BLISTERING

CAUSES: Wall painted while in sun; wall has moisture problem; surface was damp (for oil paint) or humidity was high (latex).

REMEDY: If blisters go down to wood, fix the moisture problem. Scrape, spot-prime, repaint in shade.



CRACKING/FLAKING

CAUSES: Low quality or excessively thinned paint; poor surface preparation or lack of primer; latex dried too fast because temperature was too cool or wind too high.

REMEDY: If cracks are on surface layer alone, scrape and sand, then prime and repaint; otherwise strip to bare wood.



INCOMPATIBILITY

CAUSE: Use of latex over more than three or four layers of oil paint.

REMEDY: Strip to bare wood. Or scrape, prime and repaint with latex—but expect unscraped parts to peel later.



PEELING

CAUSES: Moisture in wall; poor surface preparation; low-quality paint; surface was wet (oil paint only) or blistered.

REMEDY: Fix moisture problem, scrape, sand.



WRINKLING

CAUSE: Paint was too thick; surface or weather was too hot; uncured paint got wet or humidity rose; undercoat was dirty.

REMEDY: Scrape or sand to remove wrinkles. In hot or damp weather, wait longer to recoat.

institute's recommendations, his answer is surprising: "I would never use latex over multiple coats of oil paint. You stand a chance of peeling off all the paint if you switch." Latex paint can literally pull old oil paint off the house, he says. "I've seen houses where the paint has come off in four-by-eight-foot sheets."

When a flexible layer of latex bonds on top of brittle oil paint, the old paint becomes a thin rope in a tug-of-war. As sunshine hits the wall, the wood and the latex can expand. But the oil paint in the middle is brittle. Now pulled with double force, it either cracks or loosens its grip on the wood underneath.

"The latex tends to accelerate the paint loss," says Carl

Minchew, director of technical services for Benjamin Moore & Co.

Gary Barrett, director of technical services for the Painting & Decorating Contractors of America, says the stress on the old oil paint is greatest during the few weeks it takes latex to cure, although the results may take months or years to become fully evident. "It's the shrink factor of latex," Barrett says. "It has to coalesce, or it can't cure."

The force of this effect varies. Often, houses with layers of old oil paint can be successfully covered with modern latex. But when it doesn't work, the results may be disastrous. "It's very unpredictable," says John G. Stauffer, director of the Paint Quality Institute. To be safe, Gozdan and Stauffer say, people who have houses with more than five layers of oil paint are best to stick with oil.

Many others in the industry are not so cautious. Homeowners can safely recoat even many layers of oil paint with latex as long as the old paint is adhering well and is in good shape, says David Maurer, manager of product development and color delivery for the Glidden Co., which sold the first latex paint in 1948. "If, categorically, latex going over oil was a problem, I don't think we'd have any latex paint, or we'd have latex limited to new construction, and that's certainly not the case," he says. "But I will say that if you have a lot of loosely adhering oil paint—and it is common on older homes to see oil paints fractured right down to the surface—latex paints can hasten the demise by putting pressure on the poor oil paint. I think oil



At the Paint Quality Institute near Philadelphia, odd-looking fences test how paint performs on wood, aluminum and even faded vinyl siding.

paint makes a better Band-Aid."

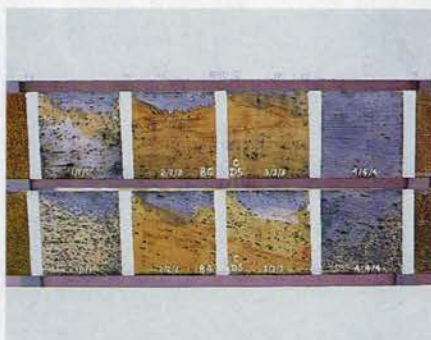
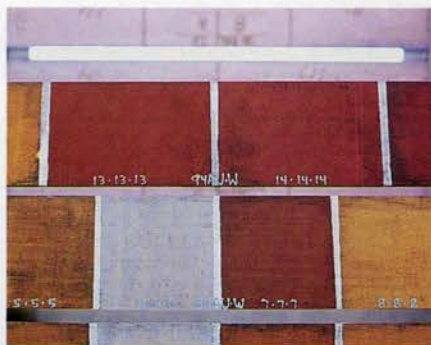
Not long ago, a friend of Maurer's sought advice on how to repaint an old house with wood shakes. "It was the old oil syndrome," Maurer says. The paint was thick and cracking, and the options were not good: Spend a lot of money stripping off all the paint, or spend less money for a repainting that wouldn't last. "I told him the good answer was to remove it all, but the short-term answer was to put another layer of oil on

top. At least he wouldn't be creating a new problem. He'd just be stalling the inevitable."

To stall the inevitable as long as possible, homeowners can do periodic touch-ups with oil paint instead of total recoats. The National Park Service, custodian of many old houses, has found that homeowners have more time to play with than they might think. Oil paint is most likely to crack, the service says, when it is more than a sixteenth of an inch thick, the equivalent of 16 to 30 coats.

Homeowners who stick with oil may find the paint thicker and not as durable as it once

was. Many manufacturers have changed their alkyd formulas to meet clean-air rules in effect in six states. But even if similar rules take effect nationwide next year, as expected, it still will be possible—and legal—to buy oil paint the way it used to be made. Oddly enough, manufacturers can continue to sell high-solvent paint simply by relabeling it "quick-dry enamel," "industrial maintenance coating" or "marine paint." Manufacturers can also sell high-solvent oil paint by the quart, although



What the research reveals:
TOP: Adding zinc oxide to paint helps it resist mildew. **MIDDLE:** Earth tones outlast bright colors because they don't break down in sunlight. **BOTTOM:** Clear finishes are short-lived because sunlight gets through, breaking down wood fibers.

buying it this way instead of by the gallon typically doubles the cost. And top-quality but expensive oil paint that meets most of the clean-air rules is available from several European manufacturers who, unlike their U.S. counterparts, have continued to invest research money in oil formulas. One company, Fine Paints of Europe, sells a "problem house" oil paint formulated to allow water vapor to pass through.

Eventually, every house painted with oil will peel, says Minchew of Benjamin Moore, "because that's what oil paints do. They continue to oxidize and get brittle." Once a house reaches this point, he says, owners have two choices. First, they can scrape off all the peeling paint, prime the bare spots and repaint with latex. Areas that weren't scraped bare will then peel, and the owners can repeat the process until eventually they have a house entirely covered with latex paint that sticks. Second, they can choose a faster, less ugly method: Strip the house down to bare wood and start over, either with latex paint or a semi-transparent oil stain. (These stains don't form a film, so there's nothing to peel.)

Unfortunately, the best solution—stripping and starting over—is also the most expensive. In fact, it can be so expensive that new siding may seem like a better option. The expense may even make the most faithful old-house lover consider the unthinkable: vinyl siding. When Dee

worked out the numbers for his house, he discovered it would cost only slightly more to rip off all the old shingles, nail up new ones and repaint. Vinyl siding was even cheaper. "Maybe that's the best solution," he says.

When paint isn't the problem

Old age doesn't always deserve the blame when paint cracks and peels. When moisture gets behind siding, it can literally push paint off the front. Read the existing paint for clues:

- Bulges or flakes at the top of a wall point to gutter or roof leaks; they should be found and fixed.
- Paint peeling on a wall next to a bathroom means condensation on the back of siding is being drawn through the wood when sunshine warms the wall. Install an exhaust fan vented to the outside.

- If window trim alone is peeling, pry off trim boards and plug gaps around the frame with a low-expansion foam sealant.
- If an entire wall is peeling, the siding may need better ventilation. One solution is to slip eighth-inch-thick wedges under the lower edge of each board or shingle. One paint company sells plastic snap-off devices for this purpose. Do not caulk the bottom edge of clapboards.



Hundreds of lightning bolts bombard the ground during an electrical storm. Every single bolt is as many as 30 strokes that shoot down from a cloud and leap up from the earth—so quickly the eye registers them as a single flash.

Zeus

Take Ben Franklin's advice and put up

KABLAMM! One summer evening, I was minding my own business in an old farmhouse in the cornfields not too far from Athens (that's in Illinois, not Greece, and pronounced AYthens) when, like a bolt out of the blue, came—a bolt out of the blue. When I could hear and see again, I traced the burning smell to the fuse box, which looked like it had incurred the wrath of God—blasted, fried and still sizzling. It was clearly going to be a while before the lights went back on. I didn't get it. There were lightning rods on the house. Was it something I said?

According to Global Atmospheric National Lightning Detec-

tion Network, based in Tucson, Arizona, I am not alone: Each year, the organization estimates, half a million American homeowners make insurance claims due to lightning damage, suffering an average loss of \$1,300 per strike, for a total of \$650 million annually. Global Atmospheric uses 105 sensors dotted around the nation, each with a range of 1,000 miles, to track electrical storms and give early warning to corporate clients. This year, the firm estimates, some 20 million bolts will strike the earth in the continental United States, with a single storm hurling hundreds or even thousands of bolts that can reach

BY CLAUDIA GLENN DOWLING REPORTING BY DON SIDER

the loose

a lightning rod before you get zapped

nearly 500,000 amps (a tenth of an amp is enough to kill you). Says company president Pat Zumbusch, "That's a lot of current. It comes in like a crunching tidal wave."

The physics of a lightning strike, investigated by Benjamin Franklin with his kite in 1752 (see box, page 107) are still somewhat mysterious. We've learned that as rising clouds collide with colder air, electrons are freed, and the bottom of a cloud becomes negatively charged. This negative charge creates a shadow—a positive charge

on the earth below—and when static electricity creates a negative spark heading downward, a positive spark heads upward. The

two meet in a blinding flash that ignites in both directions, and woe betide a house (or anything else) that's in the way.

The key to protecting your house, as Franklin discovered, is to shunt the bolt away from the structure. A metal needle, or lightning rod, takes the hit. The charge is then sent through a metal cable and into the



PHOTOGRAPHS BY

STEWART FEREBEE

ground, completing the positive-negative connection and diffusing the energy harmlessly into the earth. It's a technique that has worked for 250 years.

Today, lightning rods are called air terminals by the trade. They are typically attached to the highest points on a house—chimneys, dormers, roof peaks—connected to each other with bare copper or aluminum cable, then run to a 10-foot pole sunk in the ground. "It's much simpler in principle than plumbing or electrical work," says Leon Byerley, a lightning-protection consultant from Tucson. He warns do-it-yourselfers, however, that craftsmanship is important when retrofitting a house. The

roof has to be punctured to attach the apparatus, making good seals crucial—and reshingling and other roof repairs problematic. In an attempt to avoid such difficulties, or to conceal the cables, some builders run lightning grounding wires through the walls. Houses today, however, have electrical and plumbing systems that Franklin's didn't. Should the lightning cable make contact with metal in any of these other systems, the result can be disastrous.

Case in point: One three-story Victorian near Kansas City, Missouri, was bristling with lightning rods. Lightning struck them as it was meant to, but the clamps came loose in the violence of the storm, and the grounding cable wrapped around the metal venting stack. The water in the pipes vaporized instantly, exploded, and a toilet tank was split in

half as neatly as if it had been done with a jeweler's saw.

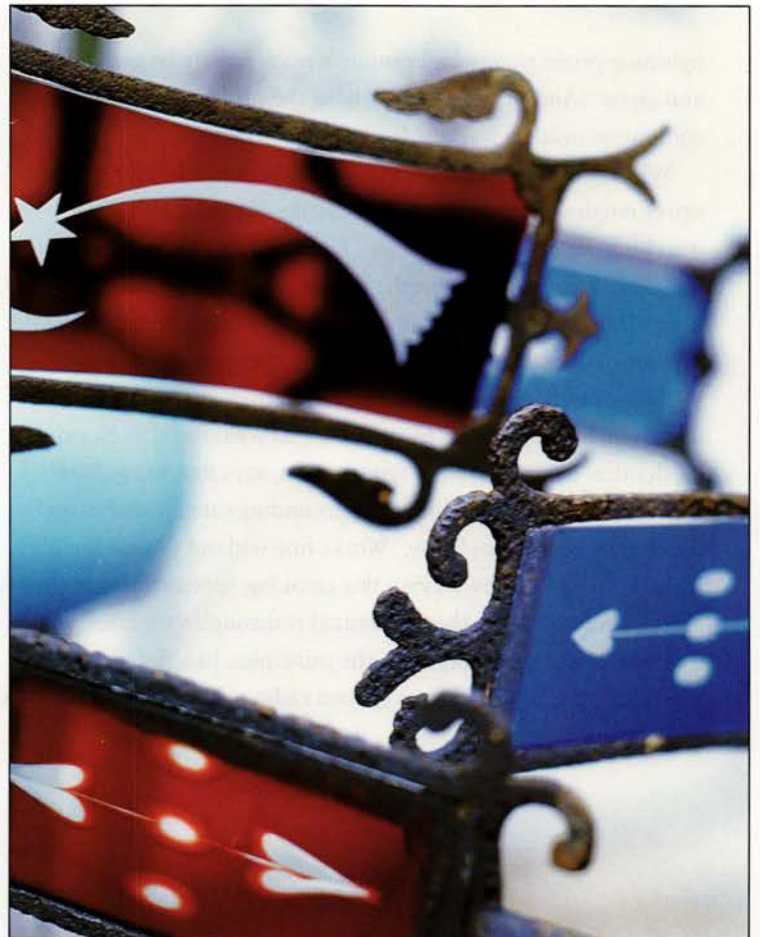
It seems logical for a homeowner to consult the experts when planning lightning protection. The problem is finding a reliable source. "There's a fair amount of snake oil out there," says Byerley. "Some are honest people who don't understand what they're doing, and others are scam artists who make claims they can't back." Nor do building codes exist to guide the homeowner. If you call local building inspectors and ask them to check your installation of lightning rods, Byerley says, "They're not going to know what you're talking about." One set of standards has been established by Underwriters Laboratories, an industry group that, for a fee, certifies the work of its some 320 individual lightning-rod contractors around the country. Copies of UL standards are also available to people who are interested in doing their own work. But what little has been learned about



Dan Fisher, a lightning rod collector in Huntington, Indiana, topped his own house with a rod and an arrow weather vane from the 1920s. The conducting rod is a hollow copper tube.



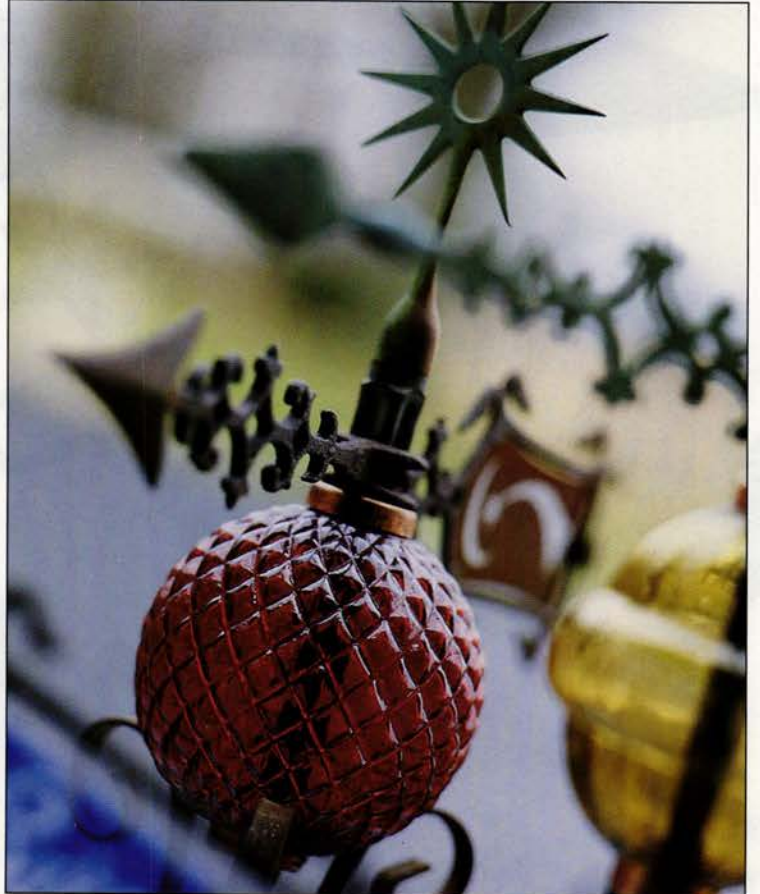
Early lightning rod makers took to adorning their sky stakes with survivable materials like glass, which wouldn't conduct the jolt.



Artisans in the 19th century found a practical outlet enhancing the wind vanes on lightning rods with stained-glass tails.

Ben Franklin's Spark of Genius

"It has pleased God in his goodness to mankind at length to discover to them the means of securing their habitations and other buildings from mischief from thunder and lightning," Benjamin Franklin wrote in *Poor Richard's Almanack* in 1753. He had been conducting experiments with electricity for several years at his home in Philadelphia, including the famous kite-flying test demonstrating that lightning was electricity and that it would travel down a wire. In his almanac, he outlined the construction of the Franklin rod, as his invention was called into this century. "The method is this," he wrote. "Provide a small iron rod (it may be made of the rod iron used by nailers) but of such a length that, one end being three or four feet in the moist ground, the other may be six or eight feet above the highest part of the building. To the upper end of the rod, fasten about a foot of brass wire the size of a common knitting needle, sharpened to a fine point." Though Franklin acknowledged the inspiration of the Creator, one preacher held the inventor responsible for an earthquake that struck Boston in 1755, two years after the description of the device was printed. It was a warning from on high, he told the congregation, not to thwart divine will with Franklin's tool of the Devil.



The sunburst on a rod from the early part of this century was both attractive to look at and thought to be more attractive to lightning.

lightning protection since Franklin's era is mostly based on trial and error. "And Franklin didn't have the problem of electrical equipment inside a house," Byerley says.

Witness my fuse box. Or the eerie experience Jesus Muñoz, a safety employee for the city of Glendale, Arizona, had while watching the news one morning. His wife asked him to turn off the television, and as he hit the button, there was a flash of lightning. "This electric thing came out of the picture tube," he recalls. "It sort of curved around me, then disappeared into thin air."

Houses today not only have electrical lines entering, they have telephone lines and wires for cable TV as well. Randall Noon, a mechanical engineer from Clinton, Iowa, says that many handy-men ignore recommendations for grounding satellite dishes and other antennas. "They'll say, 'Works fine without [grounding],' " he says. "Then they're waving this great big lightning rod in the air, and the only pathway they've created is through their television."

Even those who understand the principles, like electrical engineer Larry Lechlitner, can err. A ham radio operator, Lechlitner had

a 40-foot tower next to his house in Kokomo, Indiana, grounded with two rods. But about 3 o'clock one morning, lightning struck the tower and arced to the metal flashing of the house three feet away. "On the overhang for the eaves, it blew the nails straight out," he says. "It blew holes in the downspout. It blew the gas line. It blew the thermal coupling on the furnace. It blew a two-and-a-half-inch hole right out through the siding—just vaporized it." The problem was that the tower ground wasn't tied in to the house ground. With voltage varying wildly during the strike, the lightning sought the best ground in the vicinity—sadly, his house.

"There's more witchcraft about grounding than anything else," says Charlie Williams, an engineer for a power company in central Florida, which averages 30 strikes per square mile each year. "You've got the power system, the phone system and the cable TV system. You get a surge on one and the voltage levels shift between the systems. You need single-point grounding." He says that the National Electric Code was changed to reflect the requirement for a common



The artistic design of a weather vane made in the 1940s disguises its true function: keeping the house or barn it's mounted on from burning down when struck by lightning.

ground a few years ago, but that many older houses have systems that don't meet this standard. He suggests having an electrician check your grounding system; usually joining two systems is simply a matter of running a cable between them.

Proper grounding alone does not protect electrical appliances, however. "Two events can happen with lightning: a direct strike to the house—not likely, statistically—and a nearby strike to the ground," says Rich Kithil, the director of the National Lightning Safety Institute in Louisville, Colorado. "Lightning radiates like ripples on a pond to various metallic objects, trying to get to earth. If it's a telephone wire or TV wire that intercepts it, the current may be introduced to the house." The first line of defense is a surge protector on the main electrical line coming into the house. The best is a high-power metal oxide varistor, or MOV, surge arrester, a \$300 item that can take up to 50,000 amps. The second line of defense: lower cost surge protectors. Plug appliances into such protectors and, if a surge does get through the main panel, computers or television sets can be saved. There are also surge protector jacks made for telephones and cable TV boxes.

The home of the future is likely to have telephone, computer and cable TV service all carried by one line. Planning for that eventuality, cable companies are already building surge protection and grounds into their systems at several stages. If Zumbusch of Global Atmospherics has his way, messages warning of lightning in your area could come right to your television screen. It is too expensive to deliver such service to private houses now, but, says Zumbusch, "systems are getting smarter."

The best protection for now is to unplug from the modern world. When you hear thunder, log off the Internet, stay out of the bath and hang up the telephone. And—a nod to Franklin—if you live in Florida, the Midwest or on the East Coast (the West Coast has many fewer strikes), you should consider air terminals. Pat Garthwait, a flea-market dealer, knew that her area of Colorado was lightning prone, but the homeowners' association in her housing development prohibited lightning rods. One afternoon, her husband was dozing in the living room when lightning struck the metal chimney lining. "His eyes flew open just in time to see the fireplace across from him fly off the wall," she says. "The lightning ripped the back deck apart and tore the siding off the house." The damage totaled about \$20,000. Not long after the repairs were completed, Pat Garthwait called the homeowners' association to say she was installing lightning rods: "To hell with it, we're putting them up," she told them.

I tell myself that lightning doesn't strike twice. But I've been hit in Illinois and in Maine, and now I spend summers on an island. The squalls are beautiful when they blow in off the Atlantic, waves tossing and dark clouds flickering. But I wonder about that stovepipe that leads directly from my roof into my wood stove. I don't think it's grounded.

Protection for a modern house: air terminals

David Vann of Boca Raton, Florida, has done some 1,000 air terminal installations since 1989 and hasn't lost a house yet. Underwriters Laboratories' standards require the installation of an air terminal on each ridge or protrusion longer than two feet, and every 20 feet along the ridgeline of the roof. A chimney less than four feet square takes one terminal. Each terminal, made of $\frac{3}{8}$ -inch solid copper, must project 10 inches above the surface. On an existing roof, Vann attaches the air terminals by screwing them into a base, then attaching the base to the roof tile or shingles with stainless steel screws. He drills the tile and inserts plastic anchors with No. 8 ($\frac{7}{8}$ -inch) stainless steel screws, being careful not to break the seal of the roof and create leaks. If penetrating the plywood base is unavoidable, he covers each screw head with a clear silicon sealer. On a new roof, he does the work from the inside.

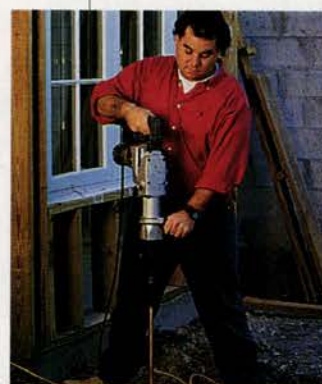
The air terminals are connected with 30-strand, 17-gauge braided copper cable. Sections are linked by butting the ends or by overlapping and crimping with copper or bronze clamps. Joins must survive a 200-pound pull test. Vann plans the network of connecting cables so that each air terminal has two possible pathways to the ground. Ground rods are installed around the perimeter of the house, about 80 to 100 feet apart. He places the ground cables perpendicular to other wiring or metal pipes so that the flash will not leap to other paths. He installs 10-foot ground rods (copper clad, $\frac{5}{8}$ -inch in diameter) sunk to a depth of 11 feet, so that their tops are a foot below ground. All will then be commonly grounded by clamping them to the ground rod at the electric meter or to a nearby water pipe. He does the same with television and telephone cables.



Installer David Vann clamps an air terminal to a length of copper cable.



In the rafters, he identifies the spot where he will put the terminal through the roof.



Ron Miller drives a 10-foot ground rod at least 2 feet from an exterior wall, above, and then attaches the cable to the rod, below.





Rethinking the lawn

Smart homeowners are turning over sod to plant natural gardens that don't need pesticides, fertilizer or much water

BY SARA STEIN PHOTOGRAPHS BY PATRICIA McDONOUGH

The yard I had been directed to wasn't hard to find: It was the only one in this Phoenix subdivision that wasn't flat and green. I spotted it from far up the street, the gravelly soil gently contoured, clumped with dry grasses among mats of bright desert flowers and crowned with mesquite and palo verde trees. As I pulled up, a hummingbird scolded me from his perch on the wires overhead. Small yellow butterflies called sulphurs were nectaring at desert marigolds. The morning air, heating rapidly, lifted from the purple-flowered Texas ranger its startling scent: grape soda.

The other yards were grass, ornamented with roses, clipped myrtle or oleander hedges. There were no hummers or butterflies—no motion at all except the sparkle of an occasional sprinkler. Most of the lawns were watered in a way I'd never seen: shaped into a shallow

Native plants are both adapted to their environment and players in it.

LEFT: An *Agave bovicornuta* opens its pores to take in carbon dioxide at night, when water in its leaves is less likely to evaporate. By contrast, plants that "breathe" during the day need 10 times more water for photosynthesis.

RIGHT: The stately saguaro cactus has night-blooming flowers fertilized by bats. Juicy red fruit ripens in time to nourish white-wing doves as they nest.





Before garden designer Carrie Nimmer transformed this Phoenix yard, the landscaping was typical of the neighborhood: a broad expanse of Bermuda grass, adorned only with an Italian cypress tree by the mailbox and a clump of bougainvillea by the front door.



Soon after it was redone, the yard looked sparse, but elements were in place for a lush landscape more suited to the desert. A flagstone path coursed past grasses, succulents and a mesquite tree, and an irrigation system lay hidden under the pebble mulch.



One year after planting, Regal Mist grass (*Muhlenbergia capillaris*) put on a fall show of smoky maroon. Across the path bloomed licorice marigold, whose leaves can be used in tea, and orange jubilee, a trumpet flower that attracts hummingbirds.

basin and flooded by a gusher. The system is common in Phoenix. Fifty percent of the water used by households here is squandered on landscape. Yet the only oasis in this green-carpeted subdivision was the one dry yard.

That a grassy yard is lifeless compared with a gritty one may surprise those who lavish attention—and water—on lawns. But Phoenix is desert, and landscape designer Carrie Nimmer simply followed nature. From an animal's point of view, home is where the habitat is—where its food plants grow or its prey abounds, where it can find shelter and raise its young.

I asked Nimmer what maintenance chores were required in the yard. "Weeding," she said, pointing ruefully to a tuft of grass that had crept in from the neighbor's lawn.

In recent years, a move toward natural gardens has been gaining ground across the country. Homeowners are planting prairies along Wisconsin streets, native wildflowers in New England woods, coastal scrub in California yards and, in Arizona, desert landscapes. They are restoring natural vegetation not only because they like watching butterflies but also because a landscape that supports wildlife rarely requires pesticides, fertilizers or water.

Phoenix lies in the northeast corner of the Sonoran desert, where annual precipitation averages 7.5 inches, about equally distributed between winter rain and summer thunderstorms.

Summer temperatures often climb past 110 degrees. Desert vegetation is adapted to this harsh climate. Some plants have leaves that are heat-reflecting gray or are waxy, thick and leathery. Other plants have no leaves, including the cacti, whose green and water-hoarding stems make food by photosynthesis. Many dryland flowers are annuals. They spend the greater part of their lives as seeds, lying in the desert grit, awaiting the wash of rain that signals them to sprout, bloom and harden new seed against the inevitable return of drought. To botanists, plants that have evolved such strategies against desiccation are known as xerophytes—"dry plants." Most of the lawn grasses and ornamental plants cultivated in North American gardens are mesophytes, whose moisture requirements far outstrip the amount of water that deserts can provide.

By definition, deserts have less than 10 inches of rain a year. But there are other xeric environments as well. Summer drought



Xeriscaper Carrie Nimmer takes pride in "gardening outside the American horticultural norm."

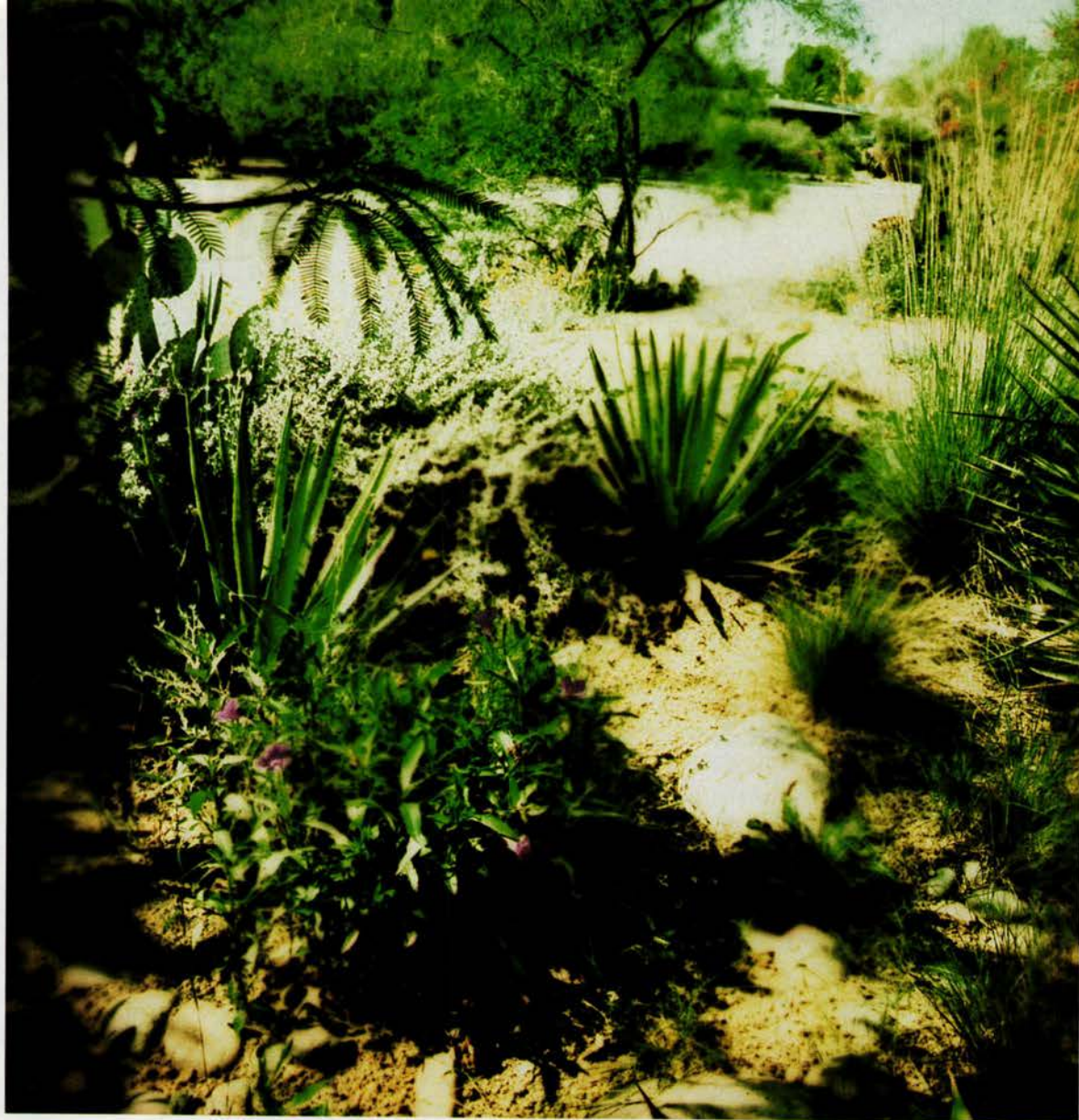
dries up Western yards, wind sucks moisture from Nebraska lawns, and water runs right through the sandy gardens of the Atlantic shore. Like desert vegetation, the natural communities of plants that occur in these environments require little water. And a yard planted with such unthirsty species has come to be called a Xeriscape.

Xeriscaping is a water-conserving design strategy devised by the Denver Water Conservation Department during a 1970s drought. In Xeriscape gardens, the land is contoured to direct and contain rainfall, and gravel or another mulch is used to cut down on evaporation. Plants are chosen for their ability to withstand drought.

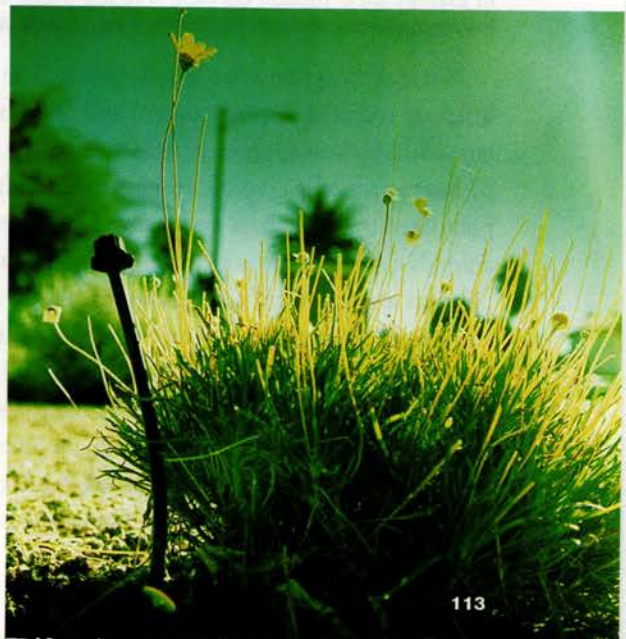
Many Arizona Xeriscapes, including Nimmer's, get a boost from buried drip irrigation lines. Without supplemental water in unusually dry years, Nimmer says, even well-adapted Sonoran perennials may die and desert annuals may fail to germinate. Drip irrigation also allows gardeners to cultivate a wider range of plants and promotes faster growth. An ironwood that in the wild may remain shrub size for many years will, if watered weekly during the spring and summer drought, soon become a tree. At the 15-acre Arizona-Sonora Desert Museum outside Tucson, a hummingbird garden is planted with nectar species that wouldn't survive without a little irrigation.

Nimmer's creation includes a flow of smooth river cobbles to simulate a wash. Though contrived to please the eye, the dry stream also conserves water: Stones that are fist-size or broader cut down on surface evaporation. Nimmer uses large rocks, too, to create microhabitats. Perennials installed at their east-facing bases receive good morning light but are protected from brutal heat later in the day.

Margaret Livingston, who lives in the more forgiving climate of Tucson, has a garden graded in subtle humps and hollows. The high spots bloom with annuals after winter and summer rains but then become as dramatically bare as rock outcrops. In the moister hollows, perennial species shade the ground, cooling the soil and conserving water. Rainspouts pour runoff from the roof into a declivity around the house, where vegetation is thickest. Much of the garden is sheltered by sparse-leaved desert trees whose filigree shade is welcome to the plants. Instead of the masonry walls that enclose most house lots in the area, Livingston has installed a fence of loosely wired ocotillo stems. Cooling breezes blow through. And many of the stems root and grow. In spring, they bloom with scarlet flowers beloved of migrating hummingbirds.



Xeriscape gardeners have many tricks for scrimping on water. ABOVE: Margaret Livingston planted perennials in hollow spots where rainwater collects. **BELOW:** Nimmer installed a drip irrigation system with individual emitters. An Angelita daisy gets water only when it needs a drink.





In Livingston's Tucson garden, a fence made of spiny ocotillo stems blossoms in the spring with bright orange flowers that draw hummingbirds, orioles, butterflies and bees. A small pool to the left of the agave also helps attract wildlife to the garden.

Natural ecosystems are self-sufficient. The nutrients in plant litter are recycled through animal and microbial digestive systems. Soil is turned, aerated, made porous and water-absorbing by burrowers of every size, from ants to gophers. Flowers are pollinated by birds, bats and insects; their seeds are dispersed by animals as well. Pests are controlled by predators and by the physical and chemical defenses of the plants. Everything is synchronized: the opening of flowers to the awakening of their pollinators, the ripening of fruit to the travels of their dispersers, the hatching of insects to the appetite of their predators. None of these environmental services depends on human labor or purchased materials. The system runs itself and costs nothing.

By contrast, the typical home landscape is not only costly

and labor-intensive, it consumes precious resources—sphagnum bogs for peat, pine woods for mulch, fossil fuel for fertilizer and ancient water pumped from bedrock reservoirs. The price can only climb as resources shrink. Ecology-minded gardens make economic sense.

Yet even authentic yards can't support the full panoply of life if they're cut off from the larger ecosystem. Not only habitat destruction but also habitat fragmentation concerns ecologists, who contend that we have to reconnect our suburbs to wild lands through natural corridors as we now connect our workplaces to our residences through highways.

A highway is a huge project, but a corridor is many small ones, involving individuals practicing conservation in the only

way that is both thrifty and sensible for the environment in the long run: by converting their own yards to natural habitat. No construction is necessary, just the replanting of one lot and then others until our little landscapes grow into a parkway to the wild.

In the Northeast, where I make my home, bringing land back to its natural vegetation takes time and patience. Woods and meadows develop in stages, each stage depending on the previous one to prepare the ground. At least there is some topsoil to begin with, even if it is the poor stuff that underlies a lawn.

In the desert, there is no topsoil. Lawns are fed on chemicals. I thought it would be much harder to reclaim those forsaken turf-grass lots. But Margaret Pope, docent at the desert museum, told me the full range of vegetation can be planted at once in local gardens, without any improvement to the soil, as though rolling out a desert carpet. Nimmer is devising plantings that are priced by the square foot, so homeowners of modest means can budget a portion of their yard each year.

I was thinking about Nimmer's scheme as I sat in Livingston's yard, looking out through her sprouting ocotillo fence. Sections of the fence were staggered: Quail, tortoises, toads and ground squirrels might freely wander yard to yard were other residents to provide habitat and access.

Across the street, one neighbor was doing exactly that. The lawn had been killed and the first few trees planted through the dead turf. I surveyed the scene in comfort from my roost on the doorstep. Looking through dappled shade and ocotillo leaves while ants at my feet carried on their endless and ecologically critical excavations, I watched the pale dragonflies and sunning lizards. A grasshopper climbed from the sidewalk to the fence.

People rarely sit in their bare green yards. Nor are children likely to find much adventure there. At most, such yards are attended by whoever mows the grass and clips the bushes, weeds, waters, fertilizes, rakes and mulches.

When we yearn for landscapes more soothing or exciting, we drive to nature centers, national parks and wildlife preserves. These trips are instructive: One learns what is missing from one's own neighborhood. Certainly I learned by touring the exhibits at the desert museum and walking the wilds at Saguaro National Monument that the desert is not, as I once had supposed, deserted, but is abundant with life.

As I took off for home, I gazed out my airplane window at the sprawl fingering out from Tucson and through the Sonoran. I thought of all the people below confined within walls, or moving from home to car and back again, without the gift of grape scent on the morning air, without the buzz of bees, without so much as a scolding from a hummer overhead.

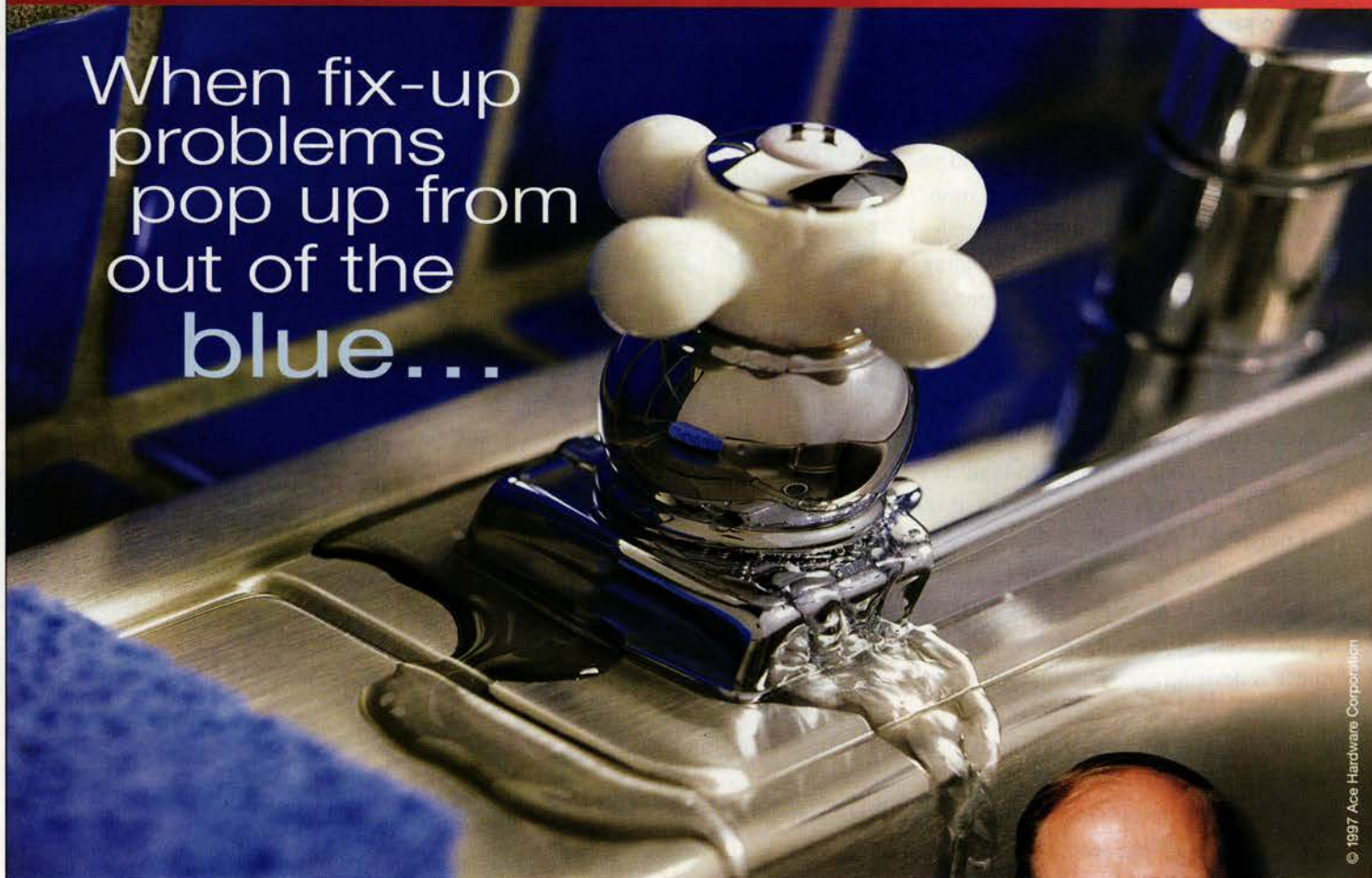


One reward of habitat restoration is seeing a spot come back to life. ABOVE: A jackrabbit bounds past agaves at the Desert Botanical Garden in Phoenix. BELOW: A desert spiny lizard stakes out a smooth resting spot with a quick getaway into the garden's nearby plantings.





When fix-up
problems
pop up from
out of the
blue...



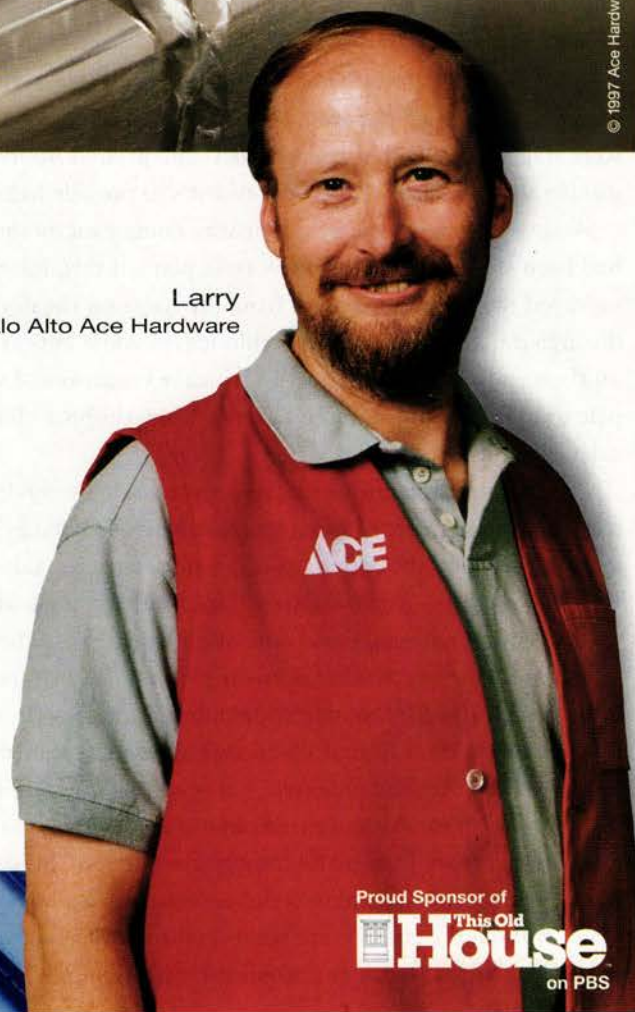
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I N T H E G A R D E N

The tastiest berries are
grown at home

Razzle-dazzle **Raspberries**

BY WILLIAM G. SCHELLER PHOTOGRAPHS BY KELLER & KELLER

MOST OF US ENCOUNTER raspberries two ways: in little super-market boxes, long on price and short on flavor, or as serendipitous treats sparkling red among the greenery at the edge of a country meadow, worth a wade into the thicket if only for a handful. Real raspberry abundance seems a grail too good to wish for—but it's possible to harvest pie- and jam-worthy amounts by cultivating them in a home garden.

Ideally, raspberries should be planted as early in spring as possible, but it's not too late to start now. Most mail-order suppliers ship through May, and local nurseries usually have potted plants even after bare-root season ends. Raspberries grow all over the United States, right into Zone 3 with its minus-30-degree winter lows, although their cousins the blackberries stand up better to

the heat and humidity of Deep South summers.

Like other members of the bramble genus *Rubus*, raspberries produce biennial canes from perennial rootstocks. The basic divisions are along color lines as well as between varieties that bear in summer only and those that produce a main crop in fall and a smaller one in summer. (These are called fall-bearers or ever-bearers.) Reds and yellows come in both summer- and fall-bearing varieties, while blacks and purples bear only in summer. Heritage is a popular double-crop red

variety that does well in many areas.

Even if wild raspberries are the inspiration for starting a berry patch, they are full of cane diseases that can be the kiss of death for cultivated varieties planted nearby. The only protection is to keep plants 600 feet from wild stands and to buy plants that are certified virus-free. "The worst thing you can do is to get cuttings from a neighbor," says *This Old House* executive producer Russ Morash, who's grown raspberries for more than a quarter century.

Berries should be planted in soil that's relatively free of weeds, such as an established bed in a vegetable garden. To convert part of a field or lawn, you may need to begin preparing the soil a year in advance. "You want to get rid of all the grass, especially quack and witchgrass," Russ says. Raspberries thrive in deep, sandy loam rich in compost, with a pH around 6.5.



A bramble that can't ramble

Raspberries aren't as thorny or aggressive as blackberries, but it's still a good idea to keep them corralled. A simple trellis does the trick. This one has posts that are angled out, so canes with berries stay in easy reach on the outside while next season's shoots grow unfettered up through the center.

1. Russ started by attaching two 30-inch crosspieces to each post with

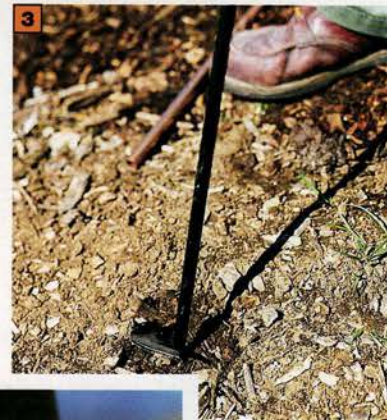
two carriage bolts and nuts, placing one arm near the top and the other about 2 feet down. In each arm, he drilled two holes for the trellis wires, placing them near the ends on the top piece and about 3 inches farther in on the bottom piece. The rust-proof wire is steel clad in aluminum.

2. He set the posts 2½ feet deep, trimming as needed so the bottom arm was 2 feet off the ground. He angled the posts out so they wouldn't pull loose, then filled in soil around the bases, tamping as he went.

3. About 18 inches behind each post, Russ screwed a soil anchor into the ground, then wired it to an eye bolt just below the top crosspiece on the post.

4. Stringing the wire was the last step. First Russ pulled the trellis wires through a fitting that grabs the wire as it passes through and keeps it from sliding back out. Then he tightened the guy wires.

5. When the canes grow, Russ will tie the tips to the wire, then look forward to the harvest.



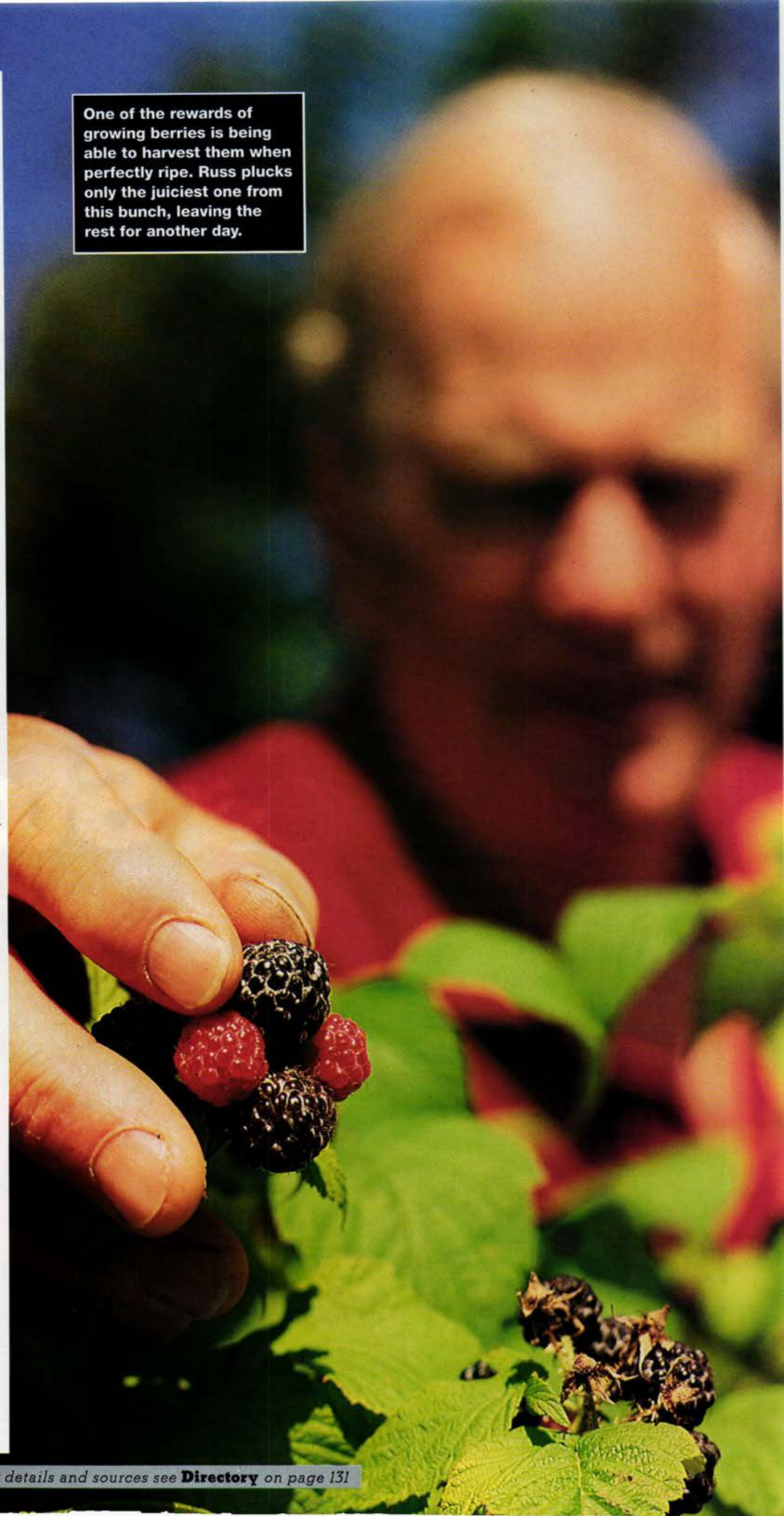
They like water—at least an inch per week during the growing season—but they can't swim. Roots extend only about 18 inches down and are thus prone to rot when drainage is poor. Plants protected by natural or artificial windbreaks can yield twice as much fruit as canes exposed to cold, dry winds.

Set plants out at two-foot intervals in rows at least six feet apart. The rows should run north to south, not east to west, so that plenty of sunlight can reach all the plants. Spread on a thick layer of mulch—eight inches of sawdust isn't too much. "New plants will grow twice as much in their first year with mulch as without," says Norma Norris, a Vermont grower who has been in the business for almost a decade.


Raspberries should be pruned when the summer harvest is over. The canes that bore fruit should be cut off near the ground, at an angle. These canes are woody, with light green or greenish-yellow foliage. Fresh, succulent canes that will bear the next crop should be selectively pruned so that no more than eight producing canes remain per foot of row. Fall-bearing varieties need pruning after the autumn harvest as well, but not to the ground. The key to getting a secondary summer crop is to prune only the spent top portions in the fall so that the lower portions can flower and bear fruit the next year.

Yields of purple and black raspberries can also be increased through strategic pruning. During June, trim off the top three or four inches of canes set to produce next year. "By removing the shoot tips, you enable the small buds in the leaf axils to throw off shoots," says Gail Nonnecke, a horticulture professor at Iowa State University. "This multiplies the surface area for fruit bearing."

The reward for all this diligence, of course, is the sweet fresh raspberry, plucked from the cane when it's almost ready to yield to its own weight. The perfect stage, Russ says, is "the point at which the fruit easily rolls off the stem between your thumb and forefinger with gentle pressure." Place the berries in flat trays as you pick, no more than three or four deep. And make sure the trays are big enough. A handful of berries rarely makes it back to the house.



One of the rewards of growing berries is being able to harvest them when perfectly ripe. Russ plucks only the juiciest one from this bunch, leaving the rest for another day.

A person wearing a tan short-sleeved shirt and light-colored shorts is pushing a red reel mower across a green lawn. The person's hands are on the black handlebars, and the mower is cutting the grass. The background is a soft-focus landscape with trees and a clear sky.

In 1830, inventor Edwin Budding said of the push-reel mower, "Country gentlemen may find in using my machine themselves an amusing, useful and healthy exercise."

The Reel Story

Today's models aren't what you cursed as a kid

BY THOMAS BAKER PHOTOGRAPHS BY KELLER & KELLER

WHAT A DIFFERENCE a week makes. One Saturday last summer, I spent 20 minutes trying to kick 40 pounds of mulish lawn mower into self-sustaining activity. When the thing finally started, my reward was a nerve-jangling hour enveloped in a cocoon of oily vapors and deafening engine noise.

The next week, I got behind a mower that consumed neither gas nor electricity, started instantly and was so quiet I could eavesdrop on the neighbors' squabble. Instead of choking on exhaust, I breathed the perfume of fresh-mown grass.

The wonderful implement was, of course, a push-reel mower, invented by English engineer Edwin Budding in 1830 as a mechanized alternative to sheep and scythes. After 167 years, the spinning reel with fixed cutter bar is still the ne plus ultra of grass clippers. Unlike rotary power mowers, which flay off grass tips, leaving ragged wounds that turn gray, reel mowers snip grass as neatly as scissors cut hair. "Grass seems to grow denser and fluffier when cut with a reel," says George Toma, a former head groundskeeper for the Kansas City Royals who fondly remembers cutting baseball infields with push mowers.

When power mowers conquered suburbia in the 1950s, reels took a downward spiral. But Budding's invention is bouncing back: Teri McClain of the American Lawn Mower Co., oldest of the manufacturers, says sales are up 135 percent since the 1985 low, to about 250,000 a year. That's a fraction of the 5 million power mowers made last year, but it should be more. These are true green machines: free of pollution, rich in exercise potential.

Many of those who grew up pushing reels through grass never saw this activity as exercise. It was pure drudgery. But modern reels are at least a third lighter than the old cast-iron, wood-handled behemoths, and some models have slippery nylon gearing instead of rust-prone metal. The four I tested last summer were as easy to use as a rotary gasoline mower—easier, considering they don't have starter cords. They're great for small lawns, anything under a quarter of an acre.

Reel mowers can be either self-sharpening (their blades touch the cutter bar) or silent (blades clear the bar within three-thousandths of an inch). The mowers I tested on my fescue

included two self-sharpeners and two silent-reels—all the available options once I ruled out low-end models, kids' mowers, four-blade "trimmers" and seven-blade mowers designed for coarser Bermuda and zoysia. My favorite was the silent reel made by Agri-Fab and marketed under several labels. It costs as much as a good gas mower, but it's solidly built and performs like a fine hand tool. And the detailed

instruction manual gave me the confidence to adjust the reel myself for a perfect cut, using a sheet of paper as a feeler gauge.

The reel mower's chief drawback is poor performance in tall grass. At the height of the growing season, you're either out there every eight days or you're borrowing a gas mower. And although three inches is the recommended cutting height for many lawns, most reels go no higher than 2¼ inches. Reels also leave longer clippings than rotary mowers, but I left the snippets where they fell. After a few days, they disappeared.

Maintenance is required but minimal: a quick brushing to clear clippings, a spray of oil to stop blade rust and a sharpening every three years or so. Despite their name, self-sharpeners require lapping of the blades and cutter bar, a task that's easy with a kit sold separately. Silent reels need professional attention, which runs about \$20 per sharpening.

"There ought to be a tax rebate to encourage people to buy reels," says Bill Brown, a member of Citizens against Lawn Mower Madness, a group in Takoma Park, Maryland, that sought a town-wide ban on gas mowers. For me, the heady aroma, pleasant workout and fine cut are reward enough.



Our favorite: a 40-pound, 6-blade silent-reel with a silky spin.

Dirty engines

Gasoline mowers, which cut most of the lawns in this country, produce 2 to 5 percent of our air pollution—astounding when you consider how little they're used. Their inefficient, cheap engines can emit as many hydrocarbons in one hour as a new car does in 344 miles. National emission standards for new models, which took effect last year, will stiffen in 1999, but even the cleanest gas mowers will still be very dirty. What's the alternative? Some suggest electric mowers. But they are either tied to extension cords or depend on battery power, which poses a disposal problem.



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Here's a patio hose that isn't a drag to use. Invented to help RV owners connect to water taps, the Rebounder is lightweight and kink-proof. But best of all, it recoils on its own. Comes in white (for recreational vehicles) and green (for gardens).

First things first

Gardeners everywhere are itchy now to get plants into the ground. But great growers take the time first to improve their soil. "Nothing is more important," says Russ Morash, *This Old House's* gardening expert. He takes the easy route, scattering seeds of winter rye each fall so his garden beds have a lush growth for him to turn over in springtime. The leaves decompose, releasing nutrients and improving the tilth. Gardeners who don't plan ahead can get similar benefits by lugging in well-rotted manure, leaf mold or compost now. But there's a penance for this late action: It's more work.



A crystal palace reopens



As a former builder of viaducts and airport runways, Charles Frattini was unfazed by the prospect of rebuilding one of the country's largest greenhouses, at the New York Botanical Garden. But that was before he realized the challenges of blasting off lead paint, replacing decayed wood with aluminum and installing 17,334 new panes of glass—with \$350,000 worth of rare trees growing in the middle of it all. "Usually, when a tree is in my way, I cut it down," Frattini says. Here, even mention of a "silly tree" brought rebuke. So Frattini coddled towering palms in air-conditioned tents. And he cleaned up his language. Now, when he gives tours of the one-acre greenhouse, he talks of the "one fatality"—a *Ficus benjamina*—during the four-year reconstruction. The conservatory reopens May 3.

nature's lessons

Inspired by our story about creating a water-thrifty oasis? Here are some places to learn more:

May 1–June 7: Peak Spring Bloom, Garden in the Woods of the New England Wild Flower Society, Framingham, Mass.; 508-877-6574

May 3: Gardens in Transition Tour, Rancho Santa Ana Botanic Garden, Claremont, Calif.; 909-625-8767

May 3–4: Habitat Helpers Weekend, Tennessee Valley Authority's Land Between the Lakes, Golden Pond, Ky.; 800-525-7077

July 24–26: Landscaping with Native Plants, Division of Continuing Education and Summer School, Western Carolina University, Cullowhee, N.C.; 704-227-7397



idea book

Lavishly illustrated, this Nature Company guide is rich with details about how to attract wildlife with specific plants.

garden invite

Beginning April 27, visitors can peek into the stellar private gardens of 250 homeowners in 17 states through the "Open Days Directory" of the Garden Conservancy, a nonprofit landscape-preservation group. Sara Stein, author of "Rethinking the Lawn" (page 110), shows off her wildland restoration on Sunday, September 7.



• indicates *This Old House* Classics, vintage episodes rebroadcast on commercial stations

ALABAMA

Birmingham
WBIQ-TV
Thu. 8 pm, Sat. 8 pm
• WNAL-TV*

Demopolis
WIIQ-TV
Thu. 8 pm, Sat. 8 pm

Dozier
WDIQ-TV
Thu. 8 pm, Sat. 8 pm

Florence
WHQ-TV
Thu. 8 pm, Sat. 8 pm

Huntsville
WHIQ-TV
Thu. 8 pm, Sat. 8 pm

Louisville
WGIQ-TV
Thu. 8 pm, Sat. 8 pm

Mobile
WEIQ-TV
Thu. 8 pm, Sat. 8 pm

Montgomery
WAIQ-TV
Thu. 8 pm, Sat. 8 pm

Mount Cheaha
WCIQ-TV
Thu. 8 pm, Sat. 8 pm

ALASKA

Anchorage
KAKM-TV
Mon. 6 pm, Sat. 9:30 am
• KIMO-TV
Sat. 5:30 pm

Bethel
KYUK-TV
Fri. 8 pm, Sat. 8 am

Fairbanks
KUAC-TV
Fri. 8 pm, Sat. 8 am
• KATN-TV
Sun. 5 pm

Juneau
KTOO-TV
Fri. 8 pm, Sat. 8 am
• KJUD-TV*

ARIZONA

Phoenix
KAET-TV
Thu. 1 pm and 7:30 pm
Sat. noon and 5 pm
• KPHO-TV
Sat. 10 am

Tucson
KUAS-TV
Sat. 11 am and 6:30 pm
KUAT-TV
Sat. 11 am and 6:30 pm
• KTTU-TV
Sat. 9 am

ARKANSAS

Arkadelphia
KETG-TV
Sat. noon, Sun. 5:30 pm

Fayetteville
KAFT-TV
Sat. noon, Sun. 5:30 pm

Jonesboro
KTEJ-TV
Sat. noon, Sun. 5:30 pm

Little Rock
KETS-TV
Sat. noon, Sun. 5:30 pm

Mountain View
KEMV-TV
Sat. noon, Sun. 5:30 pm

CALIFORNIA

Chico
• KRCR-TV
Sun. 5 pm

Eureka
KEET-TV
Wed. 7:30 pm
Sat. 10:30 am
• KAEF-TV
Sun. 5 pm

Fresno
KVPT-TV
Sat. 9 am, Sun. 7 pm
• KJEO-TV*

Huntington Beach
KOCE-TV
Sat. 4:30 pm

Los Angeles
KCET-TV
Sat. 5:30 pm
• KABC-TV
Sun. 6:30 am

Monterey
• KCCN-TV
Sun. 10:30 am

Redding
KIXE-TV
Sat. 10:30 am

Rohnert Park
KRCB-TV
Wed. noon, Sun. 7:30 pm

Sacramento
KVIE-TV
Thu. 8 pm, Sat. 8:30 am
• KPWB-TV
Sun. 6 am

San Bernardino
KVCR-TV
Thu. 8 pm

San Diego
KPBS-TV
Sat. 11 am
• KGTV-TV
Sat. noon

San Francisco
KQED-TV
Sat. 5 pm
• KPIX-TV
Sun. 10 am

San Jose
KTEH-TV
Wed. 9 pm, Sat. 3 pm
Sun. 5:30 pm

San Mateo
KCSM-TV
Wed. 6:30 pm, Sun. 10 am

Santa Barbara
• KSBY-TV
Sun. 3 pm

COLORADO

Boulder
KBDI-TV
Wed. 3:30 am and 5:30 pm, Sat. 5:30 pm
Sun. 4 pm

Colorado Springs
• KRDO-TV
Sun. 11:30 am

Denver
KRMA-TV
Sat. 2 pm, Sun. 5:30 pm
• KCNC-TV
Sun. 1 am

Grand Junction
• KJCT-TV
Sun. 11:30 am

Pueblo
KTSC-TV
Thu. 8:30 pm, Sat. 2:30 pm

CONNECTICUT

Fairfield
WEDW-TV
Tue. noon, Thu. 11 pm
Sat. 8 pm, Sun. 10:30 am

Hartford
WEDH-TV
Tue. noon, Thu. 11 pm
Sat. 8 pm, Sun. 10:30 am
• WFSB-TV
Sun. 12:30 pm

New Haven
WEDY-TV
Tue. noon, Thu. 11 pm
Sat. 8 pm, Sun. 10:30 am

Norwich
WEDN-TV
Tue. noon, Thu. 11 pm
Sat. 8 pm, Sun. 10:30 am

DISTRICT OF COLUMBIA

WETA-TV
Sat. 9 am
• WUSA-TV
Sat. 6 am

FLORIDA

Bonita Springs
WGUU-TV
Sat. 1:30 pm, Sun. 5 pm

Daytona Beach
WCEU-TV
Tue. 8 pm, Sat. 6 pm

Fort Myers
• WTVK-TV
Sat. 11:30 am

Gainesville
WUFT-TV
Sat. 1:30 pm

Jacksonville
WJCT-TV
Sat. noon and 5:30 pm
• WTLV-TV
Sat. 7:30 am

Miami
WLRN-TV
Sun. 10 am
WPBT-TV
Sat. 3 pm
• WPLG-TV
Sun. 8 am

Orlando
WMFE-TV
Sat. 9 am and 1:30 pm
Sun. 9 am, Thu. 8 pm
• WFTV-TV
Sat. 5 am

Pensacola
WSRE-TV
Sat. 12:30 pm and 6:30 pm

Sarasota
• WWSB-TV
Sun. 11:30 am

Tallahassee
WFSU-TV
Sat. 1:30 pm and 6:30 pm

Tampa
WEDU-TV
Sat. 11:30 am
WUSF-TV
Wed. 9 pm
Sat. 5:30 pm
• WFTS-TV
Sun. 11:30 am

West Palm Beach
• WPEC-TV
Sun. 11 am

GEORGIA

Albany
• WGVP-TV
Sat. 5:30 am

Atlanta
WGTV-TV
Sat. 5:30 pm, Sun. 8 pm
WPBA-TV
Mon. 8 pm, Wed. 2 pm
Sat. 6 pm
• WXIA-TV
Sun. 6:30 am

Chatsworth
WCLP-TV
Sat. 5:30 pm, Sun. 8 pm

Cochran
WDGO-TV
Sat. 5:30 pm, Sun. 8 pm

Columbus
WJSP-TV
Sat. 5:30 pm, Sun. 8 pm

Dawson
WACS-TV
Sat. 5:30 pm, Sun. 8 pm

Macon
• WMAZ-TV
Sat. 11 am

Pelham
WABW-TV
Sat. 5:30 pm, Sun. 8 pm

Savannah
WVAN-TV
Sat. 5:30 pm, Sun. 8 pm
• WTOG-TV
Sun. 5 pm

Waycross
WXGA-TV
Sat. 5:30 pm, Sun. 8 pm

Wrens
WSES-TV
Sat. 5:30 pm, Sun. 8 pm

HAWAII

Honolulu
KHET-TV
Thu. 7:30 pm
• KHNL-TV
Sat. 4:30 pm

Wailuku
KMEB-TV
Thu. 7:30 pm

IDAHO

Boise
KAID-TV
Sun. 4:30 pm
• KIVI-TV
Sun. 10:30 am

Coeur d'Alene
KCDT-TV
Sun. 3:30 pm

Moscow
KUID-TV
Sun. 3:30 pm

Pocatello
KISU-TV
Sun. 4:30 pm

Twin Falls
KIPT-TV
Sun. 4:30 pm

ILLINOIS

Carbondale
WSIU-TV
Fri. 12:30 pm
Sat. 12:30 pm

Champaign
• WICS-TV
Sat. 7:30 am

Charleston
WEIU-TV
Sat. 9:30 pm

Chicago
WTTW-TV
Tue. 7:30 pm, Sat. 5 pm
• WBBM-TV*

Jacksonville
WSEC-TV
Thu. 10 pm, Sun. 1:30 pm

Macomb
WMEC-TV
Thu. 10 pm, Sun. 1:30 pm

Moline
WQPT-TV
Tue. 7 pm, Sat. 5:30 pm

Olney
WUSI-TV
Fri. 12:30 pm
Sat. 12:30 pm

Peoria
WTVP-TV
Thu. 10 pm, Sat. 12:30 pm

Quincy
WQEC-TV
Thu. 10 pm, Sun. 1:30 pm

Rockford
• WTVO-TV
Sat. 6 pm

Springfield
• WICS-TV
Sat. 7:30 am

Urbana
WILL-TV
Thu. 7:30 pm
Sun. 3:30 pm

INDIANA

Bloomington
WTIU-TV
Mon. 5 pm, Thu. 11 pm
Sat. 1:30 pm

Evansville
WNIN-TV
Sat. 12:30 pm and 6 pm
Sun. 4:30 pm
• WTVW-TV
Sun. 9:30 am

Fort Wayne
WFVA-TV
Sat. 10 am

Indianapolis
WFYI-TV
Sat. 10 am, Sun. 7 pm
• WNDY-TV
Sat. 11:30 am

Merrillville
WYIN-TV
Thu. 8:30 am
Sun. 3:30 pm

Muncie
WIPB-TV
Sun. 4:30 pm

South Bend
WNIT-TV
Wed. 7:30 pm, Sat. 2 pm
• WHME-TV
Sat. 1:30 pm

Vincennes
WVUT-TV
Wed. 12:30 pm

IOWA

Cedar Rapids
• KWWL-TV*

Council Bluffs
KBIN-TV
Fri. 6:30 pm, Sat. 1:30 pm

Des Moines
KDIN-TV
Fri. 6:30 pm, Sat. 1:30 pm

Fort Dodge
KTIN-TV
Fri. 6:30 pm, Sat. 1:30 pm

Iowa City
KIIN-TV
Fri. 6:30 pm, Sat. 1:30 pm

Mason City
KYIN-TV
Fri. 6:30 pm, Sat. 1:30 pm

Ottumwa
• KYOU-TV
Sat. 2:30 pm

Red Oak
KHIN-TV
Fri. 6:30 pm, Sat. 1:30 pm

Sioux City
KSIN-TV
Fri. 6:30 pm, Sat. 1:30 pm

Waterloo
KRIN-TV
Fri. 6:30 pm, Sat. 1:30 pm

KANSAS

Bunker Hill
KODD-TV
Thu. 7 pm, Sat. 12:30 pm

Lakin
KSWK-TV
Thu. 7 pm, Sat. 12:30 pm

Topeka
KTWU-TV
Sat. 9:30 am

Wichita
KPTS-TV
Sat. 11:30 am, Sun. 11 am
• KSNW-TV
Sun. 6:30 am

KENTUCKY

Ashland
WKAS-TV
Mon. 6:30 pm, Sun. 5 pm

Bowling Green
WKGB-TV
Mon. 5:30 pm, Sun. 4 pm
WKYU-TV
Tue. 1 pm and 6:30 pm
• WBKO-TV
Sun. 6:30 am

Covington
WCVN-TV
Mon. 6:30 pm, Sun. 5 pm

Elizabethtown
WKZT-TV
Mon. 6:30 pm, Sun. 5 pm

Hazard
WKHA-TV
Mon. 6:30 pm, Sun. 5 pm

Lexington
WKLE-TV
Mon. 6:30 pm, Sun. 5 pm
• WTVQ-TV
Thu. noon

Louisville
WKMJ-TV
Mon. 6:30 pm, Sun. 5 pm
WKPC-TV
Sat. 1:30 pm, Sun. 3 pm
• WHAS-TV
Sat. 6:30 am

Madisonville
WKMA-TV
Mon. 5:30 pm, Sun. 4 pm

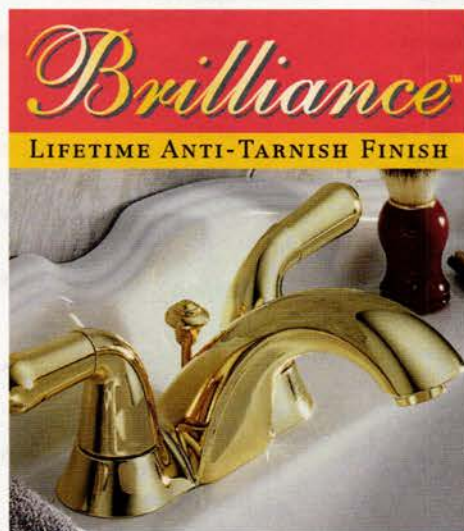
Morehead
WKMR-TV
Mon. 6:30 pm, Sun. 5 pm

Murray
WKMU-TV
Mon. 5:30 pm, Sun. 4 pm

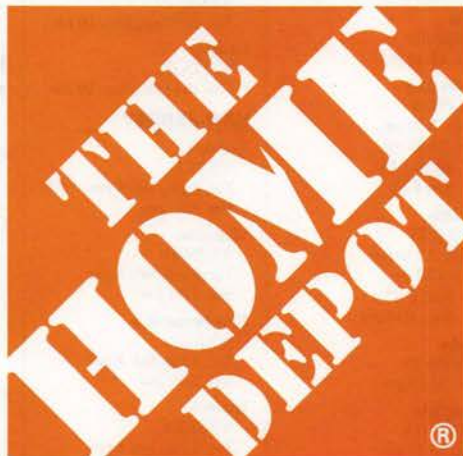
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WKOH-TV
Mon. 5:30 pm, Sun. 4 pm

Owenton
WKON-TV
Mon. 6:30 pm, Sun. 5 pm

Paducah
WKPD-TV
Mon. 5:30 pm, Sun. 4 pm
• KBSI-TV
Sat. noon

Pikeville
WKPI-TV
Mon. 6:30 pm, Sun. 5 pm

Somerset
WKSO-TV
Mon. 6:30 pm, Sun. 5 pm

LOUISIANA

Alexandria
KLPA-TV
Sat. 4 pm, Sun. 10 am

Baton Rouge
WLPB-TV
Sat. 4 pm, Sun. 10 am
• WAFB-TV
Sun. noon

Lafayette
KLPB-TV
Sat. 4 pm, Sun. 10 am

Lake Charles
KLTL-TV
Sat. 4 pm, Sun. 10 am

Monroe
KLTN-TV
Sat. 4 pm, Sun. 10 am

New Orleans
WYES-TV
Sat. 8:30 am
• WNOL-TV*

Shreveport
KLTS-TV
Sat. 4 pm, Sun. 10 am
• KTVS-TV
Sun. 6 am

MAINE

Bangor
WMEB-TV
Sat. 1:30 pm
• WVII-TV
Sun. noon

Calais
WMED-TV
Sat. 1:30 pm

Lewiston
WCBB-TV
Sat. 1:30 pm

Portland
WMEA-TV
Sat. 1:30 pm
• WPXT-TV
Sun. 10 am

Presque Isle
WMEM-TV
Sat. 1:30 pm

MARYLAND

Annapolis
WMPT-TV
Sat. 4:30 pm, Sun. 6:30 pm

Baltimore
WMPB-TV
Sat. 4:30 pm, Sun. 6:30 pm
• WMAR-TV
Sun. 7 am

Frederick
WFPT-TV
Sat. 4:30 pm, Sun. 6:30 pm

Hagerstown
WWPB-TV
Sat. 4:30 pm, Sun. 6:30 pm

Oakland
WGPT-TV
Sat. 4:30 pm, Sun. 6:30 pm

Salisbury
WCPB-TV
Sat. 4:30 pm, Sun. 6:30 pm

MASSACHUSETTS

Boston
WGBH-TV
Thu. 8 pm, Sat. 5:30 pm
WGBX-TV
Sun. 9 am
• WFXT-TV
Sun. 11 am

Springfield
WGBY-TV
Thu. 8 pm, Sat. 5:30 pm

MICHIGAN

Alpena
WCML-TV
Sat. 2:30 pm

Bad Axe
WUCV-TV
Tue. 12:30 pm, Sun. 5 pm

Cadillac
WWTV/WWUP
Sun. 10:30 am

Detroit
WTVS-TV
Thu. 8:30 pm, Sat. 10 am
• WDIV-TV
Sun. 7 am

East Lansing
WKAR-TV
Thu. 9 pm, Sat. 1:30 pm
Sun. 5 pm

Flint
WFUM-TV
Thu. 9 pm, Sat. 1:30 pm
• WNEM-TV
Sun. 5 am

Grand Rapids
WGVU-TV
Thu. 8:30 pm, Sat. 10 am
• WOOD/WOTV-TV*

Kalamazoo
WGVK-TV
Thu. 8:30 pm, Sat. 10 am

Manistee
WCMW-TV
Sat. 2:30 pm

Marquette
WNNM-TV
Sat. 1:30 pm

Mount Pleasant
WCMU-TV
Sat. 2:30 pm

University Center
WUCM-TV
Tue. 12:30 pm, Sun. 5 pm

MINNESOTA

Appleton
KWCM-TV
Sat. 12:30 pm

Austin
KSMQ-TV
Sat. 12:30 pm, Sun. 7 pm

Benidji
KAWE-TV
Thu. 7:30 pm
Sat. 12:30 pm

Brainerd
KAWB-TV
Thu. 7:30 pm
Sat. 12:30 pm

Duluth
WDSE-TV
Sat. 6:30 pm, Sun. 9:30 am

Rochester
• KAAL-TV
Sat. 6 pm

St. Paul/Minneapolis
KTCA-TV
Wed. 7:30 pm, Sat. 6:30 pm
KTCI-TV
Wed. 7:30 pm, Sat. 6:30 pm
• KSTP-TV
Sat. 9 am

MISSISSIPPI

Biloxi
WMAH-TV
Sat. 7 pm

Booneville
WMAE-TV
Sat. 7 pm

Bude
WMAU-TV
Sat. 7 pm

Columbus
• WCBT-TV
Sun. 5 pm

Greenwood
WMAO-TV
Sat. 7 pm

Jackson
WMPN-TV
Sat. 7 pm
• WLBT-TV
Sun. 6:30 am

Meridian
WMAW-TV
Sat. 7 pm

Mississippi State
WMAB-TV
Sat. 7 pm

Oxford
WMAV-TV
Sat. 7 pm

MISSOURI

Columbia
• KRCC-TV
Sun. 10 am

Joplin
KOZJ-TV
Sat. 12:30 pm

Kansas City
KCPT-TV
Thu. 7:30 pm
Sat. 12:30 pm

• KMBC-TV
Sat. 6 am

St. Louis
KETC-TV
Wed. 12:30 pm
Sat. 6:30 pm
• KNLC-TV
Sun. 3:30 pm

Sedalia
KMOS-TV
Sat. 12:30 pm

Springfield
KOZK-TV
Sat. 12:30 pm

MONTANA

Bozeman
KUSM-TV
Sat. 11:30 am

Missoula
KUFM-TV
Sat. 11:30 am

NEBRASKA

Alliance
KTNE-TV
Sat. 10 am and 5:30 pm

Bassett
KMNE-TV
Sat. 10 am and 5:30 pm

Hastings
KHNE-TV
Sat. 10 am and 5:30 pm

Lexington
KLNE-TV
Sat. 10 am and 5:30 pm

Lincoln
KUON-TV
Sat. 10 am and 5:30 pm
• KHAS-TV
Sat. 5 pm

Merriman
KRNE-TV
Sat. 10 am and 5:30 pm

Norfolk
KXNE-TV
Sat. 10 am and 5:30 pm

North Platte
KPNE-TV
Sat. 10 am and 5:30 pm

Omaha
KYNE-TV
Sat. 10 am and 5:30 pm
• KETV-TV
Sat. 6 pm

NEVADA

Las Vegas
KLVS-TV
Sat. 9 am and 12:30 pm
• KTNV-TV*

Reno
KNPB-TV
Sat. 10:30 am
• KREN-TV*

NEW HAMPSHIRE

Durham
WENH-TV
Thu. 8:30 pm, Sun. 10 am

Keene
WEKW-TV
Thu. 8:30 pm, Sun. 10 am

Littleton
WLED-TV
Thu. 8:30 pm, Sun. 10 am

NEW JERSEY

Camden
WNJS-TV
Tue. 8 pm, Sat. 8 pm
Sun. 5:30 pm

Montclair
WNJN-TV
Tue. 8 pm, Sat. 8 pm
Sun. 5:30 pm

New Brunswick
WNJB-TV
Tue. 8 pm, Sat. 8 pm
Sun. 5:30 pm

Trenton
WNJT-TV
Tue. 8 pm, Sat. 8 pm
Sun. 5:30 pm

NEW MEXICO

Albuquerque
KNME-TV
Thu. 7 pm, Sun. 10 am

• KOB-TV
Sat. 4 pm

Las Cruces
KRWG-TV
Sat. 11:30 am

Portales
KENW-TV
Sat. 3:30 pm
Wed. 10:30 pm

NEW YORK

Binghamton
WSKG-TV
Sat. 8 am, 1:30 pm and 6:30 pm

• WBNG-TV
Sat. 7:30 am

Buffalo
WNED-TV
Sat. 10:30 am

WNEQ-TV
Sun. 7 pm
• WIVB-TV*

Long Island
WLIW-TV
Thu. 8:30 pm
Sat. 10:30 am, Sun. 8 pm

New York City
WNET-TV
Sat. 6:30 pm

• WCBS-TV
Sun. 7:30 am

Norwood
WNPI-TV
Sat. 10:30 am

Plattsburgh
WCFE-TV
Sun. 11:30 am

Rochester
WXXI-TV
Sat. 10:30 am
Sun. 5:30 pm

Schenectady
WMHT-TV
Tue. 1:30 pm
Sat. 10:30 am

Syracuse
WCNY-TV
Sat. 10:30 am

• WTVH-TV
Sun. 11:30 am

Watertown
WNPE-TV
Sat. 10:30 am

• WWNY-TV
Sat. 7:30 am

NORTH CAROLINA

Asheville
WUNF-TV
Sat. 5:30 pm, Sun. 9 am

Chapel Hill
WUNC-TV
Sat. 5:30 pm, Sun. 9 am

Charlotte
WTVI-TV
Thu. 8 pm, Sat. 5 pm
Sun. 11 am

WUNG-TV
Sat. 5:30 pm, Sun. 9 am

• WBTV-TV
Sun. 1:30 pm

Columbia
WUND-TV
Sat. 5:30 pm, Sun. 9 am

Greensboro
• WGHP-TV
Sun. 8 am

Greenville
WUNK-TV
Sat. 5:30 pm, Sun. 9 am

• WLOS/WFBC-TV*

Jacksonville
WUNM-TV
Sat. 5:30 pm, Sun. 9 am

Linville
WUNE-TV
Sat. 5:30 pm, Sun. 9 am

Lumberton
WUNU-TV
Sat. 5:30 pm, Sun. 9 am

Raleigh
• WTVD-TV
Sun. 10 am

Roanoke Rapids
WUNP-TV
Sat. 5:30 pm, Sun. 9 am

Wilmington
WUNJ-TV
Sat. 5:30 pm, Sun. 9 am

Winston-Salem
WUNL-TV
Sat. 5:30 pm, Sun. 9 am

NORTH DAKOTA

Bismarck
KBME-TV
Thu. 7 pm

Dickinson
KDSE-TV
Thu. 7 pm

Ellendale
KJRE-TV
Thu. 7 pm

Fargo
KFME-TV
Thu. 7 pm

Grand Forks
KGFE-TV
Thu. 7 pm

Minot
KSRE-TV
Thu. 7 pm

Williston
KWSE-TV
Thu. 7 pm

OHIO

Akron
WEAO-TV
Sat. 10:30 am and 5 pm
Sun. 4 pm

Athens
WOUB-TV
Sat. 5 pm

Bowling Green
WBGU-TV
Sat. 1:30 pm

Cambridge
WOUC-TV
Sat. 5 pm

Cincinnati
WCET-TV
Thu. 8 pm
Sat. 9 am and 6 pm

• WCPO-TV
Sun. 6 am

Cleveland
WVIZ-TV
Sun. 12:30 pm
Tue. 7:30 pm, Sat. 1:30 pm

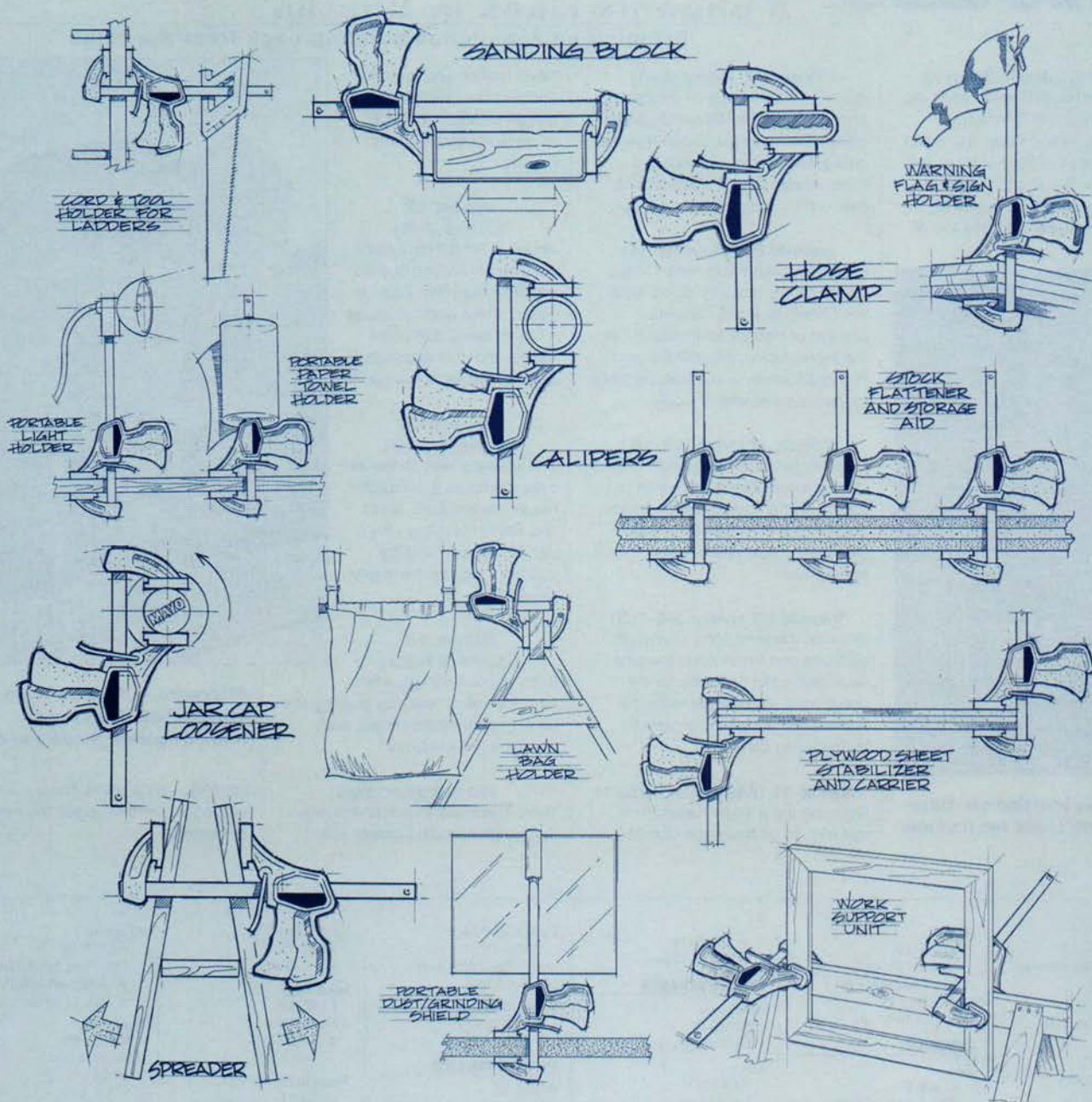
• WEWS-TV
Sat. 4:30 am

Columbus
WOSU-TV
Thu. 8 pm, Sat. 4:30 pm

• WSYX-TV
Sun. 10 am

Dayton
WPTD-TV
Thu. 8 pm, Sat. 9:30 am
Sun. noon

• WRGT-TV
Sun. 11 am



And you thought duct tape had a lot of uses.

Whether you use it for woodworking or general work around the house, there's just no end to the many uses of the QUICK-GRIP® Bar Clamp. See for yourself, why QUICK-GRIP clamping products are the perfect companions for anyone who needs an extra hand.

QUICK-GRIP®
Bar Clamps



A phoenix rises in Boston

Bringing an abandoned building back from the brink

Week 6 (April 26-27)

Homeowner Hazel Briceno and landscaping consultant Tom Wirth discuss how to transform the "awful mess" outside the front entry of her triple-decker. Turning to the inside, Hazel chooses kitchen cabinets, counters and flooring for the trio of apartments.

Week 7 (May 3-4)

Hazel gets some tips on decorating on a budget from *Home* magazine editor Joe Ruggiero, Steve Thomas gets a lesson in plastering, and Norm Abram begins lathe-turning new columns for the front porch.

Week 8 (May 10-11)

In keeping with the project's focus on affordable housing, Steve visits the Charlotte, North Carolina, chapter of Habitat for Humanity. At the triple-decker, plumbing expert Richard Trethewey outlines the plans for heating and water supply.

Week 9 (May 17-18)

Norm installs the new porch columns, and Steve helps him put up the railing and balusters. Inside, the window and door trim—now stripped of lead paint—gets remounted.

Week 10 (May 24-25)

Work on the front entry continues, as Norm and Steve stain the pine door and make brackets for the porch roof, while Hazel visits the nursery for some end-of-season landscaping bargains.

Week 11 (May 31-June 1)

Because there wasn't enough original trim for all three apartments,

Norm makes new molding and window casings. Steve travels to Japan for a look at prefabricated modular houses.

Week 12 (June 7-8)

Shovel in hand, Hazel starts planting her bargain bushes with help from Tom Wirth. In Japan, Steve watches house modules being built at the factory and then assembled at the site in just a few hours.

Week 13 (June 14-15)

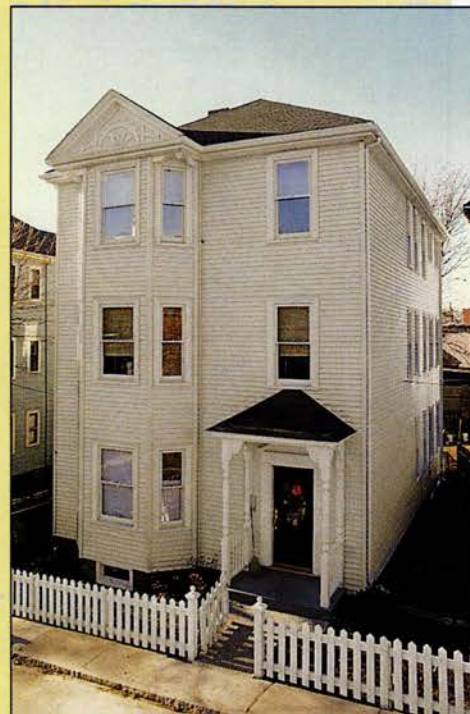
The kitchens take shape as cabinets for all three apartments are installed. Norm and Steve steal away for a visit to Chicago and the country's biggest hardware show.

Week 14 (June 21-22)

In his shop, Norm gets the new front door ready by building the jamb, mounting the hinges and installing the hardware.

Next episodes

The project nears completion with floor refinishing and carpet and



Afterward, a neighborhood eyesore had been transformed—picket fence and all.

appliance installation. Hazel welcomes her first guest: the mayor of Boston.



Before, the boarded-up triple-decker didn't look too inviting.

Portsmouth
WPBO-TV
Thu. 8 pm, Sat. 4:30 pm

Toledo
WGTE-TV
Thu. 8 pm, Sat. 1 pm
Sun. 1 pm

• WTVG-TV
Sun. 9:30 am

Wheeling
• WTRF-TV*

Youngstown
WNEO-TV
Sat. 10:30 am and 5 pm
Sun. 4 pm

• WFMJ-TV
Sun. 10 am

OKLAHOMA

Cheyenne
KWET-TV
Sat. 9:30 am and
12:30 pm, Sun. 4 pm

Eufaula
KOET-TV
Sat. 9:30 am and
12:30 pm, Sun. 4 pm

Oklahoma City
KETA-TV
Sat. 9:30 am and
12:30 pm, Sun. 4 pm
• KOCO-TV
Sat. 10 am

Tulsa
KOED-TV
Sat. 9:30 am and
12:30 pm, Sun. 4 pm
• KJRH-TV
Sat. 10:30 am

OREGON

Bend
KOAB-TV
Thu. 8 pm, Sat. 5 pm

Corvallis
KOAC-TV
Thu. 8 pm, Sat. 5 pm

Eugene
KEPB-TV
Thu. 8 pm, Sat. 5 pm
• KEZI-TV
Sun. 5 pm

Klamath Falls
KFTS-TV
Sat. 10:30 am

La Grande
KTVR-TV
Thu. 8 pm
Sat. 5 pm

Medford
KSYS-TV
Sat. 10:30 am
• KOBI/KOTI-TV
Sun. 4 pm

Portland
KOPB-TV
Thu. 8 pm, Sat. 5 pm

• KOIN-TV
Sun. 3:30 pm

PENNSYLVANIA

Allentown
WLVY-TV
Fri. 7:30 pm, Sat. 6 pm

Erie
WQLN-TV
Sat. 6:30 pm
• WUET-TV
Sat. 6:30 am

Harrisburg
WTFE-TV
Thu. 8 pm
Sat. 9 am and 6 pm
• WPMT-TV
Sat. 10:30 pm

Philadelphia
WHYY-TV
Sat. 11 am and 6 pm
Sun. 7 pm
• WCAU-TV
Sun. 11:30 am

Pittsburgh
WQED-TV
Sat. 5 pm
WQEX-TV
Wed. 8:30 pm, Sun. 11 am

Pittston
WVIA-TV
Thu. 8 pm
Sat. 5 pm and 5:30 pm

University Park
WPSX-TV
Sat. 9 am and 5:30 pm
Sun. 4:30 pm

Wilkes Barre
• WYOU-TV
Sat. 12:30 pm

RHODE ISLAND

Providence
WSBE-TV
Tue. 8:30 pm, Sun. 6 pm
• WLNE-TV*

SOUTH DAKOTA

Aberdeen
KDSD-TV
Sat. 4:30 pm

Brookings
KESD-TV
Sat. 4:30 pm

Eagle Butte
KPSD-TV
Sat. 3:30 pm

Lowry
KQSD-TV
Sat. 4:30 pm

Martin
KZSD-TV
Sat. 3:30 pm

Pierre
KTSD-TV
Sat. 4:30 pm

Rapid City
KBHE-TV
Sat. 3:30 pm

Sioux Falls
KCSD-TV
Sat. 4:30 pm
• KDLT-TV
Sun. 9 am

Vermillion
KUSD-TV
Sat. 4:30 pm

TENNESSEE

Chattanooga
WTCI-TV
Sat. 1:30 pm
• WDEF-TV
Sun. 7 am

Cookeville
WCTE-TV
Sat. 12:30 pm

Knoxville
WKOP-TV
Sat. 1:30 pm
WSJK-TV
Sat. 1:30 pm
• WATE-TV
Sun. 5:30 am

Lexington
WLJT-TV
Thu. 9:30 pm
Sat. 12:30 pm

Memphis
WKNO-TV
Thu. 7 pm, Sat. 9:30 am
• WPTY/WLMT-TV
Sun. 11:30 am

Nashville
WDCN-TV
Sat. 4:30 pm
• WKRN-TV
Sat. 6 am

TEXAS

Amarillo
KACV-TV
Sat. 12:30 pm
• KFDA-TV
Sat. 5 pm

Austin
KLRU-TV
Sat. 5:30 pm

Beaumont
• KBMT-TV
Sun. 6:30 am

College Station
KAMU-TV
Sat. 12:30 pm

Corpus Christi
KEDT-TV
Sat. 12:30 pm and 9 pm
• KIII-TV
Sat. 5 pm

Dallas/Fort Worth
KERA-TV
Sat. 9 am and 6:30 pm



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Hazel Builds Her Dream House

It took courage, determination—and a few helping hands

EDITED BY LAURA GOLDSTEIN



LEFT: Hazel Briceno in her finished apartment. Says Steve Thomas, "She's the epitome of the American dream." RIGHT: Norm takes stock of the original siding, which was replaced with vinyl.

Hazel Briceno had a way of stealing the scene. Just ask Steve Thomas. As they toured a kitchen showroom, he questioned her choice of countertop materials. She shot back, "Oh, Steve, get with the program!"—a remark producer Bruce Irving calls "one of the most memorable lines in *This Old House* history."

"It certainly reflected her feistiness," Steve says. Such spirit was typical of Briceno, whose house renovation was one of the show's projects during its 12th season. She was well-served by the confidence, because she'd taken

on a big job—restoring an abandoned, run-down eyesore in Boston's Jamaica Plain neighborhood. It wasn't enough that she was a first-time homeowner, either. When it was finally finished, the triple-decker would also be home to two other families, and she would become a landlord too.

"It was a little scary," Briceno says, "but once the work started and I got it in my mind that this was going to be my house, I knew I would have to take care of it. I thought I would be a good landlord—and I am."

She's also a good businesswoman. An accounting manager for a housing corporation, Briceno was an early participant in a program run by Boston's Public Facilities Department to reclaim abandoned and neglected properties that have fallen into the city's hands. With financial help and guidance from the agency, she managed to complete the renovation of all three apartments for just over \$125,000. She found creative ways to save—such as buying plants for landscaping at end-of-season discounts—and also contributed some hands-on labor. Instead of papering the walls, for instance, which would have been too

expensive, she helped stencil on a decorative pattern in paint. Briceno's accomplishment is considered a model for the program, which continues to rehab about 10 buildings a year for first-time buyers who might not otherwise be able to afford a home. The job was also a first for the crew of *This Old House*. "We'd never worked on any kind of non-private project before," Irving says. Even though the financial constraints were considerable—"there were no Jacuzzis going into this house," he says—staying within the city's tight budgets and specs also had its appeal. "The economics of the situation meant that the job had to be done with great efficiency and economy, and we actually enjoyed working under those conditions. 'The sky's the limit' is fun, but it also removes a project a little bit from reality."

Seven years later, Briceno remains satisfied with the result. "I still love my house, and it still looks lovely," she says. "I try to encourage my tenants to let me know as soon as something goes wrong so I can repair it." Apart from finishing off the basement, she hasn't made any big changes, although she did alter the decorating schemes featured on the show—and in the process learned a little about the power of television.

"I got a call one evening from a lady in Idaho. She said to me, 'Is your living room still black and white? You were so great on the show, and I loved the black and white in the living room. Did you keep that?' I had to tell her no."



● KXAS/KXTX-TV
Sat. 5 pm

El Paso
KCOS-TV
Sat. 5 pm
● KZIA-TV
Sun. 8 am

Harlingen
KMBH-TV
Sat. 12:30 pm

Houston
KUHT-TV
Sun. 11:30 am
● KTRK-TV
Sun. 11 am

Killeen
KNCT-TV
Sat. 12:30 pm
Sun. 9:30 am

Lubbock
KTXT-TV
Sat. 12:30 pm
● KLBK-TV
Sun. 5 pm

Nacogdoches
● KLSB-TV*

Odessa
KOCV-TV
Sun. 12:30 pm

San Antonio
KLRN-TV
Sat. 5:30 pm

Tyler

● KETK-TV
Sat. 5 pm

Waco

KCTF-TV
Mon. 12:30 pm
Sat. 9 am and 6:30 pm
● KXXV-TV
Sun. 10:30 am

UTAH

Provo
KBYU-TV
Sat. 9:30 am and 12:30 pm

Salt Lake City
KUED-TV
Sat. 8 am and 5 pm
● KTVX-TV
Sun. 11 am

VERMONT

Burlington
WETK-TV
Thu. 8 pm, Sat. 11 am
● WCAX-TV
Sun. 11 am

Rutland
WVER-TV
Thu. 8 pm, Sat. 11 am

Saint Johnsbury
WVTB-TV
Thu. 8 pm, Sat. 11 am

Windsor
WVTA-TV
Thu. 8 pm, Sat. 11 am

VIRGINIA

Charlottesville
WHTJ-TV
Sat. 8:30 am

Falls Church
WNVTV
Sun. 3 pm

Harrisonburg
WVPT-TV
Sat. 1:30 pm

Marion
WMSY-TV
Sat. 1:30 pm

Norfolk
WHRO-TV
Thu. 8 pm, 11:30 pm and 4:30 am
Sat. 8:30 am and 2 pm
● WVEC-TV
Sun. 11 am

Norton
WSBN-TV
Sat. 1:30 pm

Richmond
WCVF-TV
Sat. 8:30 am
WCVW-TV
Fri. 8:30 pm
● WAWB-TV
Sat. 5 pm

Roanoke
WBRA-TV
Sat. 1:30 pm

● WSLS-TV
Sat. 6:30 am

WASHINGTON

Centralia
KCKA-TV
Thu. 6:30 pm
Sat. 12:30 pm and 6 pm

Pullman
KWSU-TV
Mon. 7:30 pm
Wed. 7:30 am, Sat. 2 pm

Richland
KTNW-TV
Thu. 7 pm
Sat. 2 pm, Sun. 4:30 pm

Seattle
KCTS-TV
Sun. 5 pm
● KIRO-TV
Sat. 10:30 am

Spokane
KSPS-TV
Sat. 9:30 am, Sun. 5:30 pm
● KXLY-TV
Sun. 9:30 am

Tacoma
KBTC-TV
Thu. 6:30 pm
Sat. 12:30 pm and 6 pm

Yakima
KYVE-TV
Sun. 5 pm

WEST VIRGINIA

Beckley
WSWP-TV
Sat. 1:30 pm

Bluefield
● WOAY-TV*

Charleston
● WCHS-TV*

Clarksburg
● WDTV-TV
Sat. 6:30 pm

Huntington
WPBY-TV
Sat. 1:30 pm

Morgantown
WNPB-TV
Sat. 1:30 pm

Parkersburg
● WTAP-TV*

Wheeling
● WTRF-TV*

WISCONSIN

Green Bay
WPNE-TV
Wed. 7:30 pm, Sun. 4 pm
● WGBA-TV
Sun. 7 am

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WHLA-TV
Wed. 7:30 pm, Sun. 4 pm
● WEAU-TV
Sun. 9 am

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Wed. 7:30 pm, Sun. 4 pm
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Wausau
WHRM-TV
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● WJFW-TV
Sun. 10:30 am

WYOMING

Riverton
KCWC-TV
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Program dates and times are subject to change. Please check your local listings.

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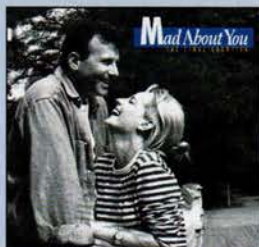
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Directory

EXTRAS pp. 24-31



p. 24—Flood insurance: For more information on the National Flood Insurance Program, contact your regional Federal Emergency Management Agency (FEMA) office, listed in the U.S. section of the blue (government) pages of your telephone directory; 800-427-4661; Web site <http://www.fema.gov>. Flex-necks:

12v floodlight #DW917, with spare bulb, \$52; recharger #9106, \$74, battery pack #9071, \$74; DeWalt Industrial Tool Co., Box 158, 626 Hanover Pike, Hampstead, MD 21074; 800-433-9258. SnakeLight Plus #5L02H with battery and belt hook, \$35; Black & Decker Inc., 6 Armstrong Rd., Shelton, CT 06484; 800-231-9786. Clip-ons: Powermate pivoting head clip-on light #2AA, \$10; Powermate clip-on light #4AA, \$13; Powermate #2D ratchet head worklight, \$12; Powermate Lighting Tools (Coleman Co. Inc.), Box 1762, Wichita, KS 67202; 800-822-3319. Torch lights: DeWalt #906 14.4v stand-up worklight with spare bulb, \$56, recharger #9106, \$74, battery pack #9091, \$84 DeWalt. Halogen lamp: Electripak #Q150WLCLS, 150 watts,

with hook and clamp, \$17; Intelectron Inc., 21021 Corsair Blvd., Hayward, CA 94545; 800-828-9887.

p. 25—Fluorescent light: Carol Plug-It utility fluorescent hanging worklight, \$25, incandescent version, \$7.99-\$8.99; General Cable Corp., 4 Tesseneer Dr., Highland Hgts., KY 41076-9753; 800-438-7314.

Rechargeable light: Heavy-duty rechargeable hanging light, #49-24-0100, 9.6v or 12v, with pivoting head, spare krypton bulb and hook, \$49; 9.6v and 12v batteries, \$76-\$109; rechargers \$68-\$74. Milwaukee Electric Tool Corp., 13135 W. Lisbon Rd., Brookfield, WI 53005; 414-783-8311. Plastic guard light: Woods Dual-Hook System plastic hanging light, available with 15- to 50-ft. round vinyl cords, \$5-\$8;

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Woods Wire Products Inc., 510 Third Ave. SW, Box 2675, Carmel, IN 46032-4960; 800-428-6168.



p. 26—Drywall crown molding: 12-ft. lengths, \$1.10 per foot; imported from England by Crown Building Products Inc., 117 Leonard Ave., Neptune, NJ 07753; 908-775-5146. **Injury statistics:** National Injury Information Clearinghouse, Consumer Product Safety Commission, Washington, DC 20707; 301-504-0424.

Recycled rubber products: Crown III crumb rubber top dressing (prevents turf wear), 50-lb. bag, \$28; *Jaitire Ind. Inc.*, 4591 Ivy St., Denver, CO 80216; 800-795-8473. Bottle-cap belt (beer or soda caps), \$34; *Little Earth Productions Inc.*, 2211 Fifth Ave., Pittsburgh, PA 15219; 412-471-0909. Whitewall tie, \$17.50; *Rubber-Necker Ties*, 10 Silver St., Greenfield, MA 01301-1210; 413-774-4349. Designer Fluff-Cord mat (for commercial building entryways), \$11.80 per sq. ft.; *R.C. Musson Rubber Co.*, Box 7038, Akron, OH 44306; 800-321-2381. Moisture Master half-inch soaker hose, 25 ft., \$5.50-\$6.50; *Aquapore Moisture Systems*, 610 S. 80th Ave., Phoenix, AZ 85043; 800-635-8379. Biker wallet, \$26; *Little Earth Productions*.

For more information: "Recycled Rubber Products Catalog," Scrap Tire Management

Council, 1400 K St. NW, Ste 900, Washington, DC 20005; 202-682-4880.

p. 27—**Kingdom Builders:** Jeri and John Skinner, Green's Farms Congregational Church, 71 Hillandale Road, CT 06880; 203-226-5751. **Preteen building kit:** Young Architects, \$75; *Patail Enterprises Inc.*, 27324 Camino Capistrano #129, Laguna Niguel, CA 92677; 800-990-0869.



p. 28—Flexible tubing: Wardflex PVC-coated corrugated stainless-steel tubing, *Ward*

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Manufacturing Inc., Box 9 Blossburg, PA 16912; 800-248-1027. Gastite flexible plastic-coated corrugated stainless-steel tubing; *Titeflex Corp.*, 603 Hendee St., Springfield, MA 01104; 800-388-9688. For more information: Jim Ranfone, American Gas Assn., 1515 Wilson Blvd., Arlington, VA 22209; 703-841-8648. Reduced-friction screw: Drew Screw, Andrew Hollander, 202-15 42nd Ave., #7-A, Bayside, NY 11361; 718-423-2734. Solar hot water: A. Hunter Fanne, Bldg. 226, Rm. B320, Nat'l. Inst. of Standards and Technology, Gaithersburg, MD 20899; 301-975-5864; fax 301-975-5433; E-mail pvssolar@nist.gov.

p. 29—Deck revivers: Wolman deck and siding brightener/rejuvenator, formulas for cedar, redwood and pressure-treated wood, 6.4 oz, \$8-\$10, 2 1/4 lbs., \$20-\$22; Wolman Wood Care Products, 1850 Koppers Bldg.,

436 Seventh Ave., Pittsburgh, PA 15219-1818; 800-556-7737. Deckwash, bleach-based, \$5.40-\$6 per gallon; *The Thompsons Co.*, 825 Crossover Lane, Memphis, TN 38117; 901-685-7555. Deckswood concentrated liquid for redwood, cedar, pressure-treated wood, vinyl and aluminum siding, \$17 per gallon; *The Flood Co.*, Box 2535, Hudson, OH 44235-0035; 800-321-3444. Penetrating oil stain (available at home centers and hardware stores): One brand is Valspar Semi-Transparent Deck Stain and Valspar Premium Natural Wood Toner, *The Valspar Corp.*, 1191 Wheeling Rd., Wheeling, IL 60090; 800-845-9061. Further reading: *Wood Decks: Materials, Construction and Finishing*, 1996, 100 pp., \$20; *Forest Products Society*, 2801 Marshall Ct., Madison, WI 53705-2295; 608-231-1361. Feng shui: *Feng Shui: Harmony by*

Design, by Nancy SantoPietro, 1996, 218 pp. \$15; *Perigee Books, The Berkley Publishing Group*, 200 Madison Ave., New York, NY 10016; 800-223-0510. SantoPietro has office in Brooklyn, NY, and Seattle, WA

MITER SAWS pp. 32-38



Miter saws: p. 32—Sliding compound miter saw #3915, 10 in., \$680; Bosch Power

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Directory

Tools, 4300 W. Peterson, Chicago, IL-60646; 800-815-8665. p. 34—Sliding compound miter saw #LS1211, 12 in., \$1,730; *Makita USA Inc.*, 14930 Northam St., La Mirada, CA 90638-5753; 800-462-5482. p. 38 (clockwise from left)—Miter saw #6491, 10 in., \$605; *Milwaukee Electric Tool Corp.*, 13135 W. Libson Rd., Brookfield, WI 53005; 800-732-4578; 800-414-6527. Compound miter saw #DW705, 12 in., \$734; *DeWalt Industrial Power Tools*, 626 Hanover Pike, Hampstead, MD 21074; 800-433-9258. Sliding compound miter saw #C10FS, 10 in., \$750-800; *Hitachi Koki USA, Ltd.*, 3950 Steve Reynolds Blvd., Norcross, GA 30093; 800-706-7337. Sawbuck compound miter saw #33-055, 8 in., \$46; *Delta Intl. Machinery Corp.*, 246 Alpha Dr., Pittsburgh, PA 15238; 800-438-2486. **Blades:** Table-saw blade #27896, 10-in. diam., 40-tooth, \$52.60; miter-saw blade #27905, 12-in. diam., 60-tooth, \$107; miter-saw blade #27897, 10-in. diam., 40-tooth, \$52.60; *Vermont American*, Box 340, Lincolnton, NC 28093; 800-742-3869. **Accessories:** Miter-saw portable workstand #50175, \$236; *Delta*. Extension kit #DW7050, \$40; length stop #DW7051, \$36; material clamp #DW7052, \$48; crown stops #DW7054, \$30; dust bag #DW7053, \$18; *DeWalt*.
Our thanks to: Nalla Wollen, *Center Lumber*, Box 2242, 85 Fulton St., Paterson, NJ 07509; 201-742-8300.

CATS PAWS pp. 41-43



Japanese nail pullers: (1) #891-945, 12-in. V-groove, \$16.95; *Woodworker's Supply*,

Directory

5604 Alameda Pl. NE, Albuquerque, NM 87113; 800-645-9292. (2) SharkGrip, Shark Saw Series, #21-2016, 6 1/4 in., \$12.49; Takagi Tools Inc., 337A Figueroa St., Wilmington, CA 90744; 800-777-5538. (5) #892-624, 17 3/4 in., \$29.95; (6) Puller #815-520, 14 in., \$20.50; Woodworker's Supply. Wrecking bars: (4) Crow Bar, Shark Saw Series, #21-2154, 21 1/4 in., \$24.49; Takagi Tools Inc. (7) The Wrecker #01K11.03, 30 in., \$21.50; (9) Renovator's bar #01K04.01, 19 1/2 in., \$34.75; Lee Valley Tools Ltd. 12 E. River St., Ogdensburg, NY 13699; 800-871-8158. Flat pry bars: (8) Superbar #B215, \$8.99; Vaughan & Bushnell Mfg. Co., 11414 Maple Ave., Box 390, Hebron, IL 60034-0390; 815-648-2446. Common two-claw cat's paw: (10) Double-ended nail puller #NP12DE, 5/8-in. hex stock, \$10; Vaughan & Bushnell Mfg. Co. Ram puller: (11) Nail puller #56, \$45-\$49; CooperTools, Box 30100, Raleigh, NC 27622; 919-781-7200. U-shaped bracket: (12) 2-by-Turner #TW-1, discontinued; Hart Tool Co., 5111 Argosy Dr., Huntington Beach, CA 92649; 800-331-4495. Ripping chisel: (3) Molding lifter #14-538, 20 in., \$14.75; Bon Tool Co., 4430 Gibsonia Rd., Rte. 910, Gibsonia, PA 15044; 800-444-7060. Our thanks to: Tom Harris, Architectural Timber and Millwork, 35 Mt. Warner Rd., Box 719, Hadley, MA 01035 413-586-3045.

SATELLITE DISHES pp. 44-48



Digital Satellite System (DSS): Viewers receive programming offered by two

companies operating their own satellites: DirecTV (DTV) and United States Satellite Broadcasting (USSB). Hardware is sold separately by firms such as Sony and Thomson Consumer Electronics (RCA, GE). DirecTV: 175 channels, program packages \$6-\$48 per mo.; 2230 E. Imperial Hwy, El Segundo, CA 90245; 800-347-3288. USSB: 26 channels, program packages \$7.95-\$34.95 per mo.; Box 2987, Shawnee Mission, KS 66201-8905; 800-204-8772. Hardware (dish and receiver): Sony DSS, 18-in. dish (3

models), \$449-\$699 (plus installation); One Sony Dr., Park Ridge, NJ 07656; 800-838-7669; fax 800-766-9022. GE, \$599 and \$699 (plus installation); RCA DSS, 18-in. dish (5 models), \$349-\$599 (plus installation); Thomson Consumer Electronics, 10330 N. Meridian St., Indianapolis, IN 46290; 800-722-6585. PrimeStar: 27-in. dish, lease only, installation, \$199; 160 channels, program packages include programming, maintenance and guide, \$33-\$60 per mo; 3 Bala Plaza W., Suite 700, Bala Cynwyd,

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PA 19004; 800-774-6378. **DISH Network:** 18-in. dish, 120 channels, installation \$99-\$150, hardware \$199 or \$299, 1-year program package, \$300; *EchoStar Communications Corp.*, 90 Inverness Circle E., Box 6552, Englewood, CO 80155; 800-333-3474. **AlphaStar:** 30-in. dish, 115 channels, hardware \$399 plus \$100-\$150 installation (leasing options by local dealers), program packages \$25-\$60 per mo.; *AlphaStar Television Network Inc.*, 208 Harbor Dr., Stamford, CT 06902; 888-257-4278. **Installation:** SurveyMaster Compass/Inclinometer, SURMAS, \$159; *Natropolis International*, Box 14115, St. Paul, MN 55114; 800-646-8665. **Signal strength meters:** Bullz-I meter #5, \$150; *Vinson's TV & Electronics*, 1955 Lucas Boulevard, Fallon, NV 89406; 702-867-2105. **Pocket Satellite Finder #SF95**, \$30-45; *Imex International*, Box 16974, Irvine, CA 92623; 714-733-3663.

For more information: Satellite Broadcasters & Communications Assoc., 225 Reinekers Lane, Ste 600, Alexandria VA 22314 703-549-6990.

Our thanks to: Ray Gallegos, owner, Wholesale Satellite, 706 E. Fort Lowell Rd., Tucson, AZ 85719; 520-888-5888.

neutralizer, \$1,415 (equipment and fittings), \$400 for installation; *Culligan Mark 1000*, 9-in. programmable water softener, \$1,200 (\$250 for installation); *Culligan RO unit #AC-15*, \$620 (\$125 for installation); *Cassidy Water Conditioning Inc.*, 39 Chelmsford St., Lowell, MA 01851; 800-428-8001. **Delzone portable ozone purifiers**, \$120-480; *Del Industries*, Box 4509, San Luis Obispo, CA 93401; 800-676-1335. **Safe drinking water hotline:** EPA hotline, 800-426-4791.

Our thanks to: Glenn Reynolds, senior engineer, *Water Solutions*, Fremont, CA. Kim R. Fox, environmental engineer, *Water Supply & Water Resources Div.*, Nat'l Risk Management Lab, U.S. Environmental Protection Agency, Cincinnati, OH. Joseph Harrison, technical director, *Water Quality Assoc.*, Lisle, IL. Paul S. Berger, PhD, senior microbiologist, *Office of Ground Water & Drinking Water*, U.S.E.P.A., Washington, DC. Stephanie Getz, marketing, *PUR and Recovery Engineering*, Minneapolis, MN. Howard Mofenson, MD, medical director, *Long Island Regional Poison Control Center*, Winthrop University Hospital, Long Island, NY. Theresa R. Slifko, Department of Marine Sciences, *University of South Florida*, St. Petersburg, FL.

WATER FILTERS pp. 51-54



Water filters: S23 ultraviolet water purifier, 6 gal. per min. (cutaway unit), 118v/60H, \$735; *Atlantic Ultraviolet Corp.*, 375 Marcus Blvd., Hauppauge, NY 11788-2026; 516-273-0500. *Culligan PV-12*

CEILING FAN pp. 57-59



Ceiling fan: Infiniti # 25280, \$220; Fan-Light wall remote control # 22787-A,

Directory

\$95; Hunter Fan Co., 2500 Frisco Avenue, Memphis, TN 38114; 800-448-6837; 901-743-1360.

Our thanks to: Steve Stillman, the Fan Man Stores, 400 Lilac Drive, Minneapolis, MN 55422; 612-540-0372. The Salem, NH, Home Depot.

Further reading: "Are Energy Savings Due to Ceiling Fans Just Hot Air?" Document # FSEC-PF-306-96, Public Information Office, Florida Solar Energy Center, 1679 Clearlake Road, Cocoa, FL 32922-5703; 407-638-1015.

ARCHITECTURE pp. 61-62



Our thanks to: Jim and Colleen Meigs, Tucson, AZ. Alexandra Hayes, architect, Tucson, AZ. Graham Gund, principal, Graham Gund Architects, Cambridge, MA. Paul Durand and Mark Meche, principals, Winter Street Architects, Salem, MA. Helen Sides, associate, Olson, Lewis & Dioli Architects & Planners Inc., Manchester, MA. Gary Brewer, associate, Robert A.M. Stern Architects, New York, NY. Donald Rattner, codirector, Institute for the Study of Classical Architecture, New York, NY.

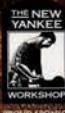
Further reading: *Le Corbusier: Ideas and Forms*, by William J.R. Curtis, 1995, 240 pp., \$29.95; Phaidon Press Ltd., 2 Kensington Square, London W8 5EZ. *Architecture: Form, Space and Order*, by Francis D. Ching, 1996, 2nd ed., \$32.95; Van Nostrand Reinhold Publishing, 115 Fifth Avenue, New York, NY 10003; 800-842-3636.

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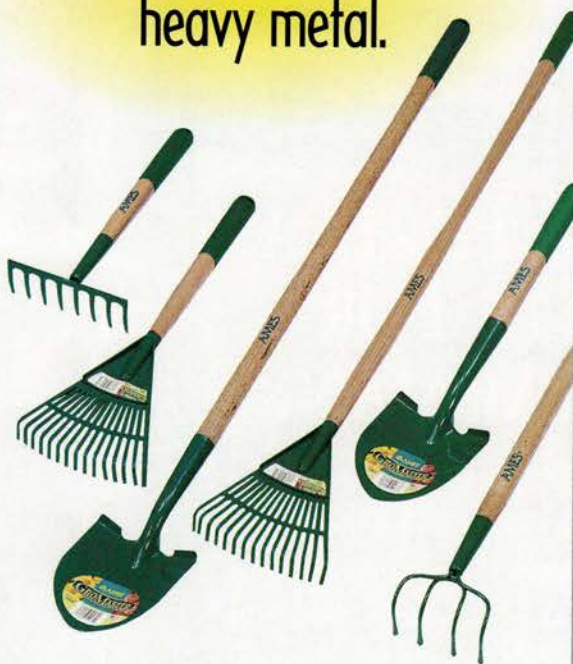
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FINANCES pp. 65-66



For more information: The Appraisal Foundation, 1029 Vermont Ave. NW, Ste. 900, Washington, DC 20005-3517; 202-624-3056; fax 202-347-7727; Web site <http://www.appraisalfoundation.org>.

Further reading: "What's It Worth? A Consumer's Guide to Appraisal and Selecting an Appraiser," free; *The Appraisal Foundation. Tips and Tricks When Negotiating Real Estate*, by Robert Irwin, 1995, 224 pp., \$12.95; *The McGraw-Hill Co.*, 11 West 19th St., New York, NY 10011; 800-722-4726. *The Complete Home Buyer's Bible*, by William J. Molloy, 1996, 256 pp., \$17.95; *John Wiley & Sons*, 605 Third Ave., New York, NY 10158-0012; 800-225-5945.

Our thanks to: Robert Irwin, author, *Tips and Tricks for Negotiating Real Estate*. Michael McDonald, branch manager, *First Republic Mortgage Corp.*, Marleton, NJ. Jeffrey Otteau, president, *Otteau Appraisal Group Inc.*, East Brunswick, NJ. Kevin Kinney, president, *Domus Appraisals Inc.*, Bronxville, NY. Jeanne Tomb, SRA, RAA, CRP, president, *The Appraisal Co.*, Casper, WY. Joseph T. Sodano, SRA, CRP, vice president, *Professional Appraisal Associates*, Summit, NJ.

TUCSON UPDATE pp. 72-77



General contractor: McCaleb and Co., 2100 N. Wilmot Rd., Suite 102, Tucson, AZ 85712; 520-722-2910. **Exercise pool:** Endless Pools Inc., 200 E. Dutton Mill Rd. Dept. T11, Aston, PA 19014; 800-943-7946; Web site www.endlesspools.com. **Radiant-floor heating system:** Wirsbo, 5925 148th St., West Apple Valley, MN 55124; 800-321-4739. **Gas cooling system:** Servel, Robur Corp. 2300 Lynch Rd., Evansville, IN 47711; 812-424-1800.

Directory

Energrid insulation: supplied by Harvey's Bldg. Materials,
3250 E. Ajo Way, Tucson, AZ 85711; 520-307-2342.

Our thanks to: Teresa and Mike Truelsen, Tucson, AZ.

MESQUITE pp. 78-83



Cabinetmaker: James Vosnos Fine Woodworks, Box 18695,
Tucson, AZ 85731-8696; 800-948-1998. Mesquite: Sonoran
Hard Woods, 2007 E. Frontage Rd., Tumacacori, AZ 85640;
520-398-9356.

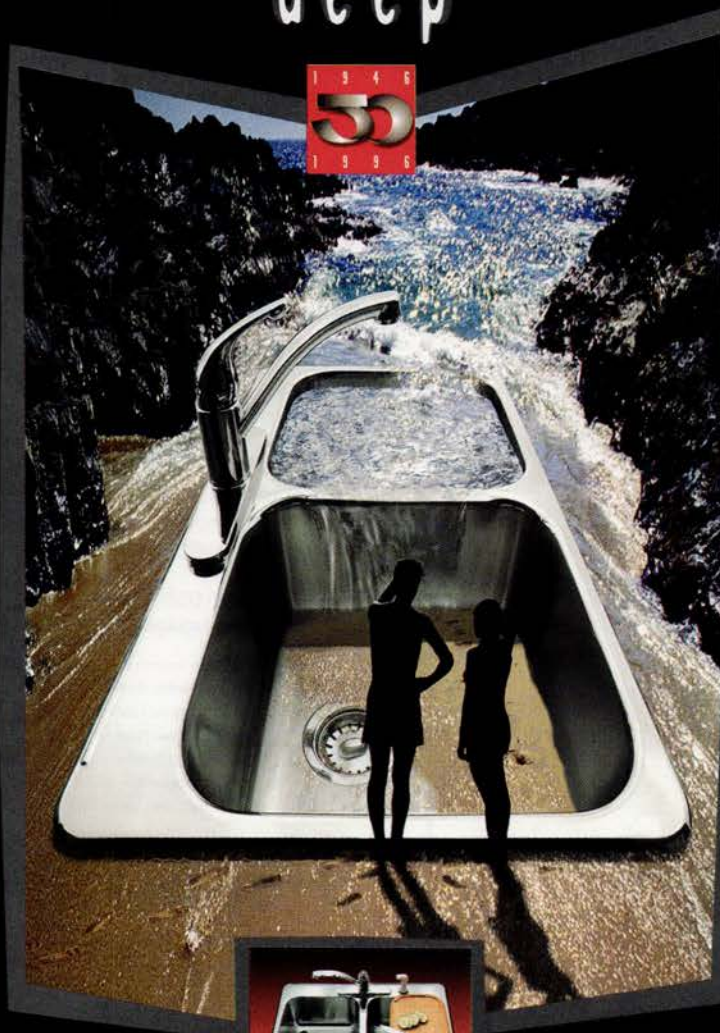
Further reading: *Gathering the Desert*, by Gary Paul Nabhan,
1985, 209 pp., \$18.95; University of Arizona Press, 1230 N.
Park Ave., Suite 102, Tucson, AZ 85719; 800-426-3797.

POURED FLOORS pp. 84-89



General contractor: Dean Carson, Carson Concrete & Decking,
3475 N. Dodge Blvd., Tucson, AZ 85716; 520-325-0557. Iron
oxide colorant: Davis Colors, 3700 East Olympic Blvd., Los
Angeles, CA 90023; 800-356-4848 ext. 22. Concrete: San
Xavier Rock & Materials, Box 551, Cotero, AZ, 85652; 520-
744-6381. Dursban TC termiticide and Sentricon Colony
Elimination system: University Termite & Pest Control, Box
30010, Tucson, AZ 85751; 800-887-4146 ext. 220. Six-inch
reinforcing wire mesh: Border Products Corp., 1855 W. Grant
Rd., Tucson, AZ 85745; 520-623-9448. Float, screed, tamper,
specialized trowels: Stanley Tools-Goldblatt Tool Div.
511 Osage, Kansas City, KS 66105; 800-621-8200. Concrete-
Terrazzo sealer: Onex Seal II, #315, \$18.99 per gal.; Hillyard

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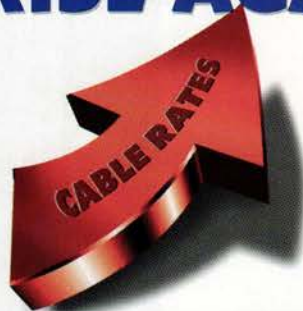
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Directory

Industries Inc., Box 909, St. Joseph, MO 64502; 800-365-1555. **White cement:** Riverside Cement Co., 1500 Rubidoux Blvd., Riverside, CA 92509; 909-860-3057.

Our thanks to: David Cripe, *San Xavier Rock & Materials*, Cotero, AZ. Bob Vint, *Bob Vint & Associates*, Tucson, AZ. Greg Golish, *A to Z Remodeling*, Tucson, AZ.

COPPERSMITH pp. 90-97



Coppersmith: Larry Stearns, catalog and copper roofing ornaments, *Vulcan Supply Corp.*, Box 100, Westford, VT 05494; 802-878-4103.

Further reading: *Copper and Common Sense: Sheet Copper Design Principles and Construction Techniques*, 1981, 103 pp., \$18; *Revere Copper Products Inc.*, Box 300, Rome, NY 13442; 800-490-1776.

Our thanks to: Warren Tice and Dody

Directory

Bleau, *Vulcan Supply Corp.* Revere
Copper Products Inc.

PAINT pp. 98-103



Paint: Schreuder Problem-House Paint, \$70 per 2.5 liters; imported from the Netherlands by Fine Paints of Europe, Box 419, Woodstock, VT 05091; 800-332-1556, Web site: <http://www.fine-paints.com>.

Plastic wedges: WedgeVent System, 500 wedges (for an average house), \$97; Donald R. Ross & Son, Painting &

Decorating Contractors Inc., 1156 Main St., Lynnfield, MA 01940; 800-933-4366.

Further reading: *Finishes for Exterior Wood: Selection, Application and Maintenance*, by R. Sam Williams, Mark Knaebe, William Feist, 1996, 128 pp, \$19.95; *Forest Products Society*, 2801 Marshall Ct., Madison, WI 53705-2295; 608-231-1361 ext. 209. "Remedies for Common Paint Problems" (flip cards), \$25; *The Rohm & Haas Paint Quality Inst.*, Box 1348, Philadelphia, PA 19105-9965; 215-592-3179; Web site <http://www.paintquality.com>.

For more information: Painting & Decorating Contractors of America, 3913 Old Lee Hwy., Ste 3313, Fairfax, VA 22030; 800-332-7322. Forest Products Laboratory, USDA Forest Service, One Gifford Pinchot Dr., Madison, WI 53705-2398; 608-231-9200. National Paint & Coatings Assoc., 1500 Rhode Island Ave., NW, Washington, DC 20005; 202-462-6272.

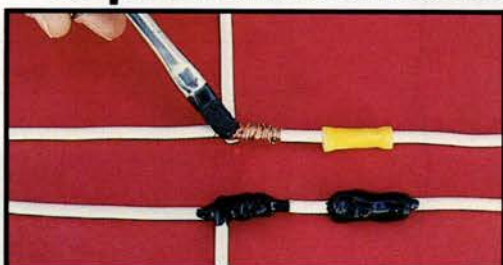
LIGHTNING RODS pp. 104-109



Lightning Protection Systems: Thompson Lightning Protection Inc., 901 Sibley Memorial Hwy., St. Paul, MN 55118; 800-777-1230; fax 612-455-2545. Robbins Lightning Inc., 1124 E. Second St., Box 440, Maryville, MO 64468; 800-426-3792; fax 816-582-3039. **Surge protection:** Max* 6 AllPath Protection Platform with six AC outlets, \$79; *Panamax*, 150 Mitchell Blvd., San Rafael, CA 94903; 800-472-5555; fax 415-472-5540. **Antique lightning protection systems:** New Old Products Inc., Box 1272,

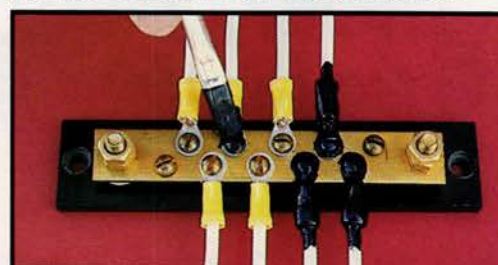
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Kokomo, IN 469030; 765-868-3092.

For more information: Richard Kithil, director, National Lightning Safety Inst., 891 Hoover Ave., Box 778, Louisville, CO 80027-0778; 303-666-8817.

Further reading: *All About Lightning*, by Martin Uman, 1987, 192 pp., \$6.95; Dover Publications Inc., 31 E. 2nd St., Mineola, NY 11501; 516-294-7000. "NFPA 780: Standard for the Installation of Lightning Protection Systems," \$22.25; National Fire Protection Assoc., 11 Tracy Dr., Avon, MA 02322; 800-344-3555. UL96 "Lightning Protection Components" and UL96A "Installation Requirements for Lightning Protection Systems," \$35 ea.; Underwriters Laboratories Inc., available from Global Engineering, 15 Inverness Way E., Englewood, CO 80012; 800-624-3974.

Our thanks to: Richard Kithil, director, National Lightning Safety Inst., Louisville, CO. Professor Martin Uman, chairman, Dept. of Electrical & Computer Engineering, University of Florida, Gainesville, FL. Patrick Zumbusch, president, and Lynne Shumaker, public affairs, Global Atmospherics Inc., Tucson, AZ. David Vann, owner, Advanced Lightning Protection, Boca Raton, FL.

XERISCAPE pp. 110-115



Landscape designers: Carrie J. Nimmer, Xerarch Studio, Box 7616, Phoenix, AZ 85011; 602-254-0300; fax 602-254-8993. Margaret Livingston, 3955 E. Calle de Jardin, Tucson, AZ 85711; 520-325-1769. Arizona-Sonora Desert Museum: Open daily March-Sept. from 7:30 am-6 pm,

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Oct.-Feb. from 8:30 am-5 pm, \$8.95 (adults), \$1.75 (ages 6-12), free for museum members and children under 6, discounts for groups of 20 or more; 2021 N. Kinney Rd., Tucson, AZ 85743; 520-883-2702. **Desert Botanical Garden:** Open daily May-Sept. from 7 am-10 pm, Oct.-Apr. from 8 am-8 pm, admission \$7 (adults), \$6 (seniors), \$1 (ages 5-12), free (children under 5), discounts for AAA members and groups; 1201 N. Galvin Pkwy., Phoenix, AZ 85008; 602-941-1225. **Further reading:** *Planting Noah's Garden*, by Sara Stein, 1997, \$35; Houghton Mifflin Co., 215 Park Ave. S., New York, NY 10003; 800-225-3362. *Noah's Garden*, by Sara Stein, 1995, \$10.95 (soft cover); Houghton Mifflin. *The Forgotten Pollinators*, by Stephen Buchmann and Gary Nabham, 1996, \$25; Island Press, Box 7, Covelo, CA 95428; 800-828-1302. *A Sierra Club Naturalist's Guide to the Deserts of the Southwest*, by Peggy Larson with Lane Larson, 1977, \$12; Sierra Club Books, 85 Second St., 2nd fl., San Francisco, CA 94105-3441; 800-935-1056. *Peterson Field Guides: Southwestern and Texas Wildflowers*, 1984, 464 pp., \$17.95; Houghton Mifflin. *Native Gardens for Dry Climates*, by Sally and Andy Wasowski, 1995, 176 pp., \$35; Clarkson Potter, 210 E. 50th St., New York, NY 10022; 212-572-6165.

5060 W. Lake Rd., Canandaigua, NY 14424; 800-836-9630. **Norris Berry Farm's Summer in Vermont Jams:** Raspberry preserves, 9-oz. jar, \$4.50; strawberry preserves, 9-oz. jar, \$3; strawberry jelly, 9-oz. jar, \$3.25; *Norris Berry Farm*, RD 1, Box 790, Hinesburg, VT 05461; 802-453-3793; E-mail nberry@together.net. **Materials for trellis:** 11½-gauge aluminum-clad steel trellis wire, 150 ft. (for 25-ft. row), \$2.50; 2 soil anchors, ½ in. by 30 in., \$7.60; Wirewise grippers #5062, 8 for \$13.60; Orchard Valley Supply, 734 Main St., Fawn Grove, PA 17321-9710; 717-382-4612. Two 8-ft.-long pressure-treated 4-by-4-in. posts, four crosspieces cut from 10-foot-long pressure-treated 2x6 board, eight 4½-in. carriage bolts, two 4½-in. eye bolts; *these items cost \$37.74 at Home Depot, Danbury, CT.* **Further reading:** *The Gardener's Book of Berries*, by Allan A. Swenson, 1994, 132 pp., \$12.95; Lyons & Burford Publishers, 31 W. 21st St., New York, NY 10010; 212-620-9580. *The Back Yard Berry Book*, by Stella Otto, 284 pp., \$14.95; OttoGraphics, 8082 Maple City Rd., Maple City, MI 49664; available from Chelsea Green, 10 Water St., Lebanon, NH 03766; 800-639-4099. **Our thanks to:** Norma Norris, Norris Berry Farm.

RASPBERRIES pp. 117-119



Mail-order raspberries: Heritage variety #BF 212, one doz., \$21.75; Miller Nurseries,

PUSH-REEL MOWERS pp. 120-121



Silent reel: Silent Mower #2354, 18-in. cutting width, \$280; Smith & Hawken,

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States Corp. Sharpening kit: #SK-1, for
Great States mowers only, \$20; Great
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Further reading: *The Lawn: A History of an
American Obsession*, by Virginia Scott
Jenkins, 1994, 246 pp., \$14.95;
Smithsonian Institution Press, Box 960,
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Our thanks to: Gardener's Supply Co.,
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718-817-8700. Idea book: *Natural
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by Jim Knopf et. al., 1995, 288 pp.,
\$24.95; *The Nature Company*, 750 Hearst
Ave., Berkeley, CA 94710; 800-227-1114.
Garden tours: "The 1997 Garden
Conservancy Open Days Directory," a
listing of participating private gardens
open for visiting on select Saturdays and
Sundays from April-Sept., \$10, \$8
(members); *The Garden Conservancy*,
Box 219, Cold Spring, NY 10516;
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SAVE THIS OLD HOUSE pp. 164

PAY DIRT p. 123



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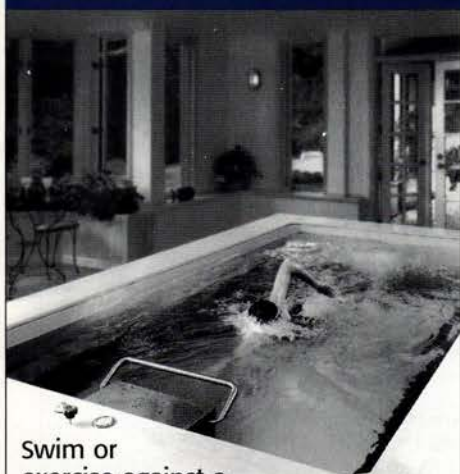
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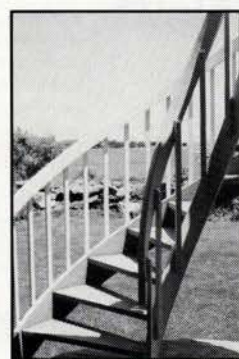
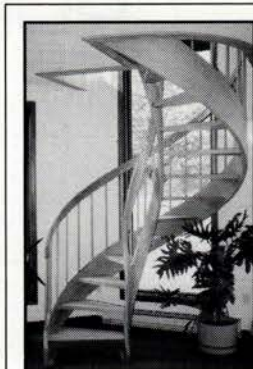
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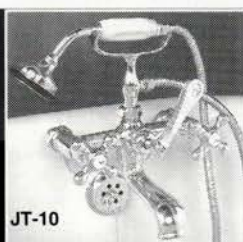
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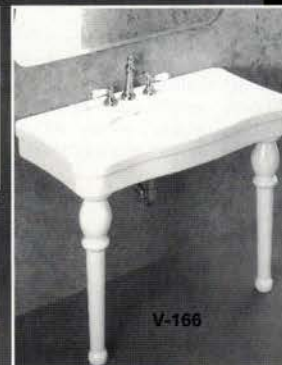
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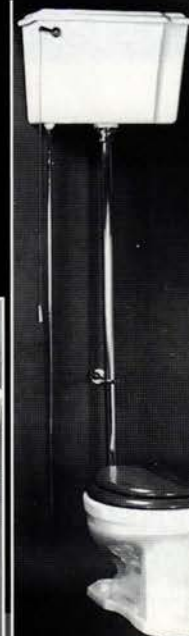
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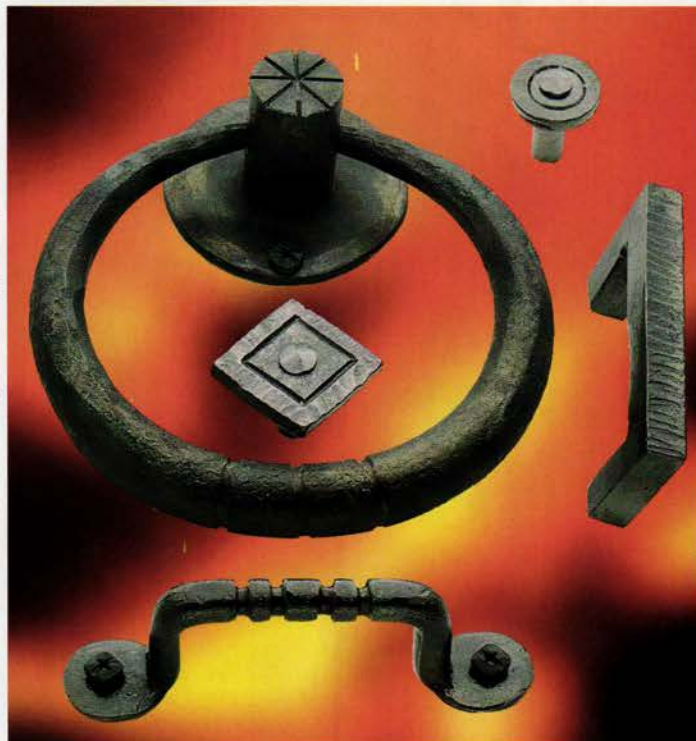
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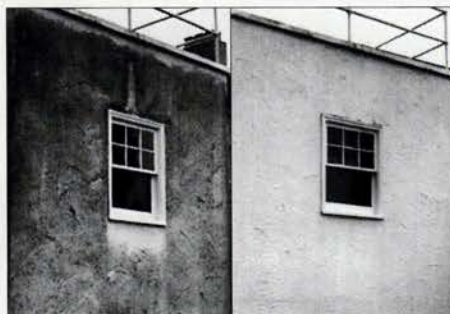
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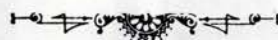
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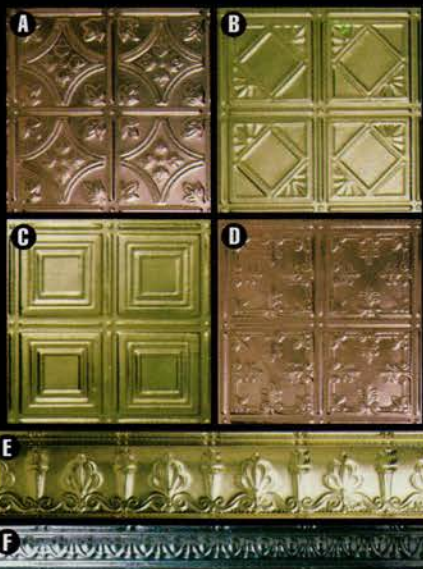
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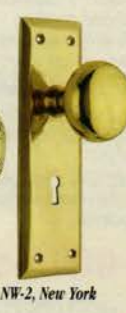
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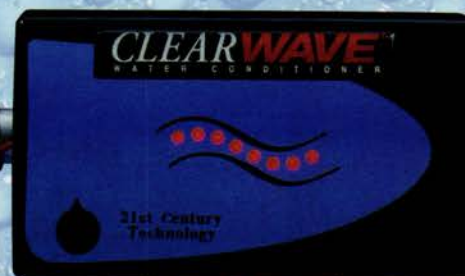
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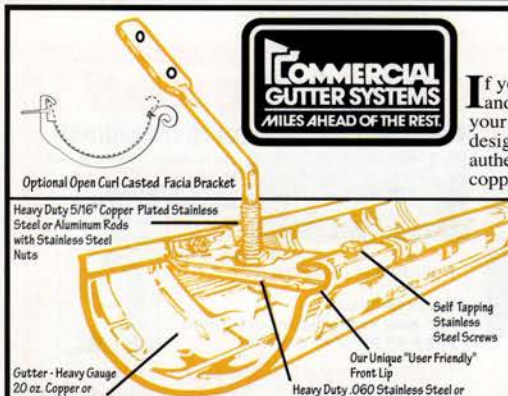
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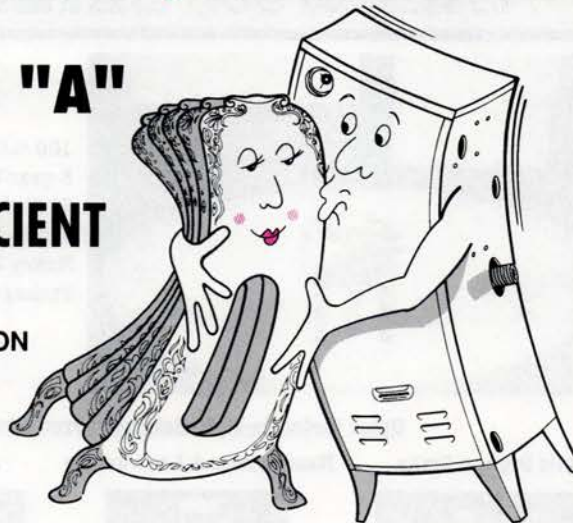
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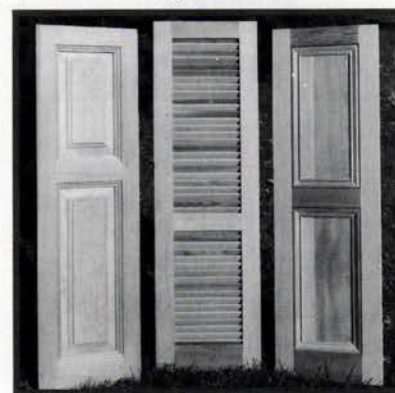


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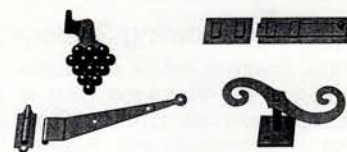
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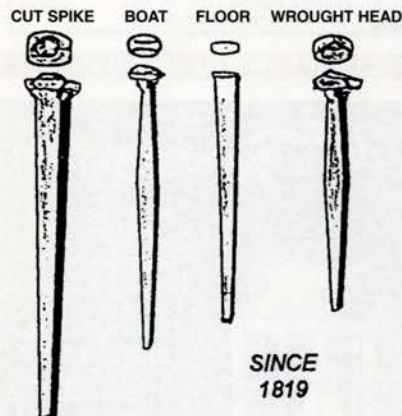
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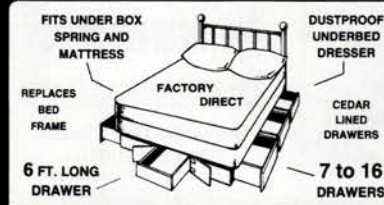
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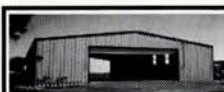
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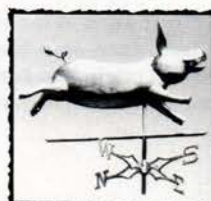
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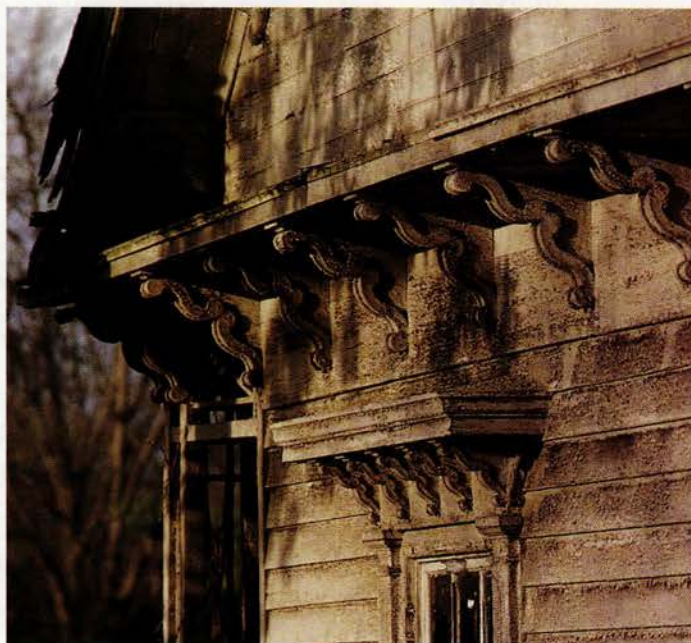
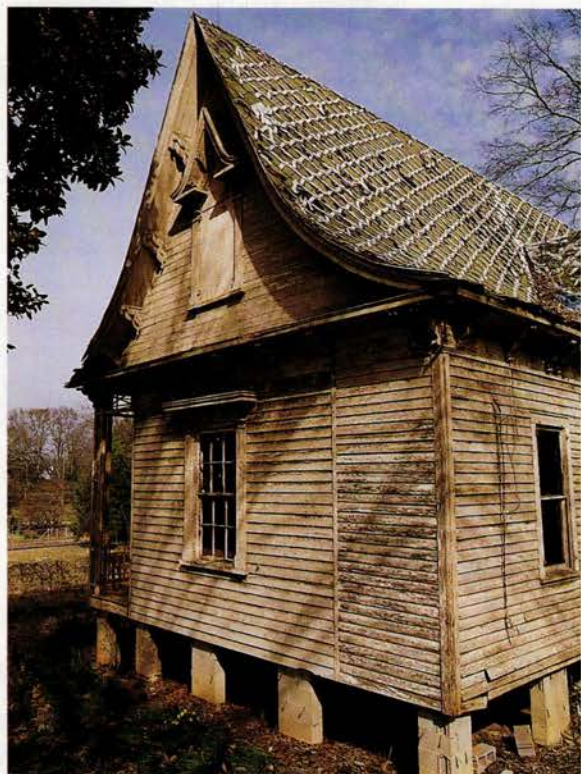


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CONTACT

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The Palmetto Trust for Historic Preservation
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