Special Energy Issue

The Old-House Journal

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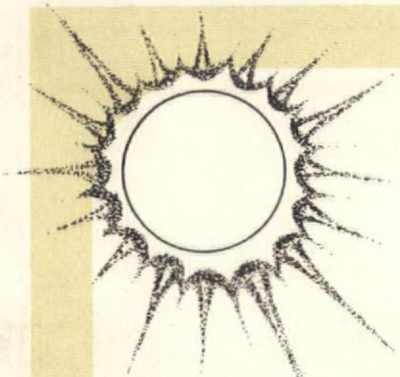
Restoration and Maintenance Techniques For The Antique House

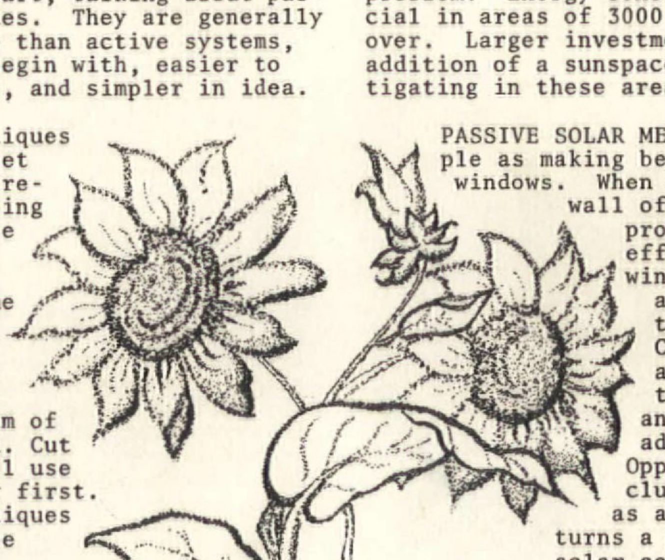


Is The Old House Ready For Solar?

By Ron DiDonno

WHEN WE TALK about retrofitting existing buildings for solar space heating, we're still, for the most part, talking about passive solar techniques. They are generally more cost-effective than active systems, less expensive to begin with, easier to integrate, reliable, and simpler in idea.

PASSIVE SOLAR techniques will usually not meet your total heating requirements. But using the sun can decrease your dependence on purchased energy, and at the same time add pleasant, useable space to your house. Solar techniques must complement a total program of energy conservation. Cut down on your overall use of purchased energy first. Solar heating techniques will only contribute significantly if your house is already energy-efficient.



THE MONEY SPENT on energy conservation measures and solar retrofitting should be proportionate to the scale of the heating problem. Energy conservation becomes crucial in areas of 3000 degree days and over. Larger investments--such as the addition of a sunspace--are worth investigating in these areas.

PASSIVE SOLAR METHODS can be as simple as making better use of existing windows. When the south-facing wall of a building is not prominent, it may be effective to add more windows. (Be aware of aesthetic and structural considerations.) Clerestory windows and skylights, when they are inconspicuous and well-fitted, can add light and warmth. Opportunities even include big projects such as a Trombe wall that turns a masonry wall into a solar collector.

continued on p. 206

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You're Wrong, Mr. Architect!

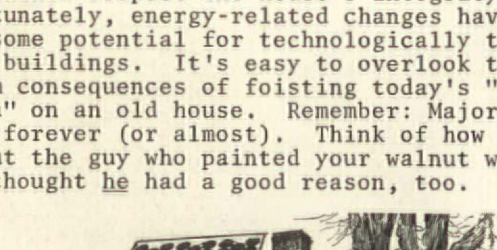
I HAVE AN ARCHITECT FRIEND who recently did some major work on the back of his house. I marveled as he showed me a kitchen addition that allowed the sun to bring in light and warmth. It sat quietly behind the existing dining room, and hadn't changed the proportion or detailing of any room. The kitchen was frankly modern, with new appliances and tile and Formica, but it was expertly handled. He had done it! Here was a passive solar addition, on a very dignified 19th-century house, which hadn't imposed itself on the original structure, which wasn't visible from the street, and which even helped to heat the house.

BEFORE I COULD UTTER one word of praise, though, he said, "You won't like it. I changed some things." I stood accused. The implication was that The Old-House Journal is against any change in any old building.

"YOU'RE WRONG!" I protested. "The Old-House Journal is not against change!" It's just that we're very much <u>for</u> conserving the good things old buildings have to offer.

EVEN THE MOST ROMANTIC of us old-house folks realize that to be useful, buildings must be adapted. Electricity and indoor plumbing were adaptations, as the heating systems of the future will be.

BUT CHANGE should have long-term purpose, and it should respect the house's integrity. Unfortunately, energy-related changes have an awesome potential for technologically trashing old buildings. It's easy to overlook the long-term consequences of foisting today's "great idea" on an old house. Remember: Major changes are forever (or almost). Think of how you felt about the guy who painted your walnut woodwork. He thought <u>he</u> had a good reason, too.



HERE ARE SOME CHANGES we wouldn't blink at: (1) An update of the utilitarian aspects that make a house livable--electricity, plumbing, heating. (2) Sensitive integration of quality modern materials. Formica is as defensible as hardwood in a new kitchen. <u>That's</u> a matter of taste. Just don't rip out fine built-ins to go "high-tech." (3) Use of undistinguished space for necessary updates. For example, solar collectors belong in back of a city house (facing the alley cats), not on the street facade. (4) Changes made for the sake of conservation. Passive solar and storm windows fit right in with the conservation philosophy of those who save the bricks and character that make up an old house.

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WE CAN'T ABIDE CHANGES that compromise the special features of old houses. One should not tamper with: (1) the house's overall shape... roofline against the sky; (2) its facade, its face and expression; (3) its patina, a sense of time that has passed; (4) layout of rooms, which expresses the interior style of a house, and which incidentally may have been reasoned out. (It's hard to close off a cold room in January when you've removed one of its walls.)

My Pet Peeve

SOMETIMES WHEN I VISIT an old building that's been adapted for a new use, I'll be presented with the work of an architect or interior designer who felt he or she had to announce changes made. The announcement is usually made with track lighting and modern gimmicks. "The architect," ventures my host, "felt he (she) had to make a statement."

I HATE STATEMENTS made on old buildings. So many times, the statement is not "honest," but a grotesque intrusion. Very few designers create timeless treasures, though I have nothing against their trying on their own work. Unless you or your architect is a genius, therefore, better to go gentle on an old house. If it shouts "look at me," sorry, it's not good design.

MY SENSITIVE ARCHITECT FRIEND seemed to feel even more comfortable with The Old-House Journal after I said these things. "Why don't you say all that in print?" he challenged. So I did.

Patricia Poore

America's Most Conservative Old House

By Patricia Poore

WITH AN ASTONISHINGLY LOW air-change rate and a brand-new heating system, the house is conservative. That is, it uses a very modest amount of fuel. The people in it, however, cannot be called conservative. With their own energy, OHJ subscribers Harvey and Susan Sachs have made their old house remarkably efficient, at the same time pursuing unusual careers, raising a family, even writing articles for bicycling magazines.

HARVEY AND SUSAN have thrown themselves into energy conservation as if it were a game to be won, playing for low fuel bills, comfortable living, and a pretty old house that hasn't lost a bit of character during its energy update. Paint color and the finish on chestnut woodwork have not been top priorities. This is more a story about just how much can be accomplished when people with great energy unleash it on caulk and insulated ducts.

"WE BOUGHT the house in July '79, and looking at a $2300-a-year heating bill, I realized I had a lot of questions that didn't have answers," says Harvey Sachs. "I tried to answer my own questions...then I just got into it!"

IN FACT, Sachs, a member of the Geology Faculty at Princeton University, is considering a switch from geology research to full-time work in the field of energy conservation. More and more, he finds himself working with colleagues at Princeton's ten-year-old Center for Energy and Environmental Studies. Susan, too, has been dedicated to the energy upgrading of the house. Once the game was begun, it took precedence over general rehabilitation and decorating.

IT WAS THEIR CAREERS that brought the Sachs to Cranbury. (Sue majored in electrical engineering in college, then took a PhD in systems engineering; she's presently a Member of the Technical Staff at Bell Laboratories, where she constructs mathematical models of the behavior of computers.) Harvey and Sue worked several towns apart in rural/suburban New Jersey; so they decided to settle in a town somewhere in between.

A FEW TOWNS were passed over because Harvey and Sue simply had no feeling for their anonymity: "Other towns left us cold. How did they hang together? What kind of feeling was behind the town? Cranbury was small, appealing, there's a low turnover, and we got a good mortgage arrangement."

The Sachs' house in Cranbury, N.J. The door was probably on the front facade at one time, but previous owners moved it around to the side when they enclosed a porch. The Sachs will leave it as it is, because the air lock prevents wind from whizzing into the house.

CRANBURY, with a downtown population of 1700 (it's 2300 counting outlying farms), still has a good stock of pre-1920 houses. It also boasts three tract-house developments, built during the 1960s. The Sachs could have afforded two out of the three developments. Why didn't they buy a predictable, new house? "It just wasn't interesting."

THEY'D LIVED in older houses before. Without giving it much thought, it had always seemed that "there was something missing in new buildings." The house in Cranbury is old and comfortable and has restoration potential, but it's rather plain and the Sachs had no extraordinary intentions. "I thought I'd just put in a new boiler, insulate some walls, and strip woodwork for the fun of it," admits Harvey. "It was a bigger job than I expected."

NONE OF THE FINAL finishing has been done on the Sachs house yet, so it's easy for Harvey to point to all the energy conservation measures. The secret to a lower fuel bill, it would seem, is simple: PAY ATTENTION TO DETAILS. There are no futuristic gizmos, solar paraphernalia, or magic boxes in the Sachs house. But there's a lot of caulk, cellulose insulation, and weatherstripping. Infiltration and air movement were checked in every conceivable nook and cranny.

THE HEATING EQUIPMENT is efficient, another important factor. Out went the converted oil furnace, and in came a brand-new, gas-fired, forced hot air system. It meant a new plant, new ductwork, vents, and the loss of cast-iron radiators, but Harvey figures the payback on the whole system plus sidewall insulation will be about four years, including loan payments.

THERE IS an unusually complete record of the work that was done on the house, and what it accomplished. Sachs had help through the Princeton House Doctors, the group of energy conservation specialists who have created new standards for upgrading the efficiency and tightness of existing structures. (They're best-known for their Twin Rivers project in New Jersey.)

The partially-stripped chestnut woodwork, between parlor and enclosed porch

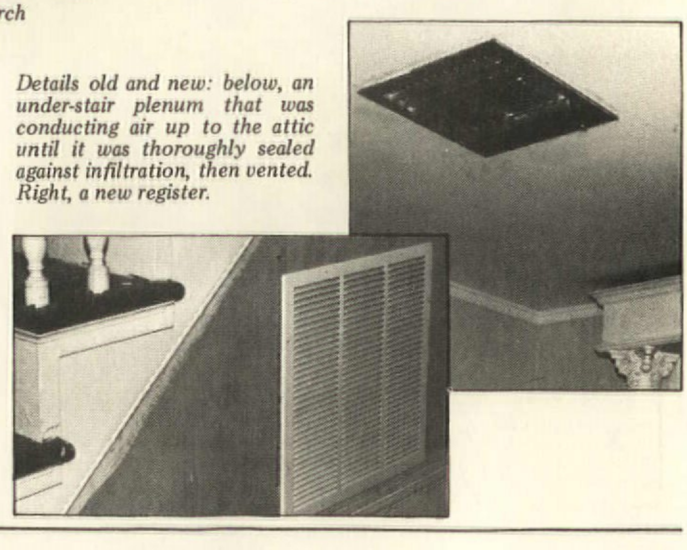
THE SACHS' house was monitored for indoor air quality and infiltration rates by Lawrence-Berkeley Labs' mobile laboratory (the trailer shown on the next page). In the process, Harvey and company had to create as tight a house as they possibly could. It became something of a game, too: Do everything possible to decrease ventilation in the house, then monitor the air to see if the indoor "pollutants" of everyday life would reach unacceptable levels. Harvey went as far as putting the hot-water heater in the kitchen, then retrofitting it with an automatic flue damper, just to increase combustion-gas levels.

THE CONCLUSION for this house in New Jersey: Despite the fact that the air change per hour rate went way down, indoor air quality was not affected in any significant way, judging by readings taken both before and after the house was tightened. Harvey and Sue felt no bad effects all winter and, as Harvey made clear, they would not have tolerated any condition that would have made the house less healthy for their son.

NOW THAT Harvey and Sue have some answers for their questions, they have a practical plan for the rest of the house. First, they want to get the dining room, living room, and family room in shape. A bookcase inspired by the interior of the house will be built in next to the simple mantel which, they recently discovered, was originally marbleized (it's really made of wood). The chestnut woodwork, not original to the 1850s portion of the house but added during a refurbishing around 1890, has been stripped of paint, and awaits final cleaning and refinishing.

The mantel was originally marbleized. Chemicals would remove marbling as well as paint, so a scalpel will be used.

SOME TENTATIVE PLANS have been set for the master bedroom and kitchen after that. Another major project may have to come first, however. Outside, the house will need painting in the next year or two. And this is the paint job, Harvey realizes, that will require much scraping. The paint buildup is quite heavy. He may opt for using the "self-stripping house" method: letting sections of the house peel annually, then just touching up after scraping and priming those areas.



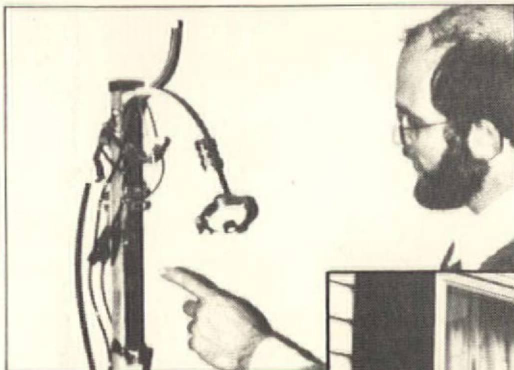
Details old and new: below, an under-stair plenum that was conducting air up to the attic until it was thoroughly sealed against infiltration, then vented. Right, a new register.

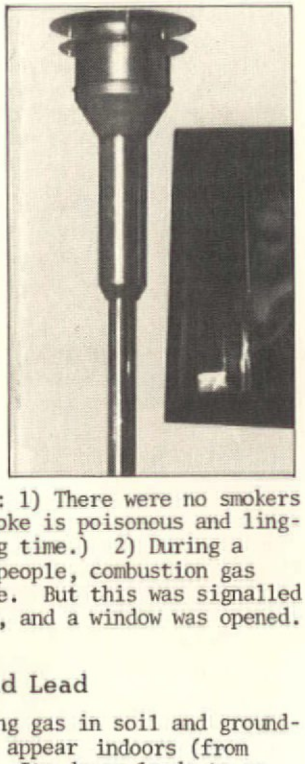
All About Indoor Air Quality

WHAT HAPPENS to the quality of the air you breathe when ventilation goes way down because of decreased infiltration? The Sachs house was monitored by a mobile laboratory-in-a-trailer for five weeks last winter. The trailer is part of the Energy Efficient Buildings program of Lawrence-Berkeley Labs (sponsored in part by the U. of California, and funded by the U.S. Dept. of Energy). Newer buildings are usually the subjects of study, but through happy coincidence, the old house they picked near Princeton belongs to Sachs, a scientist and OHJ subscriber.

THE HOUSE was measured for infiltration rate and indoor "pollutants"...then tightened up...then measured again. Ventilation was decreased with caulk and plaster, weatherstripping, a new attic hatch, plastic taped over all windows, etc. Cellulose was blown into exterior wall cavities as well as attic floor, and was cost-effective because (1) there was a full $1\frac{1}{2}$" cavity outside the brick nogging, and (2) the "world's best insulation contractor" did the job (Lee Allen, see p. 200).

THROUGH the use of a tracer gas (SF_6), a blower door (a contraption that pressurizes indoor air), and infra-red cameras, infiltration was checked more than would normally be possible. The ACH (air change per hour) was brought down to .2-.8 (avg. .45). This was a surprisingly low ACH, approaching that of efficient new construction.





Below left, the Automatic Dichotomous Air Sampler. Left, Harvey with the temperature and humidity "tree."

THIS HOUSE had no significant change in air quality. A couple of factors are important in interpreting this: 1) There were no smokers in the house. (Cigarette smoke is poisonous and lingers for an exceptionally long time.) 2) During a Thanksgiving cook-in for 31 people, combustion gas levels (chiefly CO_2) did rise. But this was signalled by a temperature rise to 75°, and a window was opened.

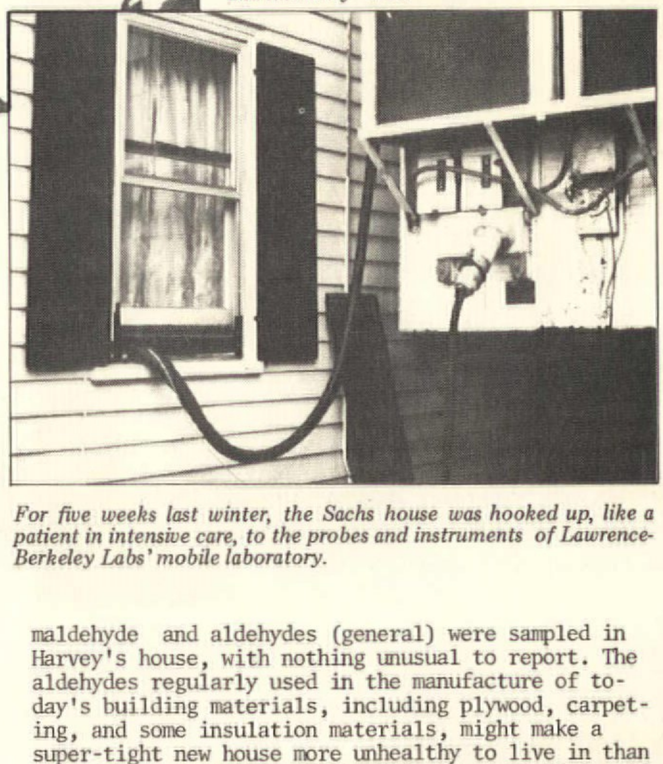
Radon and Lead

RADON is a naturally-occurring gas in soil and groundwater. Concentrations of it appear indoors (from shower spray, for example). Its decay leads to radio-active particulate matter in the air. Radon concentrations in the Sachs house remained at about 2.5-3.0 pico-curies/liter: normal for N.J. However, a newer house in Maryland with an ACH of .07-.25 (avg. .15) had radon levels up to 20-30 pico-curies/liter: unacceptable. How do you know if your soil is high in radon concentration? You don't, off-hand; soil must be tested. High radon concentration, or concern over any element in the air, doesn't mean you can't have an energy-efficient house. You'll just need an air-to-air heat exchanger, for winter ventilation with minimal heat loss.

LEAD WAS ONE of the particulates monitored by the Automatic Dichotomous Air Sampler, a fancy dust collector. Twice during the monitoring period, Harvey spent 45 minutes to an hour stripping lead-based paint with a heat gun. The average amount of lead (breathable particulates, under 15 microns) did not rise for the 24-hour period covering his use of the gun. That's somewhat reassuring--but remember, the reading was a 24-hour average, not for the specific time he worked.

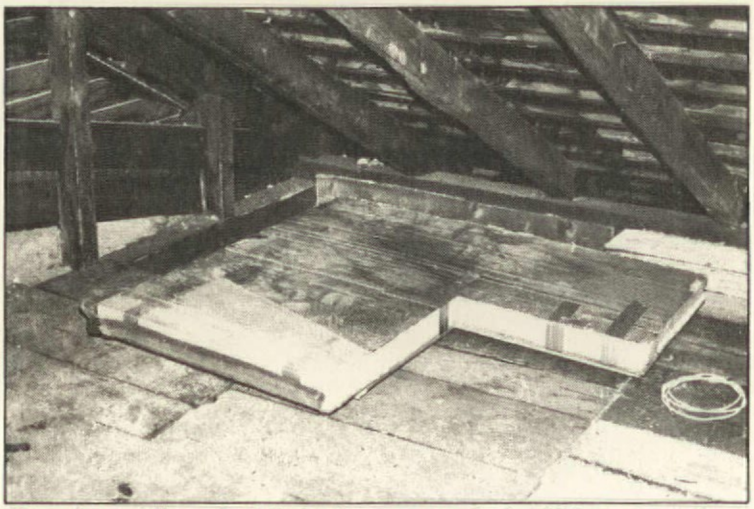
Old vs. New

THERE'S STILL a lot of research to be done on the effect of low ventilation on the air we breathe indoors, whether the house is new or old, whatever our activities. Formaldehyde and aldehydes (general) were sampled in Harvey's house, with nothing unusual to report. The aldehydes regularly used in the manufacture of today's building materials, including plywood, carpeting, and some insulation materials, might make a super-tight new house more unhealthy to live in than an old house which has long-since "de-gassed" itself. There's some concern, as yet undocumented, that gut renovations of older buildings, which greatly increase the tightness of the structure and introduce new building components, may have the same hazards associated with new buildings.

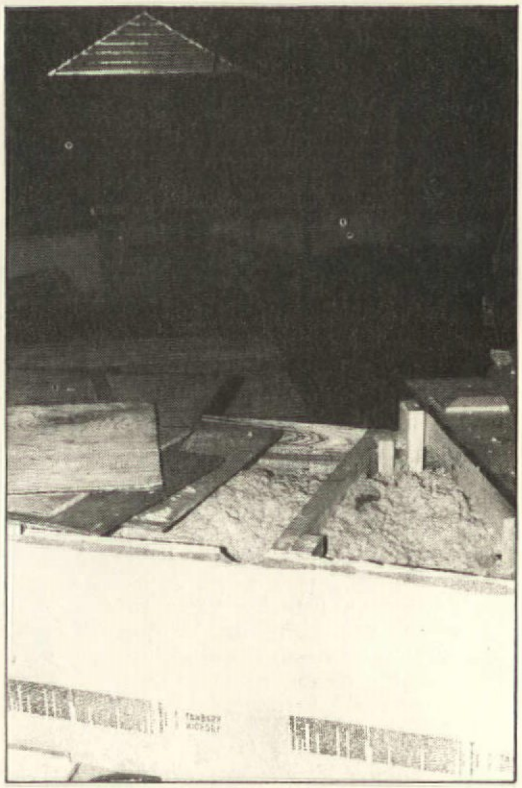


For five weeks last winter, the Sachs house was hooked up, like a patient in intensive care, to the probes and instruments of Lawrence-Berkeley Labs' mobile laboratory.

Publication of the data on Sachs' house will come after the ASHRAE symposium in Houston in January 1982. For more information on the Energy Efficient Buildings (EEB) program of Lawrence-Berkeley Labs (LBL), contact Craig D. Hollowell, Building Ventilation and Indoor Air Quality Program, LBL, 1 Cyclotron Rd., Berkeley, CA 94720.



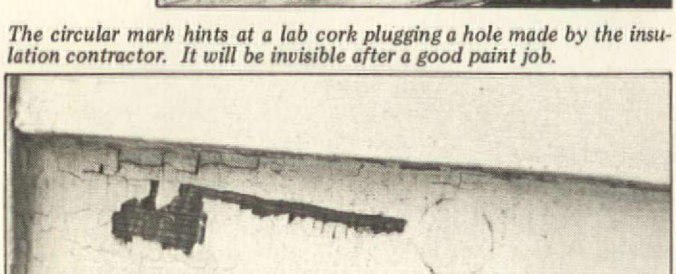
Harvey's specially-made attic hatch, constructed of rigid isocyanurate foam board (R-8 per inch), fire-protected with plasterboard faces, and gasketed to seal all edges when in place.



Loose cellulose insulation was blown into the space under attic floorboards (left). A boxed enclosure was built around all attic ductwork for the new forced-air system, and filled with cellulose (right). Notice, too, the necessary gable vent in the back.

No infiltration here: baseboards on exterior walls were removed for plastering behind, then replaced. Similarly, crown mouldings were temporarily removed so seam between ceiling and walls could be caulked.

The circular mark hints at a lab cork plugging a hole made by the insulation contractor. It will be invisible after a good paint job.



IT WAS THE SACHS' passionate interest in taking things down to the last detail that made theirs the most energy-conserving old house in America. When they put that ability to work in restoration, they will certainly be as proud of the house's character as its fuel bills. Harvey says it was all this hard work of increasing efficiency that allows them the luxury of owning an old house to fix up.

HARVEY SACHS is a serious man with a head full of numbers and untried ideas. But there's contemplation and a do-good sense behind his energy:

"I LIKE to reuse things...when I bought the '64 Dodge, it was just sitting around for a year. I brought it back to life. Same with the bicycles. We don't buy junk, but old ones that can be adapted and fixed up. That's the way the house was for us.

"UNDERSTAND, we don't expect to be here in ten years. No, we don't want a bigger house...if anything, smaller. We've taken this house about as far as we can. That goes for any old (or existing) house. If we went much further it wouldn't be the same house. And it's got to make economic sense.

"IF I WANT to carry my ideas further, we'd have to build. So my next house will be new."

SPECIAL THANKS to Harvey and Susan Sachs for sharing with us the important work going on in their old house. My thanks also go to Rodger Young at Lawrence-Berkeley Labs for his help. --P. Poore

COURSE OHJ E-2: **ENERGY AUDITS, CONSULTANTS, & CONTRACTORS**

MEETS: **Sept. 1981, The Old-House Journal**

INSTRUCTOR: **Mr. Blandy**

STUDENTS ARE REQUESTED to review their notes from last year's Course OHJ E-1: the September 1980 Special Energy Issue. While not a prerequisite for this course, it covered a great deal of information pertinent to the topics that will be discussed here.

Energy Conservation

WE'LL BEGIN WITH energy conservation. You can expect to save a lot, even in old buildings (especially in old buildings), because you usually start with an inefficient building envelope with an inefficient heating plant. Don't settle for anything less than an amazingly low fuel bill, even though it may take more than one heating season. You must become as sensitive and knowledgeable about energy flows as you have become about other matters of maintenance, construction, and restoration in an old house, if you are to reduce your heat use so as to keep abreast (or even ahead) of inflation. You just have to know what to do and persist and persist.

ALMOST INVARIABLY an efficient house will be more comfortable as well, as there will be fewer drafts and more humidity retained. Less air movement and higher humidity means you can lower the thermostat setting without sacrificing comfort. This is the most effective way of saving energy. Every degree reduction is worth about 4% of your fuel bill. In houses that are really tightened up, as well as in warmer climates, the saving will be greater than 4% per degree.

MUCH OF THE WORK can be done inexpensively, either by yourself or with some help. But there are other improvements that will require some real money ($1500 and up, depending on the size of the building), which will be worth doing because the yield is so great. On the other hand, avoid spending a bundle on some items just for the sake of doing something. Some people will buy a new furnace or whatever because it's a thing, new, shiny, and therefore satisfying, without evaluating how it contributes to the overall goal. (OHJ readers probably will be less susceptible to this sort of thing. Our vanity is tickled by more esoteric items such as repointing, stenciling, etc.)

Thinking Twice

THERE ARE TWO KINDS of heating changes that I would think twice about. One is a wood stove. Is wood going to stay cheaper than other fuels? Moreover, how long are you going to continue to enjoy cutting, loading, unloading, and splitting? Remember that hilarious expense list that starts out with chain saw and pickup truck, and ends with the divorce settlement? Then there is chimney maintenance. I'm wondering how I'm going to clean and line a 150-year-old, 40-foot-high flue that connects the sky to my Jotul in the basement.

THE OTHER AREA where I have reservations is solar. Except perhaps for water heating in some cases, solar isn't cost-effective compared to energy conservation--isn't even in the same league. Unless there are some other non-monetary reasons (aesthetics or growing plants or you just can't help yourself), don't bother. Honest solar experts will unwillingly agree with me on this. Put another way: Cut down energy loss, and the sunlight that does happen to come in will contribute more significantly.

Energy Audits

AN ENERGY AUDIT, for anyone who doesn't already know, is an appraisal of a building's energy use, given by utilities, consultants like myself, and others. Any respectable audit will deal not only with the exterior envelope of the building but with the heating system, major appliances (especially water heater), and the habits of the occupants. It's analogous to a medical treatment: examination, diagnosis, prescription.

IN AN AUDIT, numbers are invoked. ("Invoke": "address in prayer or supplication...summon or conjure by means of sorcery"--Funk & Wagnalls.) Numbers are like language in that they can be made to say almost anything. Nevertheless, I recommend that you get an energy audit, especially if you think that you don't have a feel for the subject. You can scarcely help but learn something. Get more than one, if they aren't too expensive. Some contractors offer one for free; more on that later. And do one yourself: See the sidebar on this page.

Yardsticks

THIS DESCRIPTION of two excellent energy contractors is intended as a kind of yardstick. Very few others will measure up, but there are more good ones now than there used to be. Lee Allen's The Energy Savers is in Hightstown, New Jersey, and Bill Streit's All-Star Insulation is in Chelmsford, Massachusetts. The two men are friends and learn from each other. Streit buys his insulation-blowing rigs from Allen and learned the business from him.

BOTH COMPANIES conduct a respectable "walk-through" audit, going through the house with the customer from bottom to top. Allen's audit form has over a hundred items to be checked out, many of which do not relate to anything The Energy Savers sells. Generally speaking, the idea is that while you have the customer's attention on energy, you feed it with information, and the sale comes as a natural consequence at the end. Pushiness at the beginning turns people off, while knowledge allows them to sell themselves.

THE AUDIT FORM does not have any calculations. Once the customer is interested, then Allen uses another form, along with a programmable calculator, to figure out savings, paybacks, etc. The customer then signs a proposal form, including a 2-page Terms & Conditions. Designed to protect the contractor, this document contains some very interesting explanations.

ALL IN ALL, it's a very good service. They both know a lot and have read all the technical papers. Allen has learned a lot from the Princeton House Doctors (and they from him). They have integrity, are meticulous about the whole job, and they use a very good machine, perhaps the best. So if you are fortunate enough to live in or near New Jersey or in the eastern Massachusetts/lower New Hampshire area, then you should consider The Energy Savers or All-Star, respectively. Otherwise, you'll have to look around for the best people near you.

Don't be too impressed by the fact that this or that audit is done "by a computer." It's the quality of the inspection that counts. Calculations can be done with a hand calculator or even with pencil and paper. The computers just do them faster. If you care to follow this short-cut description of the calculations, you can find the payback (in years) of any energy-saving step. Even if you don't use the calculations yourself, this should demystify all those numbers. (Students with extreme math anxiety may go on to the next page.)

1. LOSS THROUGH CONDUCTION

$$L = A/R = BTU/hr./°\Delta t$$

Conduction **Loss** = the **Area** (sq.ft.) of a building element (all windows OR all doors OR all uninsulated walls, etc.) divided by its **R-value***.

This is the same as the BTUs (heat) lost per hour per degree of temperature difference between inside and outside air.

Do this for each of the following parts of the envelope. With a little chart, you can see where heat is being lost. Let's assume this is a small house with no insulation or storm windows:

CEILING	A/R = 1000/3 = 333
FLOOR	A/R = 1000/5 = 200
WALLS	A/R = 1160/4 = 290
WINDOWS & DOORS	A/R = 150/1 = 150

2. LOSS THROUGH INFILTRATION

$$L = V \times .02 \times ACH = BTU/hr./°\Delta t$$

Infiltration is figured in Air Changes per Hour (ACH). **Loss** = **Volume** (floor area times height of room) x the heat capacity of air (a constant: **.02**) x **ACH**.

How do you find ACH? You punt. It's a guess based on experience. An "average" house might have an ACH between 1 and 2. An unweatherstripped, uncaulked house with loose walls and rattling windows will be 2.5 plus. Break a window pane or two and you're up to 5 or 10. Wind also increases ACH. So assuming the little house above has an ACH of 2:

Infiltration = 9000 (cu.ft.) x .02 x 2 = 360

Comparing infiltration Loss with the conduction Losses above, it's clear that the infiltration and ceiling are the biggest culprits.

3. IMPROVEMENTS

To get the improved Loss after an energy-saving retrofit, just add the R-value of the new installation to the old R-value in the denominator:

$$L_{improved} = \frac{A}{R\ (original) + R(improved)}$$

In Part 1 we determined that the ceiling (1000 sq. ft. with an R-value of 3) would have a loss of 333 BTUs per hour per degree of temperature difference between inside and outside air. Let's say we add insulation of R-19 to the ceiling.

Original L	Improved L	L saved
1000/3 = 333	1000/3 + 19 = 46	333 - 46 = 287, or 86%

Now, fuel savings per year can be calculated by multiplying the **L saved** x **24 hrs.** x **degree days***. This sum is divided by **furnace efficiency** (a percentage number you know if you have a new furnace or have had an efficiency test performed) x the **heat content** per unit of fuel:

$$\frac{L \times 24 \times DD}{Efficiency \times Heat\ content} = FS$$

In the example above, the savings in gallons of oil would be:

$$\frac{287 \times 24 \times 5000\ \text{(DD for New York City)}}{.7\ \text{(i.e., 70\%)} \times 140{,}000\ \text{(BTU per gallon)}} = 351\ \text{gallons}$$

For infiltration improvements, just estimate what the new ACH will be and run its calculation through again in similar fashion.

THE PAYBACK in years is determined by dividing the cost of the insulation by the cost of that 351 gallons saved per year.

Believe it or not, that's the entire basis for all the heat calculations that engineers do on any building.

*See Glossary, p. 218

Lee Allen's Terms & Conditions Condensed

1. All work to be done to be in writing beforehand.
2. Work to be done at our schedule; deposit required, Right of Recession (change your mind in 3 days).
3. Cost you extra if you're not at home at the agreed time.
4. Payment upon completion.
5. Workmanlike manner, industry standards followed, repair damage, clean up.
6. Homeowner provides electricity.
7. Sidewall procedures:
   —All cavities thoroughly probed in all directions for obstructions. If encountered, more holes drilled to get to blocked-off portion of cavity.
   —Wood Siding: Either drill, plug, spackle, and prime holes, or siding carefully removed, sheathing drilled, siding replaced. Broken siding repaired or replaced and primed.
   —Asbestos Shingles: May break. We'll make the best repair we can but replacements are impossible to find.
   —Aluminum Siding: Difficult to remove and replace; it will have minor dents and kinks.
   —Vinyl Siding: Brittle in cold weather. We prefer above 50 degrees, otherwise owner's responsibility to replace damaged siding.
   —New areas of siding or touch-up paint may appear different from surrounding areas.
8. Infrared scan, if provided, is not to result in withholding of payment unless written so. Arrange for scan during cold weather.
9. Interior finish should be hole- and crack-free. Insulation escaping through gaps is owner's responsibility.
10. Minimal moving of belongings in basement or attic is assumed, otherwise $50 per hour (crew of 2).
11. Sometimes impossible to do some of work quoted. Partial refund will be given in such a case.
12. Do everything possible to satisfy. Better Business Bureau arbitration if agreement not reached.

Sold On Cellulose

FIRST LET'S TALK ABOUT insulation materials. I am willing to be a little dogmatic here: Based on both considerable listening to experts and my own reading, I believe that properly installed cellulose is better than anything else for sidewalls and attics. (I even prefer it in new construction or reconstruction.) At this moment, I know of no serious problems with cellulose--but I know a lot of advantages.

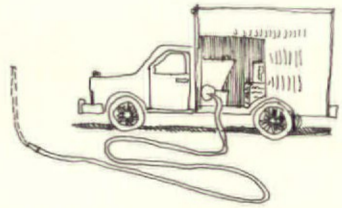
UNLIKE UREA-FOAM, cellulose has no safety problem. Unlike fiberglass or rock wool, there is no skin irritation problem. (Cellulose is treated with boric acid, however, so it's still a good idea to wear a mask when handling it.) It should go without saying by now that you have to take care of existing moisture problems before installing any insulation. But unlike fiberglass, cellulose absorbs moisture, so it can prevent condensation from forming immediately in low vapor situations. It is non-flammable, and may even inhibit the spread of fire. It can penetrate anywhere and won't settle appreciably when installed at the correct density. It is made from recycled material. Lastly, it may be dense enough to have some effect on infiltration. Cellulose had problems several years ago, but they were solved by uniform federal spec that everyone adheres to (HH-I-515D). The bags should have complete data on amounts, proper density, etc.

IN SOME PLACES it is impossible to use cellulose. The great virtue and usefulness of fiberglass, aside from its cheapness, is that it has a shape, unlike loose fill materials like cellulose, and yet is still flexible, unlike rigid board materials. Fiberglass is still incomparable for wadding up and stuffing into large gaps and holes to stop air flows.

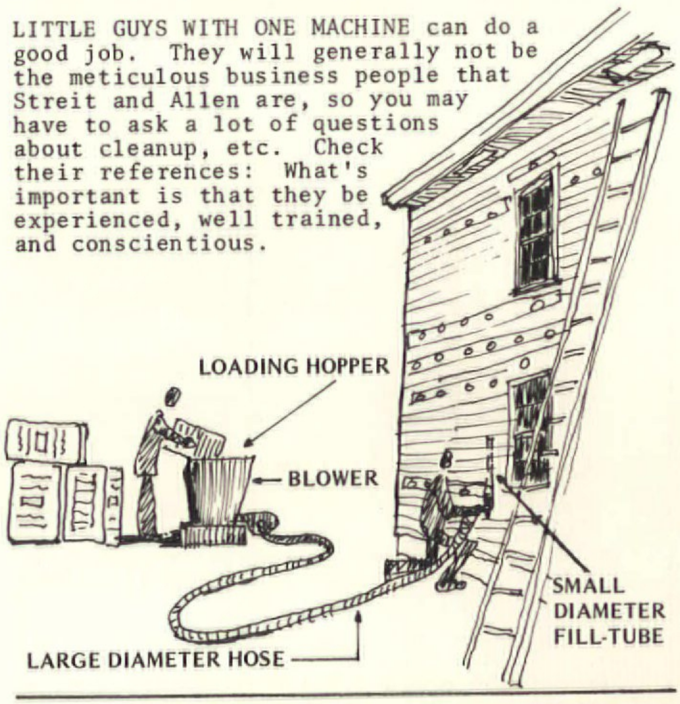
Installations & Installers

CELLULOSE CAN BE PUT INTO WALLS with several types of machines. A small, portable machine is OK, provided it has a flexible fill-tube that's actually shoved up or down the cavity, delivering the stuff to its place. These machines are relatively cheap and small entrepreneurs can afford them. Lee Allen tells me that a small operator can get into business for as little as $15,000.

ANOTHER TYPE is the large, truck-mounted machine. There is no fill-tube and the hose is plugged into the hole. Provided the holes are sufficiently close together, this type can blast it in to pack up or down. The deluxe one is the Lee Allen machine. It is truck-mounted and has a fill-tube along with an automatic shut-off at the correct density. The operator shoves the fill-tube up or down in the cavity and waits until the machine slows down or stops from the back-pressure. He then withdraws the tube a little and the blower resumes delivering.



LITTLE GUYS WITH ONE MACHINE can do a good job. They will generally not be the meticulous business people that Streit and Allen are, so you may have to ask a lot of questions about cleanup, etc. Check their references: What's important is that they be experienced, well trained, and conscientious.



Small machine uses a fill-tube for installing cellulose into walls.

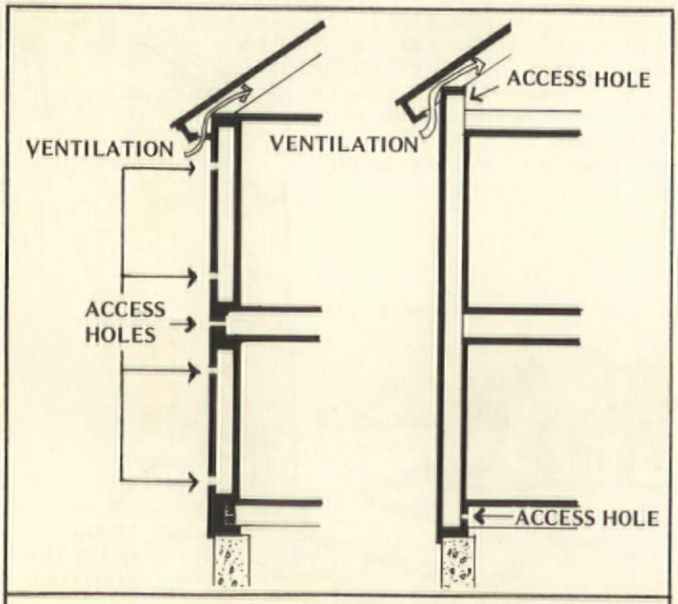
SMALL CONTRACTORS may be a little defensive if quizzed, because they know they aren't big and impressive. But they should be knowledgeable. An integral part of roof insulation is adequate ventilation above it. Therefore, any good contractor should be equipped to put in vents. A small outfit in our area includes an infrared scan in the price and calls in a consultant with the equipment. This gave me a good feeling: The man wasn't afraid to have his work scrutinized.

CONTRACTORS SHOULD NOT BE ALLOWED to touch anything that requires special skills other than theirs. If you are particular about appearances, then you should have the siding removed for the installation holes, not drilled and plugged--plugging tends not to be done well enough to be undetectable. It's a good general rule to keep insulation people from perforating stucco walls or climbing on slate roofs.

Life Of A Salesperson

ANY FIRM, GOOD, BAD, OR INDIFFERENT, that has been in business for a number of years will have its sales pitch down pat and competent salespeople to deliver it--and it will almost always sound convincing. It will have been tested on folks like you and known to be effective a good percentage of the time. Part of the reason it will sound convincing is that the salesperson believes it. Be aware of the possible manipulation going on and try to get to the substance of the matter. Ask yourself if what is being said is essentially true--is the product or service a good one? If it is, then consider what facet of it you need in your particular circumstances. This last part is important because you are presumably trying to use a limited budget in the most cost-effective way.

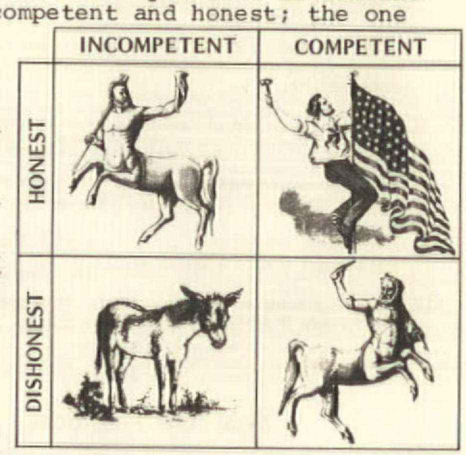
A CASE IN POINT: The Pink Panther is telling us all to put insulation in our attics, over stuff already in place. In many instances, this procedure will have far less effect than if you were to spend the same amount of time and money elsewhere. OK product, inappropriate use. Do your homework. The more you know about something, the more able you are to evaluate what a salesperson is telling you.



This diagram shows the access points for blown-in wall insulation for houses that have platform framing (left) or balloon framing (right).

RESIST THE TEMPTATION TO SHOW OFF. Instead, ask questions--some of which you may know the answers to--and compare the salespeople's responses. Test their backgrounds by asking as many appropriate questions on the subject as you can think of. Some salespeople know only the pitch that they have been taught, and beyond that, they're lost. Reaching the end of a salesperson's knowledge is like driving off the end of a paved road; what had been a smooth ride is suddenly very bumpy, with swerves to the left and right. Or an abrupt stop--that's what the smart ones do: admit what they don't know. (Except of course the real smart ones, the con artists. If you're with one of them, you won't know it anyway, and there's no help for you. Generally, however, those super-powered types won't be out selling insulation.)

The kind of contractor you want is someone who is both competent and honest; the one to avoid at all costs is someone who is incompetent and dishonest. The field also has some people who are competent but dishonest, or who are honest but incompetent. It's hard to say which of those two is worse, but if you have to settle for one of them, be sure to oversee them through all their work.



IF YOU'RE STARTING OUT with very little knowledge, then the best thing to do is talk to a number of people. The answers that come out the same from different sources are probably true. The ones that vary are probably shaped to show off strong points and minimize weak ones. Your best bet, of course, is to talk directly to bosses. They should know what they are talking about, and should be less apt to make silly statements.

I ALSO BELIEVE in politeness and respect, even for those whom you decide you don't like. If someone tells you a story and you know it, don't start accusing unless you know that the person is a real rascal. After all, you're in control; you just don't buy. You don't have to humiliate people as well. (Besides, you could be wrong, and they right.)

TOM BLANDY is a registered architect in Troy, New York. He is co-author of *All Through the House, A Guide to Home Weatherization* (McGraw-Hill Paperback, 1980). His article on the Princeton House Doctors will appear in the October issue of Mechanix Illustrated.

Restoration Basics
Part 6

Energy-Saving Fundamentals

By Clem Labine

IN THIS ISSUE on energy conservation, we're looking at topics the OHJ has not discussed before. But that doesn't mean we're losing sight of the fundamentals. If you have just bought an old house, and little has been done to make it energy-efficient, your first step should be to read the OHJ's Sept. 1980 Special Issue on energy (see box on pg. 205). In this article, we'll review the simplest energy-saving steps that have the most dramatic impact on your fuel bills. And we'll work up to those other steps that still make sense...but which have a longer payback period.

AN OLD HOUSE is not inherently an energy waster. If your house is 100 years old, remember that fuel wasn't cheap a century ago; the original owners were as anxious to save energy as you are. Two things have changed during your home's lifetime, however: (1) People expect to be warmer indoors during winter than they used to; (2) The fittings on your house have loosened so it is probably more drafty than it used to be.

LIVING AT A CONSTANT 72° year-round is energy wasteful. The first step on the road to saving energy is realizing that we're going to feel warmer in summer and cooler in winter. Saving energy is not a matter of buying this or that gadget. It is more a matter of attitude.

THE FASTEST, SUREST WAY to fuel savings in winter is to cut back the thermostat and buy wool sweaters. Every degree cutback on the thermostat can save about 4% on your fuel bill. Worthwhile savings will also come from lowering the setting on your hot water heater. Also, take advantage of any built-in energy saving features in the house: Use doors to close off unused rooms; enter by doorways that are sheltered from the wind; operate shutters and drapes to take advantage of solar gain by day and to cut heat loss at night.

Envelope Vs. Heating Plant

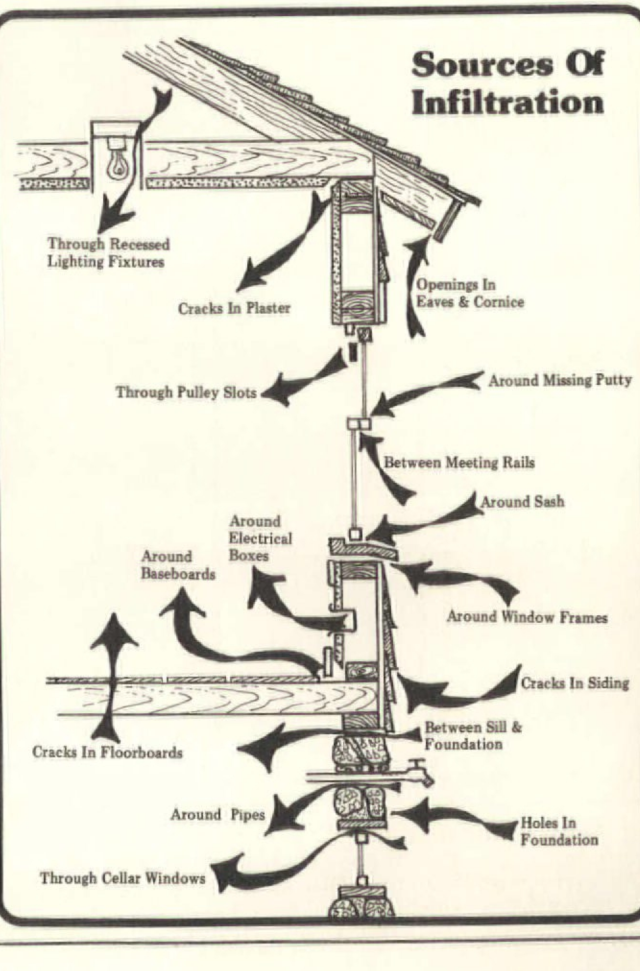
WITHIN THE STRUCTURE ITSELF, there are two major elements to consider: (1) The building envelope; (2) The heating plant. The envelope and heating plant are related in a chicken-and-egg way. It is critical that the heating plant be sized correctly for your home's BTU loss (in fact, slightly undersized is best). But as you take steps to tighten the envelope, you reduce the BTU loss. And so, the furnace that used to be the correct size now becomes oversized--and thus less efficient.

IF YOU HAVE A HEATING PLANT that is more than 15 years old, it may be a candidate for replacement (see Ward Bucher's article on pg. 210). But...you shouldn't replace the heating plant until you have taken every possible step to tighten the envelope. Only then can you get a new unit that's optimum for the new condition of the building.

Fight Infiltration

IN THE AVERAGE OLD HOUSE, infiltration of air through holes and cracks is the biggest source of heat loss. There is no single "quick fix" to solve air infiltration; it requires a lot of perseverance with caulk, weatherstripping and fistfuls of fiberglass. But as the story of the Sachs house on pg. 195 shows, patient work can make a "drafty old house" as tight as the most energy-efficient new construction.

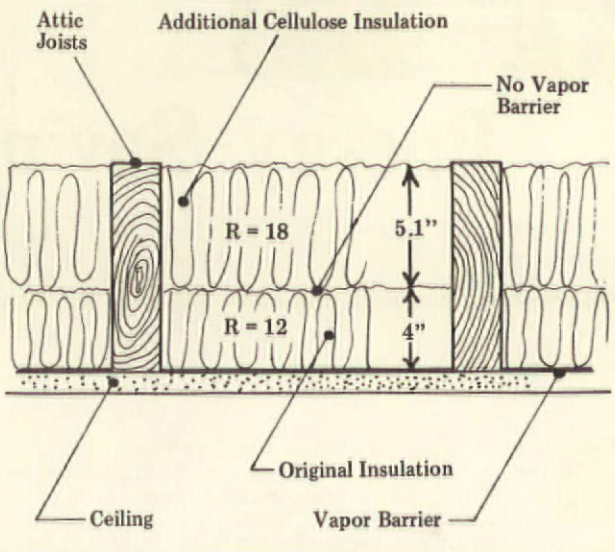
Sources Of Infiltration



ONE POINT not widely understood is the importance of caulking on the INSIDE of the structure. A tremendous amount of air can leak around baseboards, window casings, electrical outlets, etc. By caulking on the inside you not only stop this infiltration; you also stop migration of interior moisture into the walls where it could cause condensation problems.

IN ADDITION, be sure to stuff with fiberglass all holes in the foundation wall where pipes and utilities pass through. Also stuff pipe chases and other openings from the cellar that lead up into wall partitions (especially important in balloon frame construction). And be sure all chimney flue dampers close tightly.

REDUCING INFILTRATION has the fastest payback of any energy-saving step you take. The materials used are cheap, and the results can be dramatic.



In many parts of the country, recommended R-value for attic insulation is 30. If your attic has less than the recommended amount, adding a "topping layer" of new insulation can be worthwhile.

Attic Insulation

AFTER REDUCING air infiltration, your next step should be attic insulation. Your attic should be insulated to the recommended R-value shown on pg. 109 of the Sept. 1980 OHJ. In the Midwest and much of the Northeast, for example, the recommended R-value is 30. Existing attic insulation can be assigned an R-value of 3 per in. For instance, if you have 4 in. of existing insulation. that's an R-value of 12. If you live in Chicago, Ill., the recommended R-value is 30. That means your attic could use an additional 18 units of R-value. If you are putting in loose-fill cellulose insulation (R = 3.5 per in.), that means you could add 5.1 inches of cellulose (18/3.5) and get an adequate return on your investment.

TWO SAFETY NOTES--When adding attic insulation: (1) Be sure not to cover boxes for recessed lighting fixtures in the ceiling below; (2) Don't block the soffit vents in the eaves or cornice.

THE BASIC, LOW-COST ENERGY-CONSERVATION STEPS

(Saving Energy Without Technological Trashing)

1. Make use of house's inherent conservation features: Close off rooms; use sheltered entrances; use shutters to maximize solar gain and minimize heat loss.

2. Lower thermostat; buy sweaters.

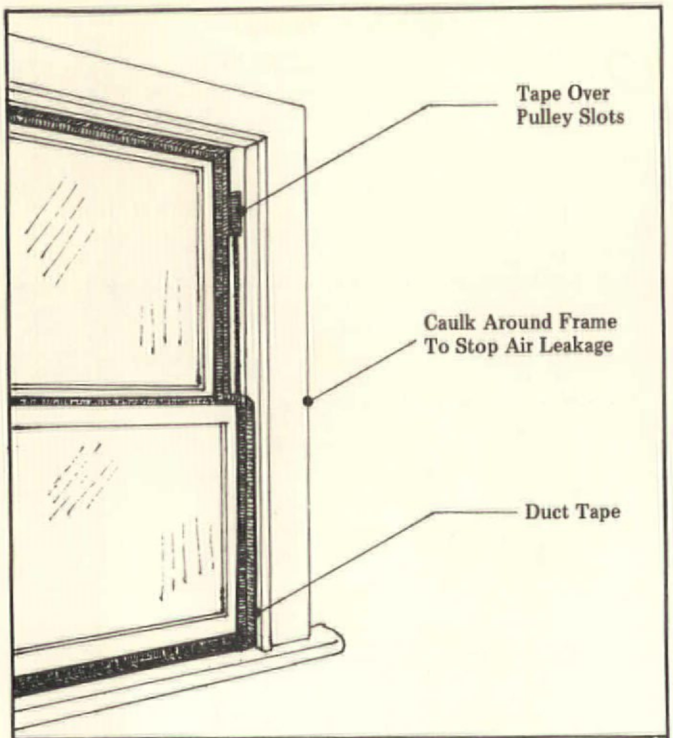
3. Reduce air infiltration: Weatherstrip doors and windows; caulk interior; seal electrical outlets; seal off "secret passages" in interior partitions.

4. Install attic insulation.

5. Weatherize windows: Block infiltration; install storms or double glazing; install night insulation.

6. Install sidewall insulation.

7. Update heating plant.



Duct tape around window sash and across the junction of the meeting rails is a quick, cheap way to stop infiltration losses. Taping plastic sheeting inside the frame is a good temporary way to stop conduction losses—until you can install storm windows or double glazing.

About Windows

WINDOWS are the most troublesome part of the envelope-tightening process. About 20% of the heat loss from an unimproved building flows through windows. An old, single-glazed, loose-fitting, uncaulked, unweatherstripped window leaks heat in several ways:

(1) INFILTRATION--Air leaks through cracks around frame, sash, and glass. Infiltration can be thwarted with caulk, putty and weatherstripping.

(2) CONDUCTION--Glass is a good conductor of heat. Great amounts of heat are lost through single-glazed windows. The function of storm windows or double-glazed windows is to put a layer of still air (a very poor conductor) between the cold outer glass and the warm inner glass.

(3) CONVECTION--Cold window glass creates convection currents, giving rise to the complaint: "I feel a draft!" Convection currents make you feel colder at any given air temperature than you would if the air were still (for the same reason that fans make you feel cooler). When there are no convection currents, you can turn the thermostat down further without feeling any chillier.

THE SIMPLEST AND CHEAPEST improvement you can make to drafty single-glazed windows is to tape plastic sheeting to the interior frame. It's not elegant, but it's a very cost-effective temporary expedient.

AFTER CAULKING, weatherstripping and adding storm windows (or double glazing), the last step to consider is movable insulation. This allows the warming rays of the sun to come through the windows on winter days, while blocking heat loss at night. For details, see the book "Movable Insulation," listed at the end of this article.

Wall Insulation

NEXT STEP after windows is to consider blowing insulation into the side walls of the house. Before taking this step, however, be sure you understand the potential hazard from moisture condensation in cold climates. (See Sept. 1980 OHJ). As noted earlier, risk of condensation can be minimized if you completely tighten the inside of your building envelope.

ALL THE STEPS you take on the interior to block air infiltration (caulking, gaskets on electrical boxes, etc.) will also reduce the amount of moist air getting into the walls. Pay special attention to high-moisture areas like bathrooms, laundries and kitchens. You might want to provide vent fans to give moisture a direct path to the outdoors.

ONCE YOU HAVE taken care of the basics, you could look into additional measures such as solar hot water heating. This is becoming more economical as energy costs go up. In certain cases, increasing south glazing or adding a sunspace can also be considered. Beware: (1) The increase in glazing should only be done on the back or side of a house where it won't mar the appearance; (2) When you increase the glazing area, make sure you use double glazing--or make provision for movable insulation. Otherwise, the large glass area can lose as much heat at night as it gains during the day.

THE BASIC BOOKS

THE ENERGY-EFFICIENT OLD HOUSE—Energy conservation Special Issue of The Old-House Journal, Sept. 1980. Reviews all the basic how-tos of insulation, caulking, weatherstripping, weatherizing old windows, inherent energy-saving features of old houses. Tells how to save energy without technologically trashing your old house. $2.00. Order from: The Old-House Journal, 69A Seventh Avenue, Brooklyn, N.Y. 11217.

MOVABLE INSULATION—By William K. Langdon. To be truly energy-efficient, windows require night insulation (also called movable insulation) to prevent heat loss through the glass. Since window sizes vary greatly, much movable window insulation is of the do-it-yourself variety. Langdon's book is the definitive manual on why and how to make your own. $9.95 softcover; $14.95 hardcover. Order from: Rodale Press, Organic Park, Dept. OHJ, Emmaus, PA 18049.

THE COMPLETE BOOK OF INSULATING—By Larry Gay. A good over-all manual on the how-to and where-to of insulation. Also covers caulking, weatherstripping, and other aspects of tightening your house. $7.95 + $1 postage. Order from: Stephen Greene Press, Box 1000, Dept. OHJ, Fessenden Rd., Brattleboro, VT 05301.

FROM THE WALLS IN—By Charles Wing. A sensitive look at how to adapt up-to-date weatherizing procedures to the older house. Has special section on historic house styles. $9.95 + $1.00 postage. Order from: Little, Brown Co., 200 West St., Dept. OHJ, Waltham, MA 02154.

HOME REMEDIES / A GUIDEBOOK FOR RESIDENTIAL RETROFIT—Ed. by Tom Wilson. This helpful how-to volume is the result of the first National Retrofit Conference held in Princeton, N.J., in 1980. Several of the contributors to this volume are members of the Princeton House Doctors, a leading retrofit organization referred to elsewhere in this issue. $10.00. Order from: Mid-Atlantic Solar Energy Assn., 2233 Gray's Ferry Ave., Dept. OHJ, Philadelphia, PA 19146.

ALL THROUGH THE HOUSE / A GUIDE TO HOME WEATHERIZATION —By Thomas Blandy and Denis Lamoreaux. Written by the same author who wrote the article on insulation contractors (pg. 199), this book presents the over-all concepts and mathematics you need to diagnose your home's energy-saving needs. Numerous charming pen-and-ink drawings illustrate the many ways your house wastes energy. The book gives you plenty of common-sense tips, options and solutions. $7.95 + $1 postage. Order from: McGraw-Hill Book Co., Order Service—Dept. OHJ, Princeton Road, Hightstown, N.J. 08520.

READY FOR SOLAR, cont'd from p. 193

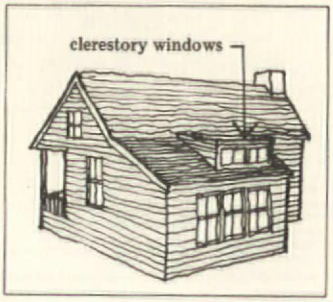
BUT I THINK sunspaces hold the most promise for old-house owners who want to increase solar gain.

Sunspaces

ATTACHED SUNSPACES exceed other passive solar techniques in terms of special amenities. Increased south glazing almost always adds natural daylighting, view to the outside, and the perception of a larger, more open space; the attached sunspace, in addition, adds room for sitting, dining, even growing plants and vegetables. Because of this latter use, sunspaces are often called greenhouses.

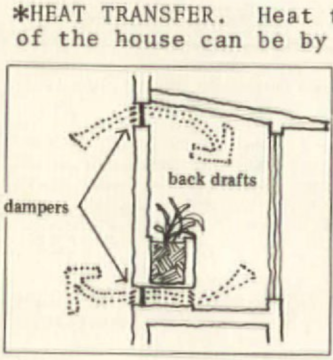
A SUNSPACE is a separate space from the rooms that it helps to heat. While the rooms of a house seldom have temperature fluctuations in excess of 10°F., a sunspace can fluctuate more than 35°. Its principal features are these:

*GLAZING. The glass should be placed to maximize winter solar gain and minimize summer gain. Invariably, the ideal surface is a south-facing vertical glass wall or clerestory window.



*STORAGE. To prevent all heat gained from going directly into the air in the sunspace, masonry, earth, and/or water should be provided for heat storage.

*HEAT TRANSFER. Heat transfer into the rest of the house can be by natural convection or aided by a fan. If by natural convection, back-draft dampers are mounted at the top and bottom of the wall between the sunspace and adjacent room. The bottom damper permits a flow of air into the sunspace; at the top, the warmed air exits. Dampers should close to prohibit the reverse flow at night when the space cools down. A fan would require a heat sensor in the top of the sunspace to activate its use. Hot air is drawn off and blown down to spaces or storage. Again, cooler room air returns at the bottom of the sunspace.

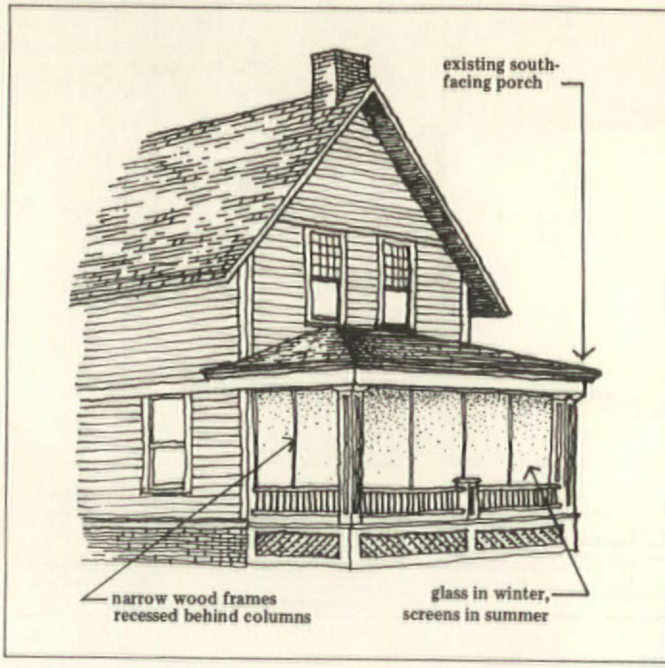


*MOVABLE INSULATION. Although not always critical to the functioning of a sunspace, movable insulation is desirable: It both lowers temperature fluctuation and insulates the sunspace against the cold, dark night.

THERE ARE FOUR MAJOR WAYS for you to create a sunspace, some more advantageous than others. (1) You can adapt an existing space, such as a south-facing porch or extension room. (2) Select and install a purchased, pre-fab or kit type greenhouse. (3) Design and construct a ground-level, attached sunspace. (4) Design and construct a rooftop sunspace.

Option 1: Adapt

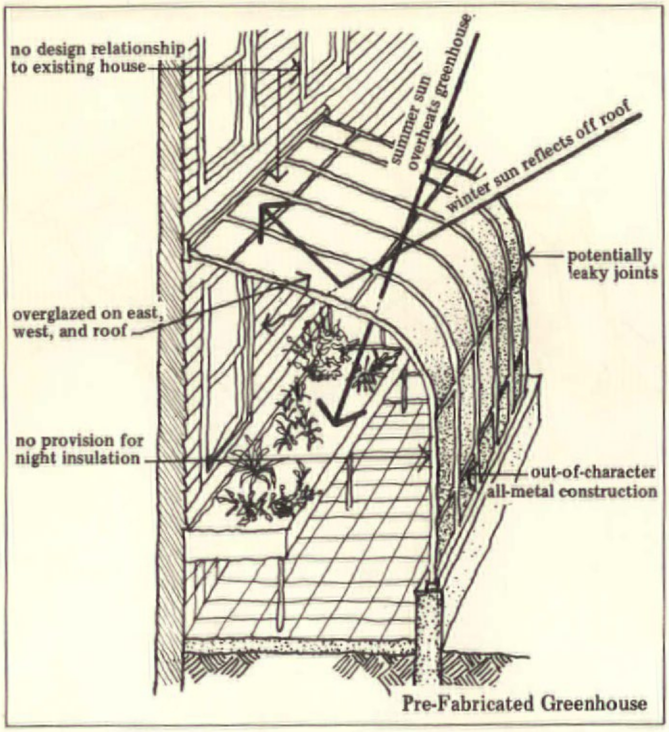
PORCHES ARE IDEAL because they can readily be fitted with removable framed glass panels, as illustrated. In the summer, glass can be removed and stored, or replaced with screens. If properly detailed, the framed glass can be unobtrusive and designed for the architecture. On the other hand, we've all seen converted porches that are a visual mess.



THE ISSUE of thermal storage poses more of a problem for an existing house. If the wall between the sunspace and room to be heated is masonry and the sun strikes it, the problem is solved. But if storage must be added, it's likely that existing wood floors will have to be partially or fully removed and rebuilt to make way for footings, foundations, and masonry structural systems. (Thermal mass is heavy.) If direct solar gain is rather low and adding storage is costly (which might be the case in an old house), you may do better to avoid storage. Any heat flowing into the house during sunny days could be utilized for auxiliary space heat; but nothing would remain for evenings and cloudy days. Savings would therefore result only if the heating system responded to complement the solar gain.

Option 2: Pre-Fab

GREENHOUSES have been used for many years to extend the plant growing season year-round, but their use for space heating is recent and highly problematic. A well-designed sunspace places glass to maximize winter gain and minimize summer gain. Most greenhouses have glass walls and roof with little or no provision for summer shading. In the winter, the wall readily collects the sun's energy. The roof, however, is not nearly as efficient, as the sun's rays strike it at an acute angle, causing much of the heat to reflect away. In the summer, the inverse is true. With the sun high overhead, excessive gain is admitted through the roof.



Pre-Fabricated Greenhouse

OTHER PROBLEMS result from usual construction practices and detailing. While most old houses are either wood or masonry with wood construction, pre-fab greenhouses are normally aluminum with glass or plastic. A basic problem is one of aesthetics. The old house and greenhouse have vastly different materials, proportions, and detailing, and are difficult to integrate into a cohesive design.

FUNCTIONAL PROBLEMS also result. Most greenhouses are entirely glass with minimal framing. Most also are only single-glazed and often not well sealed. While the glass wall is collecting heat, the heat may be lost through infiltration and conduction losses. Add to this the difficulty of providing movable insulation on so many surfaces...obviously, one should closely scrutinize this method before adopting it as a passive solar strategy.

Option 3: Ground-Level

ONE OF the most difficult but effective answers is the new design of an attached sunspace. Architectural style is established by the existing house. Shape, proportion, mass, and detailing must be as carefully considered as energy issues. The sunspace design on the next page is an attempt to satisfy all these criteria.

GLAZING IS LOCATED on vertical south and, to a lesser extent, east and west walls. These surfaces provide good solar collection in winter. The overhangs (which echo the existing deep eaves) also shade the south glass. As the masonry floor and wall inside heat up, they transfer heat to the air within the sunspace. When a significant temperature difference occurs between the rooms in the house and the sunspace, air is convected into the space via dampers. The system is self-regulating if equipped with back-draft dampers. The only intervention required is the opening and closing of thermal shades morning and evening.

Option 4: Rooftop

THE ROOFTOP SUNSPACE is an ideal solution for flat-roofed buildings, such as city rowhouses. It can often be added with minimal disturbance to the existing building, and it can be made to work regardless of the building's orientation to the sun. Because little or none of it is visible from the street, it can be optimally designed for solar gain, no matter what the house's style.

THE SHAPE of the urban sunspace on the next page reflects an optimal solar shape. Most of the glass is on the south surface, and tilted to be roughly perpendicular to the winter sun. Its roof and north walls are shaped to cut down on surface area. This roof structure is of metal, non-combustible construction (often required by code).

WHEN THE TEMPERATURE of the heated air exceeds 85°, a sensor at the top of the sunspace activates a fan which draws air from the sunspace and ducts it down to rooms below. When the sunspace cools, the fan stops and a back-draft damper prevents air from convecting back to the sunspace. Return air complements the system by opening and closing a second vent to permit recirculation.

A BACK-UP HEATING SYSTEM adjusts to maintain constant room temperature. Storage is not provided because its weight would necessitate expensive rebuilding to bring the load all the way down to ground level. On cold evenings, removable insulated panels are placed over glass surfaces to minimize night-time loss.

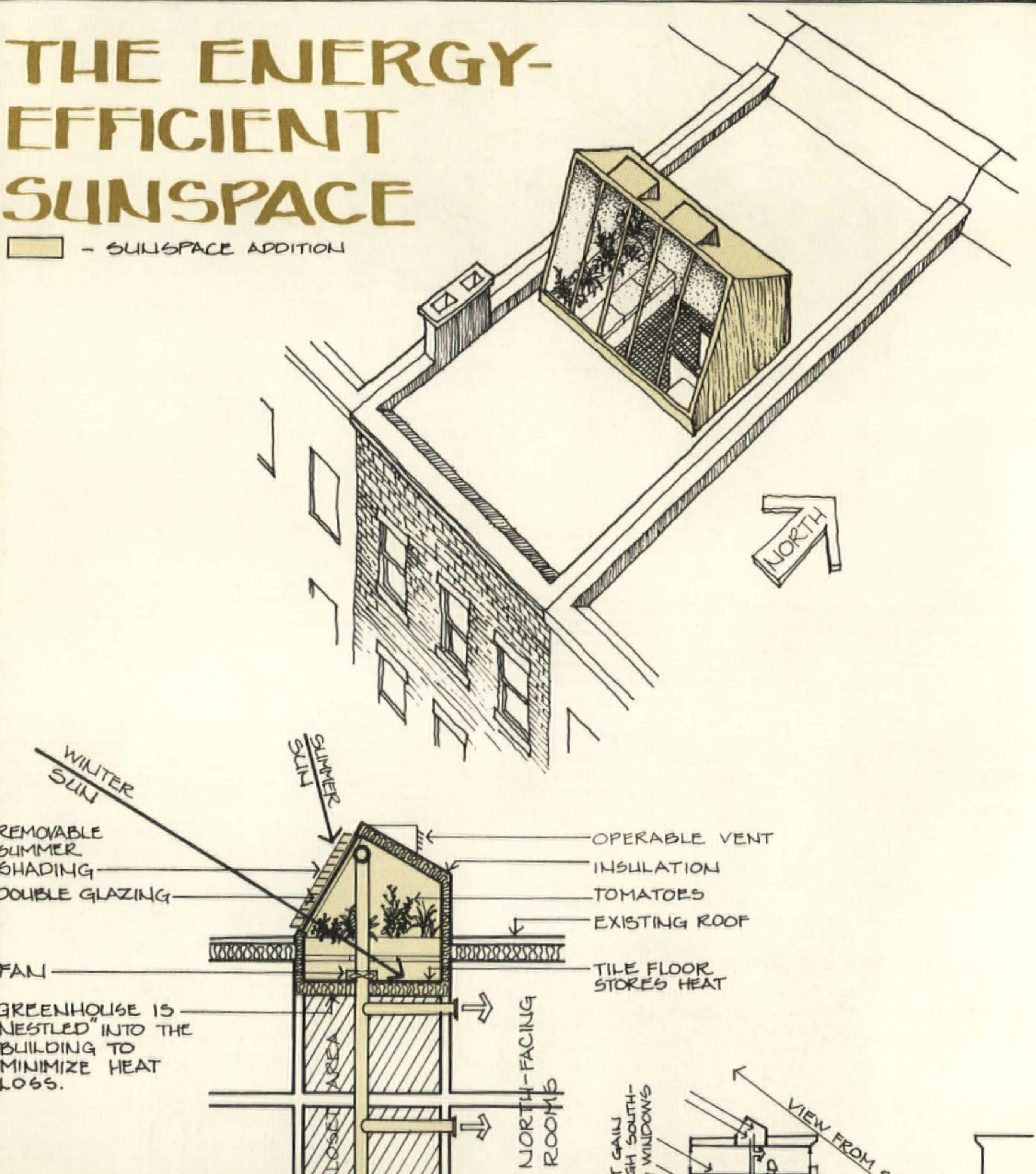
IN THIS SHORT ARTICLE, I've put forth a few suggestions for adding solar capacity to your old house. I must add one last caution: Whenever possible, seek competent professional help. If the solar method you choose is simple, a few hours of consultation will probably be sufficient. And if the method is complex, all the more reason to seek full-scaled architectural or engineering services. Fees will add 10 to 25% to the cost, but it's money well spent. A WELL-MEANING BUT IMPROPERLY INSTALLED SOLAR RETROFIT CAN CAUSE STRUCTURAL DAMAGE TO YOUR HOUSE OR A NEIGHBORING BUILDING, OR SIMPLY ADD GREAT COST TO THE HOUSE WITH LITTLE OR NO POSITIVE REDUCTION IN ENERGY COSTS.

IS THE OLD HOUSE ready for solar? The answer is yes for essentially passive systems--carried through with sensitivity and forethought.

The author suggests that those serious about making passive solar changes read the book Passive Solar Energy, by Edward Mazria. The $24.95 professional edition is recommended, as it contains additional solar tables and printed acetates that aid in siting. Order from Rodale Press, 33 E. Minor St., Dept. OHJ, Emmaus, PA 18049.

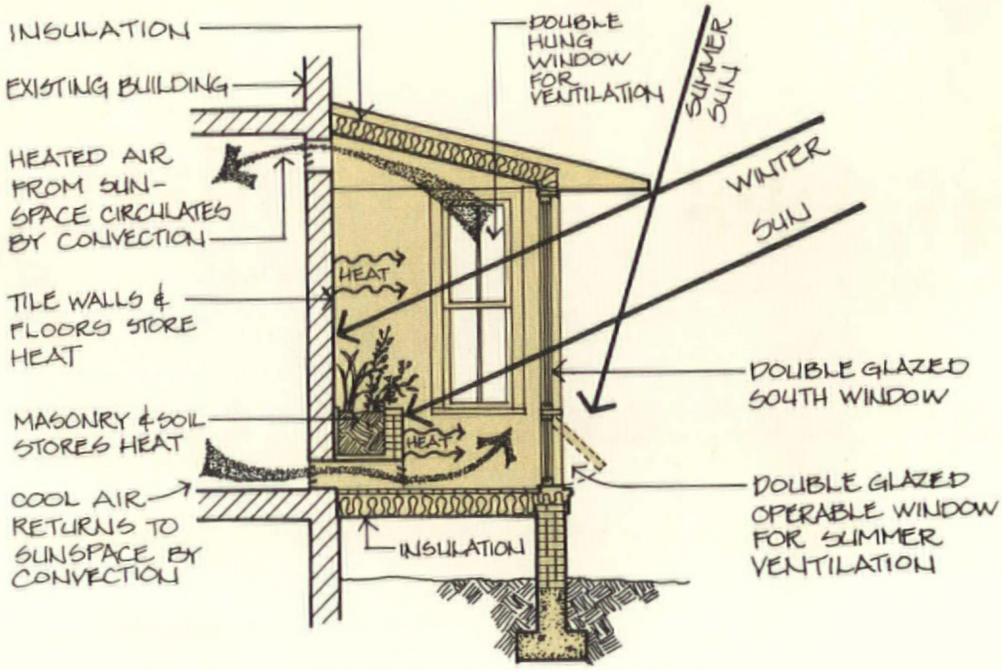
ARCHITECT RON DIDONNO recently won a Design and Retrofit Competition Award from the New York State Energy Research and Development Authority for the rooftop sunspace design described in this article. DiDonno is a design professor at Pratt Institute School of Architecture, and maintains an architectural office in Brooklyn.

THE ENERGY-EFFICIENT SUNSPACE



ROOFTOP GREENHOUSE

Restoration Design File#9

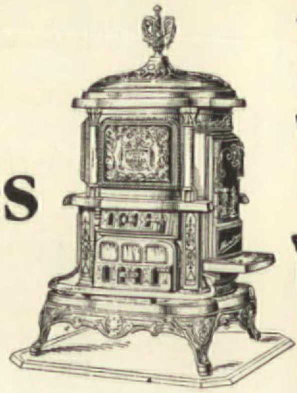


SECTION

ATTACHED SUNSPACE

JONATHAN POORE 8-81

Heating Alternatives



By Wm. Ward Bucher, Architect

STOP! Don't read this article until you have taken all of the energy conservation measures recommended by The Old-House Journal. Reduce infiltration, add insulation, even buy a new energy-efficient refrigerator before considering a new heating system for your house. All of these things will save you more money at less cost than switching to a new fuel.

THAT ADVICE is the only thing all of the energy experts agree upon. From here on, you're in the jungle of hungry salesmen promoting their favorite products, fuels and ideas. However, there is a path to follow that will lead you to the best decision for your home.

THE TWO MAJOR CHOICES are: (1) Type of fuel; and (2) Type of system to buy. The fuel is a variable annual expense, while the system is a one-time capital investment. But obviously, the type of system you use will affect fuel consumption and your annual bills.

COST OF FUEL varies tremendously depending upon where you live. Electricity is 5 times more expensive in New York City than in Seattle. Natural gas has a smaller price range, but is still half as expensive in Kansas City as it is in New York City. On the other hand, #2 fuel oil varies little in price.

First Step

TO DO A RIGOROUS analysis of your heating options, your first step is to find out fuel costs in your area. Keep in mind that utility companies have special rates for different amounts of use and times of year. Among the fuels you'd evaluate would be oil, electricity, gas (natural or liquefied petroleum), and (perhaps) wood.

YOU MUST ALSO determine how much heat your house loses during winter months. This can be gotten from an energy audit, which many utilities will perform free or for a small fee. The outcome of energy audits can vary with different inspectors, so if possible get an audit from both the gas and electric companies for cross-checking. A good heating contractor will also be able to advise on required heating for your home, but his "audit" is more likely to be based on experience than actual calculations.

Heating Systems

THE TRAIL is covered with if's and's and but's when you try to discover the single most economical heating system. You start the evaluation by getting (1) cost for the particular fuel; (2) the amount of heat produced by the fuel; and (3) the efficiency of the system being evaluated.

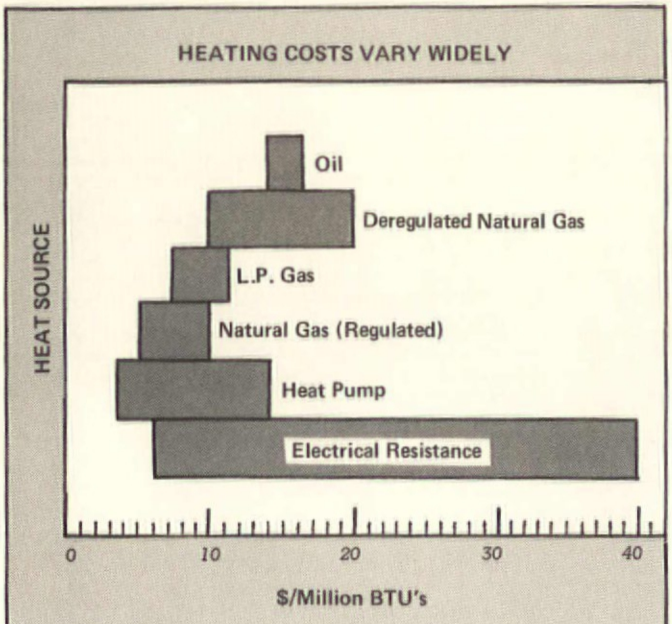
CLEARLY, the most expensive house to heat is one in New York that uses electrical resistance. In other parts of the country, though, electricity may provide cheaper heat than some other systems. Electrical resistance heat might be particularly appropriate in a large older house which is only partially occupied in the winter. With baseboard units that have individual thermostats, you can lower heat drastically in unused rooms. (Don't go below 50° F. inside or the paint may peel.)

OIL HEAT is usually more expensive than gas at today's prices. (The price advantage of gas may be eliminated if it is deregulated.) Nevertheless, in northern climates where gas is not available, and electricity is expensive, oil could be the least costly alternative.

GAS IS IN MANY WAYS a good solution for the older house. It requires less maintenance than oil, is cost-competitive, and can be easily adapted to most existing heat distribution systems.

The Heat Pump

HEAT PUMPS are relatively new for home heating. The heat pump functions like a reversible air conditioner. It pumps heat out of the house during the summer and into the house during the winter. Its great advantage is that it produces more heat than the amount of energy it takes to run the motor. While conventional heating systems are between 50 to 90% efficient, a standard heat pump is 200% efficient. With low-cost electricity, it provides the cheapest heating.



NOTE: Range shown indicates highest and lowest prices in U.S. as of June, 1981.

THE HEAT PUMP does have some disadvantages for an old house. Because it can't generate high temperatures, the heat pump is used only for hot air heating (air-to-air heat pump). This means removing the hot water (or steam) radiators and installing large air ducts, which can be aesthetically traumatic for your house. On the other hand, you can use the same ducts for the air conditioning, which is part of the heat pump system.

ONE PRODUCT which avoids large ducts is the Space-pak heat pump system manufactured by Dunham-Bush.* It uses high-velocity air, circulating in small 6-in.-dia. ducts, which can be threaded through closets and joist spaces. It seems ideal for use in old houses, although I don't know anyone who has personal experience with it.

ANOTHER TYPE of heat pump is the self-contained through-the-wall type. Generally, it is about the size of a large air conditioner and is mounted through a hole in an outside wall of the house. It supplies hot or cold air directly into the room where it is located. Its advantages are that it avoids ductwork and can be individually controlled. Disadvantages: The grilles mar the outside of the house, and it is as noisy as a window air conditioner.

ANOTHER PROBLEM with heat pumps is that they become less efficient as the outside air gets colder. At low temperatures, it becomes cheaper to heat by some other method. In northern parts of the country, a hybrid heat pump--where oil or gas heating cuts in at low temperatures--is more economical than an all-electric system. The dotted line on the map shows approximately where it becomes necessary to use a hybrid heat pump. Some southern areas at high elevation may also require hybrids.

Dunham-Bush, Inc., Harrisonburg Div., Harrisonburg, VA 22801. If any OHJ subscriber has experience with this system, the editors would like to hear about it.

CAPITAL COST of a heating system varies tremendously, depending on size and shape of your old house. In general, a heating source that can be attached to an existing distribution system (steam, hot water or air) will cost much less than an entirely new system. A rough scale of initial cost for completely new systems--from least to most expensive--would be:

1. Electric Resistance
2. Gas Hot Water or Hot Air
3. Oil Hot Water or Hot Air
4. Gas with Central Air Conditioning
5. Air-to-Air Heat Pump
6. Oil with Central Air Conditioning

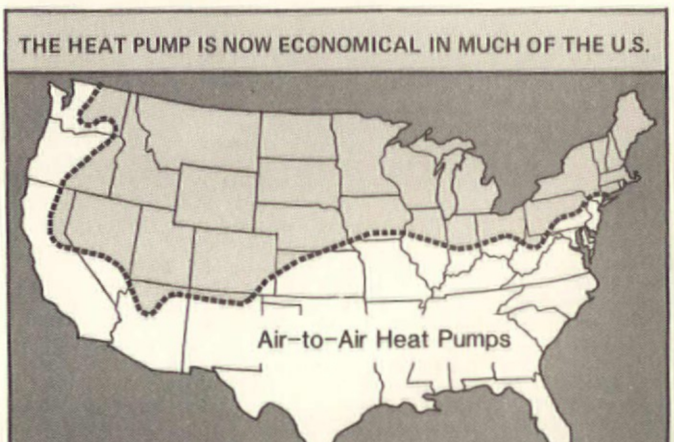
BUT WHAT ABOUT all those exotic new technologies you've been reading about? If you're thinking about active solar space heating, forget it. The large number of collectors you'd need for heating probably wouldn't fit on your roof. And if they did, they'd look ugly and be hideously expensive. As romantic as solar heating sounds, it's not yet the whole answer.

WOOD IS NOT usually considered for central heating. But it can make great sense to use wood stoves for zone heating. This allows you to keep the active living spaces warm, while the central furnace keeps the rest of the house at some pre-set minimum temperature. Wood heating requires a real change in lifestyle, but if you're interested read the wood heat section of The Next Whole Earth Catalog.

SOME NEW PRODUCTS that show promise, if you want to invest for the long run, are water-to-air and earth-to-air heat pumps. In winter, they get heat from underground or ponded water, or from the earth itself. They are more expensive than air-to-air heat pumps, but can be more than 300% efficient.

The Future

THE WORLD of energy supply and technology is in the midst of great upheaval that makes it difficult to see ahead. But I have some thoughts which may help in making a choice about a heating system. For example, I believe that fuel costs are going to go up faster than anyone has predicted. The



HOW A HEAT PUMP WORKS

MOST HEATING SYSTEMS are like a campfire: When you want more heat you throw on more wood. You can never get more heat back than was in the wood in the first place.

THE HEAT PUMP WORKS on a different principle: It doesn't generate heat; it just takes it from one place and moves it around to where it's needed. The energy you put into a heat pump is used to collect and move the heat, rather than being "burned up."

THE HEAT PUMP works the same way that refrigerators and air conditioners do—but in reverse. On the outside of the building there is a coil of metal tubing with cold liquid refrigerant running in it. A fan blows air across the coil, which heats up the refrigerant and makes it boil. This vapor is then compressed into a pipe and pumped into the house. The compression makes the temperature of the gas rise to 100° to 150° F. which is hotter than the air inside the house. When it passes through another coil inside the house it gives up this heat to the interior air.

AS THE REFRIGERANT COOLS, it condenses back to a liquid and is pumped back outside. At this point it is warmer than the outside air, so it is passed through a decompression valve. The rapid decompression drops the temperature of the refrigerant to somewhere below 0°, and the cycle repeats.

THE SYSTEM works even better when the heat source is water or earth. Both of these materials are denser than air and have more heat per volume to give up. And even more important, their temperature is usually higher in the winter and lower in the summer than the outside air is. This means the heat pump has to do less pumping and squeezing to get the same amount of heat.

THE OTHER BIG DIFFERENCE between the heat pump and other heating sources is that it can be made to pump heat out of the house during summer months. If you're in a part of the country where you want summer air conditioning, your needs can be met with a single unit.

only thing consistent about past cost predictions is that they have all been too low. Gas will at least double in price in the next few years, and oil will continue to rise in price. Since the cost of producing these fuels is extremely low, their price is determined only by what the market will bear. Therefore, cost per unit of heat delivered will eventually be about the same for oil and gas.

HOW TO CALCULATE YOUR HEATING COST

YOU MAY FIND IT DIFFICULT to get an answer to this simple question: What is the cheapest fuel for my heating system? Since the experts all think they know, they don't bother to figure it out—even though prices and equipment may be different from the last time they calculated it.

THE FIRST STEP is to determine the amount of useable heat (effective heat) that your proposed system will yield for each unit of fuel put into it. This effective heat is calculated by multiplying the gross heat per unit of fuel by the efficiency of the heater. For example, the gross heat per gallon of No. 2 fuel oil is 140,000 BTU's. If this were used in a furnace that was 60% efficient, the effective heat would be 84,000 BTU's per gallon. The gross heats of the common fuels are:

No. 2 Fuel Oil—140,000 BTU/Gal.
Electricity—3,413 BTU/Kwh.
Propane Gas—91,000 BTU/Gal.
Natural Gas—95,000 BTU/Therm (this varies)

THE BEST WAY to get the efficiencies of new equipment is to check with the dealer. By law, all heating products now carry this information. With heat pumps, the information will be in the form of a Coefficient of Performance (COP) that will be somewhere between 2 and 3. A COP of 2 equals 200% efficiency. For reference, here are some common efficiencies:

Standard Oil Furnace—60%
Electric Resistance Heater—95%
Standard Gas Furnace—58-66%
Electronic Ignition Gas—66-69%
Electronic Ignition Gas with Automatic Vent Damper—70-75%
Power-Burner Gas—76-83%
Standard Air-to-Air Heat Pump—200%
High-Efficiency Air-to-Air Heat Pump—210-250%
Water-to-Air Heat Pump—300%

THE SECOND STEP is to determine the amount of fuel you'll use during the heating season. Get this by dividing the total BTU heat loss from your energy audit by the effective heat per unit of fuel. For example, if your house has a 60% efficient oil furnace and it lost 100 million BTU's during the heating season, the number of gallons of oil required would be 100 million BTU's divided by 84,000 BTU/Gal. = 1,190 gallons of oil.

TOTAL FUEL COST is then calculated by multiplying cost per unit of fuel by the amount of fuel used: 1,190 Gal. x $1.25/Gal. = $1,487.50. By performing this calculation for each type of fuel you are considering, you can see how much money yc 'd save by switching fuels.

AS FOR ELECTRICITY, price will vary widely. Where it is generated by hydroelectric plants, such as in the Pacific Northwest, its cost will go down relative to other fuels. In areas where no new electric plants are being built (most of the country), it will go up at the same rate as its oil and coal fuel. In parts of the country where new plants are under construction, or older plants have to be replaced, the cost of electricity may rise rapidly.

AT THE SAME TIME, there will be a tremendous increase in the efficiency of heating equipment. An average gas furnace was about 60% efficient 10 years ago. Now there are gas furnaces with as high as 83% efficiency. New pulse-combustion furnaces may push the figure up to 95%. The same trend can be seen in heat pump technology. The difference is that the maximum theoretical efficiency for oil and gas is 100%, while for heat pumps it is 1,800%.

BECAUSE OF THESE RAPID technological developments, I'd wait a few years to change my heating system. However, if my boiler just cracked, I'd buy the most fuel-efficient equipment available, even if it cost a lot more.

IF YOU ARE IN AN AREA where air-to-air heat pumps make sense, use one. If you are in a colder climate, I'd use gas heating because its source is more reliable. By the time you again need a new furnace there will be a whole new range of products available (maybe even solar!).

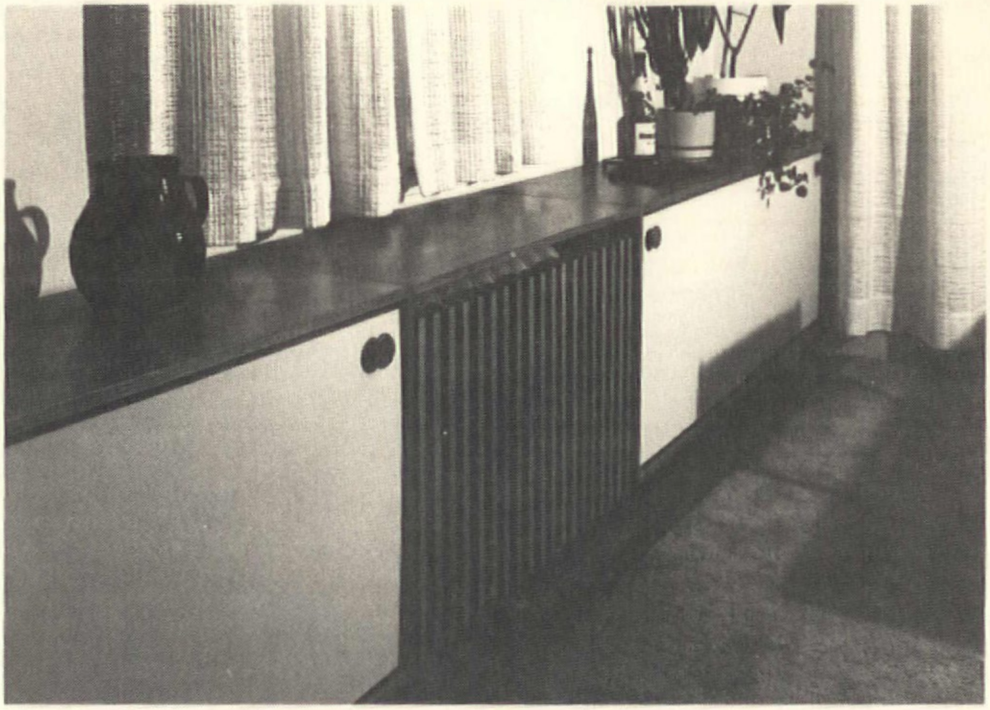
THEN AGAIN, you can always move to Hawaii.

BOO's AND BOUQUETS

I'd like to thank the many people who gave me information for this article. Special thanks go to Don Kluckhuhn of HUD's Energy Office* for helping me make sense out of the energy jungle. A big boo goes to the Dept. of Energy for not returning phone calls or sending me any of the promised information.

**This HUD office has just fallen victim to the budget cuts.—Ed.*

WARD BUCHER, in addition to being an architect, owns an old townhouse in Washington, D.C. On his own house, Ward has increased the glazing on his south-facing back wall to take maximum advantage of passive solar heating, and has installed a heat pump. His architectural office is at 1638 R St. N.W., Washington, D.C. 20009. (202) 387-0061.



RADIATOR COVERS

By George Stephen

THE TREATMENT of steam and hot water radiators in an older house often poses problems to which there are no simple or ready-made solutions. Where the radiators are part of the original fabric of a house that is being restored internally, the question is simply, do they work efficiently; if not, can they be repaired or duplicated?

IN MANY CASES, however, the radiators have been added at a later date and are either unattractive or hazardous. They may be well placed for heating purposes, for instance, but may have a distinctly negative impact on the appearance of the room, being narrow and vertical when they would look better broad and horizontal, or vice versa. Also, many children and adults have been painfully burnt by exposed radiators--particularly steam ones. A well designed casing can often solve both problems.

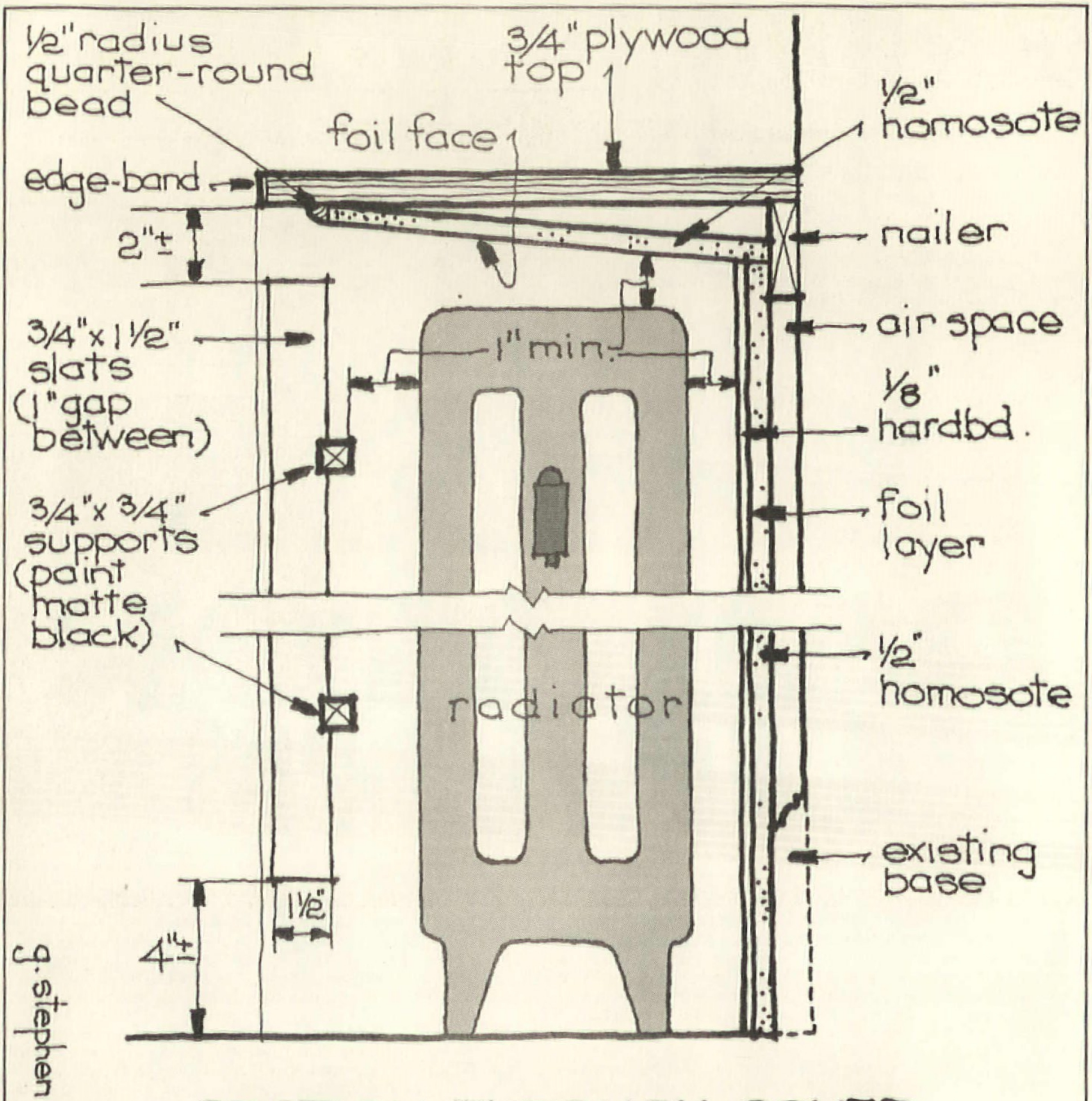
Back To Basics

BASIC REQUIREMENTS of a good radiator cover are:

1. It must be relatively unobtrusive and designed to relate to the proportions of room or space in which it is located.
2. It should be large enough to allow for the free circulation of air on all sides of the radiator.
3. It should direct the heat towards the room and prevent it from being transmitted back through the outer wall.
4. The front should be at least 75% open, to allow for the unobstructed movement of air, and yet be strong enough to resist denting.

The last requirement is the most difficult to fulfill in a way that both pleases the eye and screens the radiator adequately.

IT HAS BEEN MY EXPERIENCE that most of the commercially available grilles seem to combine all the wrong characteristics. They're neither open enough to allow for a proper flow of heat nor strong enough to withstand an occasional blow without some form of visible reinforcement. Also, their aesthetic merits tend to range from neutral to zero. After much fruitless shopping around, therefore, I developed the slatted-front design shown in the photograph and diagram. It works well, resists damage, and presents something more attractive to the living room than a sheet of perforated metal.



SECTION THROUGH COVER

How To Do It

FOR THE VERTICAL SLATS, use a good grade 1 x 2 birch or pine (actual dimensions 3/4" x 1-1/2"), set with 1" air spaces between them. They are nailed and glued to two 3/4" x 3/4" horizontal support beams that are painted matte black or grey to make them as invisible as possible. The ends of the support beams are drilled to fit down over the upturned tails of four square jug hooks screwed to the sides of the cabinet. This arrangement allows the front to be easily removed by lifting it off the hooks--a useful feature for periodic cleaning and adjusting of the radiator.

THE BODY OF THE CASING can be incorporated in a row of cabinets (as shown in the photo) or free-standing. The top and sides are 3/4" plywood (to resist warping by the heat) with all exposed edges covered by wood tape or 1/8" wood nosing. The finish should match that of the slats--either painted, stained, or natural wood. Stained or natural wood should be finished with three coats of clear matte polyurethane varnish and finely sandpapered between each coat.

ENERGY Products For The Old House

Your house will require adaptation if it is to become energy-efficient. Home retrofitting is a lucrative field and so has attracted its share of phonies and mountebanks. Not every item listed below is appropriate for every house, but these companies all offer products that the editors of The Old-House Journal believe are worthy of consideration.

SPECIALTY HEATING & VENTILATING SYSTEMS

XXTH CENTURY HEATING & VENTILATING CO.
96 Ira Avenue, Dept. OHJ
Akron, OH 44301 (216) 762-9168
Available through distributors. Write for free literature.
They manufacture heating equipment, including cast iron heat exchangers for gas or oil. (Also available: 22-inch coal furnace; wood-burning systems, including a wood-fired boiler for hot water systems.)

WESTMORELAND CUPOLAS
R.D. 2, Box 185, Dept. OHJ
Export, PA 15632 (412) 327-7370
Available by mail. Send $1 for brochure, refundable with order.
They manufacture powered ventilators that can be concealed in a cupola, and redwood attic louvers.

KOOL-O-MATIC CORP.
1831 Terminal Road, Dept. OHJ
Niles, MI 49120 (616) 683-2600
Available through distributors. Write for free literature.
They manufacture residential ventilating equipment, including an attic fan concealed in an Early American cupola, and roof- and gable-mount attic ventilators.

INSULATION

(Only one product under "Insulation"? We know you know about fiberglass, cellulose, etc. But here's something new that you may not have heard of.)

DIAMOND SHAMROCK CORP.
351 Phelps Court, PO Box 2300, Dept. OHJ
Irving, TX 75061 (214) 659-7000 or (800) 223-1954
Available through selected homecenter chains. Write for free literature.
They manufacture Dacotherm, a loose-fill insulation of puffed silicate that will not burn, release toxic fumes, or attract animals. The product is odorless, safe, and non-irritating. Costs about $4.99 for a 6-lb. bag containing 3 cu.ft. of insulation. Its R-value is R-4 per in. Most suitable for insulating attics and wood-frame sidewalls, Dacotherm is ideal for homeowners who can't or won't struggle with heavier or more unwieldy alternatives.

(Continued on next page)

THE BACK OF THE CABINET is 5/8" Homosote board with a layer of aluminum foil on the radiator side to minimize loss of heat to the outside wall. It is important that it be securely fitted to the sides and top, as any heat will eventually cause sooty streaks to appear on the wall surface above the radiator.

A SIMILAR THERMAL BAFFLE should be installed under the top of the cabinet to prevent it from overheating. (When the cat stops sleeping there, you'll know it has been effective.) This baffle should also be slightly sloped to expedite the flow of air into the room. The aluminum foil on the backboard is sometimes unpleasantly visible through the slats and radiator, in which case it can be covered up by a layer of 1/8" hardboard painted in a lighter color.

A Burning Question

OFTEN, THE QUESTION of what color a radiator should be painted generates as much heat as the radiator itself. When it is enclosed, some shade of grey seems to be preferable, as this tends to make it disappear into the shadow of the cabinet. Some people, however, feel that radiators should be painted only white or silver because light, shiny surfaces reflect heat best. This argument overlooks the fact that a coat of paint also has an <u>inner</u> surface that reflects heat back into the radiator. In terms of efficiency, then, it seems to make little difference how dark or light the color is.

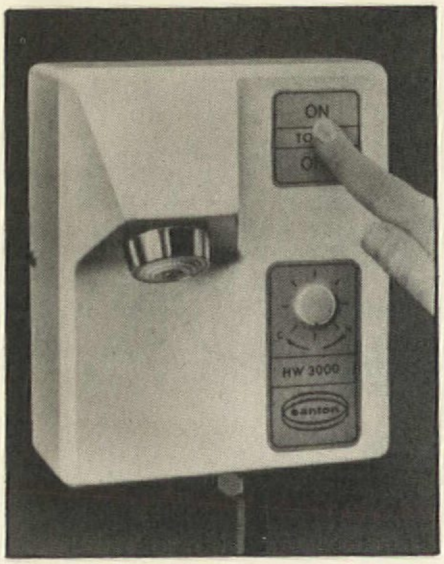
THERE ARE MANY POSSIBILITIES in the choice of colors and finishes for this type of enclosure, as long as we remember that its prime function is to conceal the radiator. The interior of the cabinet and its contents, therefore, should tend to form a darker, neutral background against which the lighter-colored slats appear to float in air.

GEORGE STEPHEN is the North Atlantic Regional Architect for the National Park Service and the author of many publications on preservation. Further details for this type of radiator cover appear in his book: *Remodeling Old Houses Without Destroying Their Character*, Knopf, 1972.

HOT WATER

PALOMA INDUSTRIES, INC.
241 James Street, Dept. OHJ
Bensenville, IL 60106 (312) 595-8778
Available through distributors. Write for free literature.
They manufacture Constant*Flo, a gas-burning device that heats water as it is used. The unit must be vented through a flue, but it is compact and economical.

TANKLESS HEATER CORP.
2 Lafayette Court, Dept. OHJ
Greenwich, CT 06830 (203) 661-2102
Available by mail. Write for free literature.
They manufacture Santon Tankless Instant Heater, an electrically powered device that heats water as it is used. Available in a variety of models.



WINDOWS

We know we've passed over all the fine millworks that make wooden storm and prime windows to your style and size specifications. Custom-made sash is not always the most expensive alternative, so don't rule it out. (In fact, for some Colonial and Early American houses, custom sash and frames may be the only aesthetically acceptable choice.) A more complete listing will appear in an upcoming issue all about windows. In the meantime, here are several national sources for good stock-priced prime and storm windows.

CURTIS INSULATION, INC.
30 Pond Park Road, Dept. OHJ
Hingham, MA 02043 (617) 749-8866
Available by mail. Write for free literature.
They manufacture the Magnetic Airlock Window, a custom-made inside storm window. A sheet of acrylic glazing in an insulated plastic frame with a flexible, permanent magnetic material. This adheres to an adhesive-backed steel strip that is attached to your window frame; permits easy exit.

HOWALL PRODUCTS, INC.
1351 Deloss Street, Dept. OHJ
Indianapolis, IN 46203 (317) 631-8798
Available through retail store or by mail. Send $1 for literature.
Wooden storm window frames in easy-to-complete kit form with lower glass and screen inserts. Supplied without glazing and screen materials. Another lower cost alternative to custom wood sash.

PELLA DOORS AND WINDOWS
Dept. OHJ 100 Main Street,
Pella, IA 50219 (515) 628-1000
Available through distributors. Write for free booklet, "Window and Door Ideas for Older Homes."
Pella has recently begun a determined effort to establish a line of replacement windows that don't remuddle. They come in a wide range of stock sizes, shapes, and styles, as well as custom sizes. And their snap-in muntins for multi-light panes are made of wood, not vinyl.

K.S.H., INC.
10091 Manchester Road, Dept. OHJ
St. Louis, MO 63122 (314) 966-3111
Available through distributors. Write for free literature.
They manufacture Safe-T-Vue, a low cost alternative for indoor custom-size storm windows. You cut and install the self-adhesive, snap-apart vinyl mouldings and acrylic glazing or styrene sheets yourself.

QUAKER CITY MANUFACTURING CO.
701 Chester Pike, Dept. OHJ
Sharon Hill, PA 19079 (215) 727-5144
Available through distributors. Write for free literature.
New channels or window balances, used with standard wood sash to give snug fit. Friction-fit replaces counterweights. A secondary option. Only a few standard sizes.

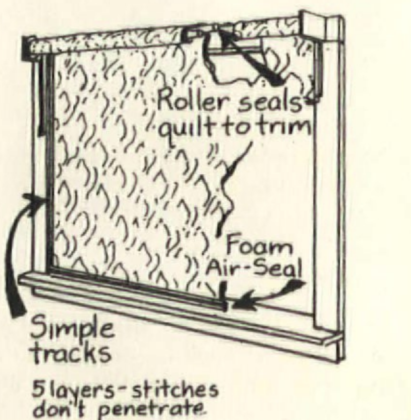
PERKASIE INDUSTRIES
50 East Spruce Street, Dept. OHJ
Perkasie, PA 18944 (215) 257-6581 or (800) 523-6747.
No national distribution for residential products yet, but all inquiries will be answered. Write for free literature.
They manufacture Thermatrol acrylic interior storm windows. (Plexiglass in a molded acrylic frame.) Have done retrofits for landmark government buildings. Industrial/commercial and residential capabilities. 30 stock sizes; by using combinations of these sizes, you can weatherize some 355 different-sized windows without cutting. Clipped to frame—easy to remove.

SEASON-ALL INDUSTRIES, INC.
Dept. OHJ
Indiana, PA 15701 (412) 349-4600
Available through distributors. Write for free literature.
Storm windows: Custom-sized, finished in aluminum, anodized, brown and white enamel. 5 types of double-hung, plus picture windows, horizontal siding, 1-4 light. Can be adapted to go inside. NuPrime Windows: Custom-fit to opening. In most cases window frame and moulding can remain; thermalized aluminum frames. And of special interest to old-house owners: Round and Gothic top NuPrimes.

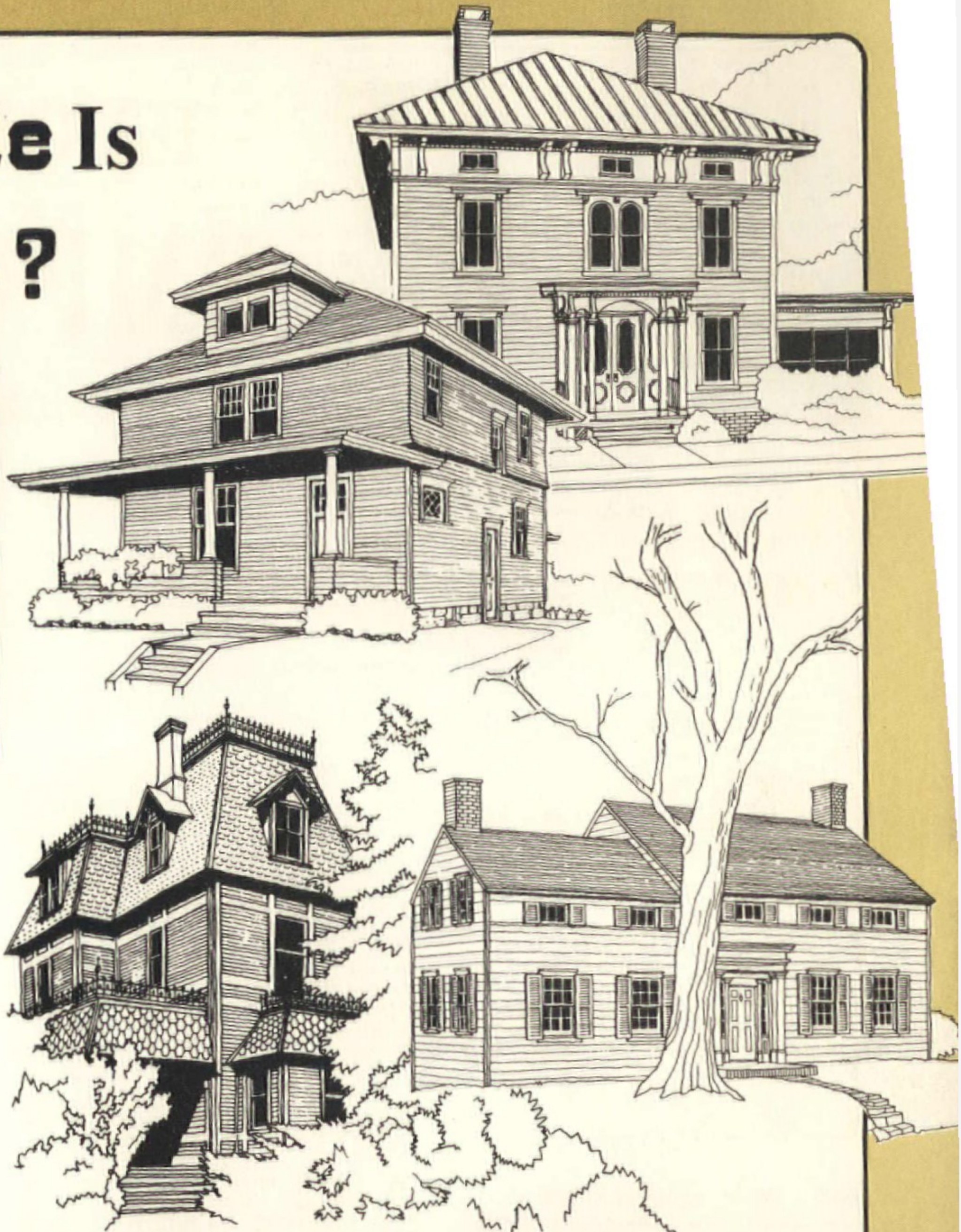
WINDOW COVERINGS

Insulating window coverings are tough to manufacture as a stock item for a reasonable cost because windows come in too many different sizes. The best alternative is to make your own from covered, rigid foam boards, wood, etc.

APPROPRIATE TECHNOLOGY CORP.
Box 975, Dept. OHJ
Brattleboro, VT 05301 (802) 257-4501
Available through dealers. Write for free literature.
They manufacture Window Quilt, a 5-layer, insulated roller shade with vapor barrier. Relatively unobtrusive plastic tracks. Useful and attractive; available in 3 colors. Costs about $4.95/sq.ft., all inclusive.



What Style Is My House?



The most common question asked of us at The Old-House Journal is "What style is my house?" Subscribers nationwide are curious — they send us photographs all the time, trying to learn the answer.

Now The Old-House Bookshop makes available to you a comprehensive, inexpensive book that answers everything you always wanted to know about architectural styles in this country. We're excited about *The American House*, a unique, easy-to-follow illustrated guide to our rich architectural heritage. We think it's the best volume on building styles around.

Combining the clarity and focus of line drawings with a singular concentration on *style* — rather than history — the distinctions and relationships between genres are intelligibly sorted out. Introductions to each section establish the general orientation and attributes of that style. Highlighting essential form and detail, the illustrations — with bite-size stylistic explanations — then chart and clarify as never before this ever-changing lineage.

As a nation of immigrants, a host of native architectural traditions were transplanted in America, including those of the English, Dutch, German, Swedish, French and Spanish. As cultures mixed in the melting pot of the New World, formal and folk styles evolved as architects learned from one another.

The engrossing word-and-picture approach charts these changes both in the more formal styles, such as the Georgian, Greek or Gothic, as well as a vast array of not-usually-noted vernacular buildings.

Just as house design reflected many purposes, this book also serves many functions — as a convenient, complete manual of style, as a field guide for traveling house watchers, as an easy chair tour for at-home building enthusiasts, and as a popular history of residential cultural expression.

Softcover. 10 x 10". 299 pages.

To order your copy of *The American House*, just check the box on the Order Form, or send $12.95 +$2 for postage & handling to

The Old-House Bookshop
69A Seventh Avenue
Brooklyn, NY 11217

The Old-House EMPORIUM

FREE ADS FOR SUBSCRIBER/MEMBERS

Classified ads are FREE for current member/subscribers. The ads are subject to editorial selection and space availability. They are limited to one-of-a-kind opportunities and small-lot sales. Standard commercial products are NOT eligible.

Photos of items for sale are also printed free—space permitting. Just submit a clear black & white photograph along with your ad copy.

Examples of types of ads eligible for free insertion: 1) Interesting old houses for sale; 2) Architectural salvage & old house parts for sale; 3) Restoration positions wanted and vacant; 4) Hard-to-find items that you are looking for; 5) Trades and swaps; 6) Restoration and old house services; 7) Meetings and events.

Free ads are limited to a maximum of 50 words. The only payment is your current OHJ mailing label to verify your member/subscriber status.

Deadline will be on the 5th, 2 months before the issue. For example, ads for the December issue are due by October 5th.

Write: Emporium Editor, Old-House Journal, 69A Seventh Ave., Brooklyn, NY 11217.

BOOKS & PUBLICATIONS

THE RESTORATION HARDWARE HANDBOOK—The most comprehensive selection, usage, and source guide available for 17th-century to early 20th-century reproduction hardware, for use in the restoration or construction of furniture and houses. $4.00. Paul Brooks, PO Box 10063, Wilmington, DE 19850.

PICKET FENCES. 25 variations from Colonial thru Victorian days. Do-It-Yourself, 12-page detailled construction guide with full-sized patterns, complete instructions. Send $5 to Colonial Picket Charm, PO Box A1111, Dept. OH, Findlay, OH 45840.

PLANNING A PARTY OR RECEPTION for 25-100 people? From A Katerer's Kitchen To You will solve your food problems. Send $12 (ppd) to M.A. Wilson, 3237 Washington St., Alameda, CA 94501.

FOR SALE

WIDE PINE BOARDS approx. 20 in. wide. Also wide oak boards. Dale Carlisle, Rt. 123, Dept. RPN, Stoddard, NH 03464. (603) 446-3937.

SALVAGE MATERIALS from old hotel. Brass sash lifts, $1.75 each. Brass sash locks $2.25 each. 2 old gas fireplace inserts, large brass mailbox. Many brass door sets, knobs, plates, locks. Other items available at reasonable prices; all are in original uncleaned condition. John G. Mahar, 745 Fairway Drive, Saginaw, MI 48603. (517) 792-4489.

2 OAK FRENCH DOORS, each 2½ ft. wide x 6 ft. 8 in. high x 1-3/8 in. thick, to fit a 5 ft. wide opening. Each door has 15 panes of glass. Call evenings (212) 442-0523.

GENUINE OLD-TIME POLISH. Use on shellacked finishes only. Gives a sparkling shine. No ordinary polish—my formula rearranges the molecular structure. Guaranteed to work or money back. Send $6 @ quart plus $1 handling. Anthony Bruno, 3947 Lexington, Harvester, MO 63301.

FLUTED MARBLE ANTIQUE COUNTERTOP from butler's pantry of 1894 house. 70 in. x 24 in. x 1½ in. with 21 in. x 12 in. bowl on left side. $250 or best offer. 4914 South Ellis Avenue, Chicago, IL 60615. (312) 536-4914.

GLASS DOOR thermograte fireplace closure and tubular heat extractor with blower. 10 stainless steel tubes. Ideal for large fireplace. Fits openings 42-49 in. wide, 30-33½ in. high. 80,000 BTU. Will heat approx. 1200 sq.ft. $725 new—will sell $375; we pay shipping costs. Russell Bees, R.R. 1, Carlisle, IA 50047. (515) 287-2036.

33 MAHOGANY POLES, 5-9 ft., not true rounds; 3 matching butcher-block legs; 9 crystal doorknobs from old church; wood venetian blind, 27 in. x 59 in.; overhead toilet tank, not oak; 2 globe fixtures, 11 in. diameter; 2 oscillating fans; 2 mirrored sliding doors. A. Conti, 734 Humboldt Street, Brooklyn, NY 11222 or call (212) 383-5157.

IRON FENCES. Prices start at $30 for a 2 ft. x 4 ft. style. Most expensive is the $60 section, which is 3½ ft. x 8 ft. Call (219) 879-3923.

ONE LOT OLD-HOUSE PARTS. Quarter-sawed golden oak and pine from 10-room house. Details on request. PO Box 362, Marion, IN 46952 or call (317) 662-2591.

ORNAMENTAL SHINGLES. 10 Victorian patterns in Number 1 Calif. redwood. Also available fence pickets with ornamental tops in select redwood. Mad River Woodworks, PO Box 163, Arcata, CA 95521. (707) 826-0629.

CANVAS FLOOR CLOTHS—custom designed, painted in durable, attractive manner to coordinate your historic dwelling, protect your floors. For more information and a canvas swatch, write P. Kurtz, 329 Rockland Road, Westminster, MD 21157 or phone (301) 848-4029.

3 ARCHWAYS & 8 WINDOW CASINGS varnished in original turkey feather finish. Best offer. Always have wood, cupboards, doors, windows, etc., from old houses and barns. (319) 659-5293 or write Waack, 408 7th Street, Dewitt, IA 52742.

AUTHENTIC BARR PAVING BRICK. Perfect for patios, backyards, or walkways. Excellent condition. Your choice, 5000 available. $40 per 100. In northwest suburban Chicago. (312) 477-2404.

INNS & HISTORIC HOUSES

KING PHILIP HOUSE, Bristol, RI. Efficiency apartment, double with private bath and kitchen, fireplace, spectacular view of Mt. Hope Bay. Recently restored Colonial home is only minutes from historic Newport and only a few steps from King Philip's cliffside throne on the side of Mt. Hope. $150 per week. Call: (401) 253-9385.

SPRING HOUSE, York County, PA. Bed and Breakfast or longer in restored 18th-century stone house in charming pre-Revolutionary village of Muddy Creek Forks, near Ma and Pa Railroad. Trout stream, swimming, solitude. 2 hrs. to Philadelphia, Washington DC. (717) 927-6906 for brochure, reservations.

THE TAMWORTH INN, Tamworth, NH—Charming restored village inn (ca. 1830) with first-class restaurant and pub. Double with private bath: $40; with shared hall bath: $30. For reservations, call (603) 323-7721.

MEETINGS & EVENTS

8TH ANNUAL VAN VORST PARK HOUSE TOUR on Sunday, Oct. 15 from 1-5 PM. Victorian brownstone, brickface buildings in this historic district will be open to the public, along with various displays and booths. PATH to Grove St., Jersey City and follow signs. For information, call (201) 434-3535 (c/o Mercer Street Designs).

4TH ANNUAL "A DAY IN HISTORIC BETHLEHEM." Tours of homes in Bethlehem's historic district, Xmas treasures at one-of-a-kind boutiques set in Hotel Bethlehem Ballroom, afternoon tea, and drawing for a hand-worked needlepoint rug. Oct. 27, 10 AM to 4 PM. Reservations may be made by calling (215) 868-6311.

THE FRIENDS OF PROSPECT HEIGHTS will have their Fall '81 house tour on Sunday, Oct. 11, rain or shine, from 1 to 5. Tickets will be $4.50 in advance or on the day of the tour. For further information, please call (212) 638-7190.

VICTORIAN MANSION TOUR sponsored by the Jackson Boulevard Association. Tour restored and renovated homes in a landmark district on Sunday, Sept. 13, 1 to 5, beginning at the Church of the Epiphany, 201 South Ashland Blvd., Chicago, IL 60607. Tickets, $10. For further information, call Chris Jensik at (312) 243-8363.

41ST ANNUAL CHESTER COUNTY DAY will be held on Saturday, Oct. 3. Visit homes and historic landmarks, including Valley Forge, from 10 AM to 5 PM. For further information, call (215) 692-4322.

ANNUAL HOUSE TOUR of historic homes in Quincy, IL. Saturday, Oct. 10, 10 AM to 4 PM. Group members will act as guides conducting tours of the interiors of the homes. Make inquiries to (217) 222-1355 or 224-9538, or write Box 1111, Quincy, IL 62301.

"HISTORIC HOUSE PRESERVATION: HOW TO," an outstanding seminar program from the Smithsonian Institution, Nov. 1-6. Includes lectures by preservation experts such as James C. Massey, Director, Historic House Association of America, and R.A. Clem Labine, Editor, The Old-House Journal. Also tours of successfully restored country estates as well as lovely urban homes and townhouses in handsome Georgetown and Old Town Alexandria. $428 price includes hotel and breakfasts. For further information, contact Selected Studies, A & I 1190A, Smithsonian Institution, Washington, DC 20560. (202) 357-2475.

"DINING & DRINKING IN THE 19TH CENTURY" is a festival of lectures, cooking classes, tastings and tours offered on Sept. 24-27 by the Victorian Society of America. Craig Claiborne, George Lang, and Barbara Kafka will be guest speakers. For further information, call (215) 627-4252.

WATCH FOR OCTOBER ISSUE OF METROPOLITAN HOME

The October issue of Metropolitan Home magazine will have a feature article about OHJ Editor Clem Labine and the interpretive restoration he has done in his 1883 Victorian home. Many of the decorative projects have been featured in past issues of OHJ...but we didn't have the 4-color photography to do the interiors full justice.

The October issue of Metropolitan Home will be on newsstands Sept. 15.

APT Meeting

REHAB/TECH—Annual meeting of Association for Preservation Technology (APT) will be held in Washington, DC, October 7-10. Program will focus on common problems encountered with rehabilitation of historic buildings. Topics include: Energy Conservation, Health & Safety Problems, Difficulties With Large Rehab Projects, Use of Computer Technology. For program information write: REHAB/TECH, c/o Mary Oehrlein, Suite 301, 1555 Connecticut Ave. NW, Washington, DC 20036.

REAL ESTATE

1881 ITALIANTE BRICK MANSION, beautifully restored, 12 rooms, 3 fireplaces, winding staircase, servants quarters. On acre of land, Lake Michigan view in center of lovely fishing community 27 miles east of Green Bay and south of Door County, WI. Beach, golf, X-Country nearby. Perfect residence/inn, shop, office, studio. $110,000. Reilly, (312) 823-5354 or 693-3773.

HAPSTEAD, in Cane Hill, AK, built in 1865. Has new wiring and plumbing, but needs some TLC. Eight main rooms with 8 fireplaces, winding stairway in entry, original wooden pegs in stairway, glassed porches. 80 acres with winding drive approaching house. For more information: Irwin Town & Country Properties, 1800 W. Sunset, Springdale, AK 72764. (501) 751-4900.

WASHINGTON, NORTH CAROLINA—National Register Historic District, local historic designation—An-tebellum home, constructed 1842; 4000 sq.ft., large ot, near Pamlico River. 8 fireplaces (2 closed), central heat, large rooms, recently restored. $39,800. PO ox 134, Bath, NC 27834.

RNATE CARPENTER GOTHIC (1870) in small vil-ge between Grand Rapids and Lansing, MI. 3 bed-oms; gas furnace with alternate wood stove heat; lly insulated; recently undergone interior restora-n to complement golden oak woodwork. City wa- and sewer. $57,500. Douglas Bell, 538 W. Bridge, ons, MI 48851. (517) 855-3860.

UMEE, OH—National Register home in historic rict in lovely suburb of Toledo. 6 bedrooms, 2 hs, brick & frame. Half-restored and fully livable, needs finishing work: priced to allow for resto-n costs—$82,500. Most original remains are unal-d. Brochure available. Carol Dunbar Kimbrough, or. (419) 832-5522.

1880 VICTORIAN ITALIANATE on National Register. 4-5 bedrooms, 2 parlors, dining room, spacious modern kitchen. New electric, water; gas furnace. Wide-plank floors, cherry oak spiral staircase, 2 marble fireplaces. Wood-grained doors, original gas lights. 1840s log cabin under rear of house. Summer kitchen and brick spring house. Large lot in small town 20 mi. SE of Columbus, OH. Chris Grewell, Saxton Realty, 5087 Sedalia Drive, Columbus, OH 43227. (614) 837-3222, 837-9626.

ATHENS, NY—Nestled in historic district of quaint artist community 2 hrs. from NYC. Spectacularly renovated Victorian home boasts wood panelled foyer with spindles, parquet floor, tin ceilings, modern kitchen, 10 rooms, 1½ baths. Fresh exterior paint, new furnace. $54,500. Land Resources, 28 Second Street, Athens, NY 12015. (518) 945-1303.

I NEED A LOVER ... of old homes in Gilroy, CA. 1100 sq.ft. neo-classic rowhouse and 2200 sq.ft. shingle cottage homes on one lot zoned R-3 near new city hall. In Gilroy Rehab. Target Area. Asking $125,000. Contact Mary Jo Van Valey, Valley of California, 1225 First St., Gilroy, CA 95020. (408) 847-3939.

ATHENS, NY—Located in historic district, this 10-room Victorian has stained glass transom, sargent door hardware, arches, 3-storey banister, wine cellar, original fixtures, corner lot, garden. $53,900. Land Resources, 28 Second St., Athens, NY 12015. (518) 945-1303.

HISTORIC HAW TABOR HOME, Leadville, CO. on top of the Colorado Rockies, Leadville's founder's home dating from 1876, currently used as a museum. Property includes all antique furnishings and small craft shop. $110,000. Century 21 Whalen Realty, PO Box 971, Leadville, CO 80461. (303) 486-3030.

LANCASTER COUNTY, PA. Sandstone farmhouse with central chimney and much original interior, circa 1755. Close to Reading, Lancaster, PA Turnpike. House, large sandstone barn on 3 acres, $140,000. Up to 155 acres, of which 40 acres are farmed, is negotiable. Gavin Ross, PO Box 71, Denver, PA 17517. (215) 267-5429.

HUDSON RIVER GOTHIC—1½-storey, renovated interior, 6 rooms plus 1½ baths. New roof and furnace; 2 porches. 2 acres overlooking Hudson River. 2½ hrs. to downtown Manhattan. Germantown, Columbia County, NY. $66,200. Raymond R. Crawford. (518) 537-6440.

KENTUCKY LANDMARK FOR SALE. Elegant 126-year-old home in mint condition. 4500 sq.ft. Curving cherry staircase. Eligible for the National Register. Situated on ¾ of an acre 15 minutes from Bardstown, KY; one hour from Louisville, KY. $80,000. Contact David J. Dutschke, (502) 893-0381 or 897-0831.

PUTNAM VALLEY, NY. 100-plus-year-old Victorian farmhouse, original plank floors and beams. 5 bedrooms, 2 baths, dining room, fireplace. 1973 well and 1980 septic fields. Lofty maple trees. 1.3 level acres in lovely residential area. Convenient to parkway. $69,900. Spain Agency, Route 6, Box 949, Mahopac, NY 10541. (914) 628-3464.

BELLINGHAM, WA, between Seattle and Vancouver, BC. Queen Anne Victorian, on National Register, 5 bedrooms, Italian tiled fireplace, view of bay from widow's walk, furbished with period pieces also for sale. Reasonably priced with terms at $135,000. For fact sheet call (206) 734-5342, or write Natashe Kupras c/o Diane Heath, 2215 Utter Street, Bellingham, WA 98225.

JOLIET, IL—Here is your chance to restore a Victorian Brownstone with 15 rooms. This home is on the Illinois Historical Survey Map. $38,500. Louis Sehring, Box 668, Joliet, IL 60434.

LAST OF ITS KIND. Last multi-storey, bay-windowed, commercial building in this historic mining town. Hotel built in 1899, later tavern addition and living quarters attached. On State Register. A functioning business in scenic, mountainous rural area. The Rozzanos, PO Box 355, Republic, WA 99166. (509) 775-3374.

SCHENECTADY, NY—Colonial Revival home (1804) in the Realty Plot Historic District, a planned, turn-of-the-century development built for executives of the General Electric Co. Opulent woodwork, elegant tile baths, 6 fireplaces, near mint condition. $89,500. Historic District Realty Co., 1404 Union Street, Schenectady, NY 12308. (518) 346-6655.

FOR RENT—155-year-old restored log cabin on three acres near Boone, NC. Easy access and convenient to winter skiing. Write for brochure: Mattei, 11723, Ft. Lauderdale, FL 33339. (305) 561-3081.

WASHINGTON, DC—Logan Circle Second Empire mansion with side lot, extraordinary details. Livable but needs your loving restoration. Plenty of room for an apartment or two plus parking in good downtown location. $158,000 w. excellent owner financing. Linda Barnes, City Sites, Inc., 510 C St. NE, Washington, DC 20002. (202) 546-CITY.

JERSEY CITY, NJ: 3-storey, 14-room late Victorian house; ½ mile to PATH to NY. 4 baths; up to 6 bedrooms, new plumbing; new gas heat; cedar shingle exterior. Owner will help finance. $89,000. (201) 656-7024.

HOWARDSVILLE, VA: 1840s frame house on 15 acres near the James River. All new plumbing and wiring. 1½ baths, 3 or 4 bedrooms, 6 fireplaces. Owner financing. $65,000. Call Royer & McGavock, Ltd., Realtors, No. 3 Boar's Head Lane, Charlottesville, VA 22901. (804) 293-6131 or evenings 589-3083.

LATE 18TH-CENTURY COUNTRY VILLAGE recently on US Historic Register has several log/stone houses needing restoration, all under $25 K. Low WV real estate and income taxes. 10 miles to Washington, DC commuter trains. Call (304) 725-4857 after 6:30.

PRE-CIVIL WAR 2-storey antique collector's dream. 9 spacious rooms, 2 baths, wide center hall, natural pine floors situated on 15 beautiful acres. New 5-stall barn. $130,000. Sayle Titter, Derrick Realty, PO Box 486, Johnston, SC 29832. (803) 275-3234 or 275-4816.

EDWARDSVILLE, IL. On National Register. 25 minutes from St. Louis. 1820 2-storey Federal brick. 8 rooms, verandah, 2 baths. 4 fireplaces, original mantelpieces, staircase, natural gas-fired steam heat, lovely grounds, move-in condition. $85,000. (618) 656-9439 or 692-3246.

WANTED

WROUGHT OR CAST IRON GATE, single panel, Victorian 1880-95, 4 ft. wide x 5½ ft. high, prefer with lever/box lock. Contact D.C. Brennan, 866 Eaglenest Ave., Akron, OH 44303. (216) 867-8809.

VICTORIAN LIGHT FIXTURES with vaseline glass shades. Also vaseline lamps and door knobs. Don't have to be Victorian but should be at least Depression era. Ginger Hyland, 24305 Pine Canyon Road, Lake Hughes, CA 93532.

FRENCH DOORS—a set, 6 ft. 10½ in. high x 35 in. wide. Should use 3 hinges, approx. 4 in. x 1-1/3 in. Also old bottles or postcards marked "Plainfield, New Jersey." Please send description to B. Loizeaux, 1148 Martine Ave., Plainfield, NJ 07060. (201) 561-3359.

NICKEL TRIM for front of range top and front of warming shelf (Monarch) of Red Cross Regal woodrange, Model 8-18-0; also need one towel rack and oven door opener. Write: A.L. Coddington, PO Box 321, Sprakers, NY 12166.

OLD VICTORIAN HOUSE near Monterey, CA. Prefer large lot. Willing to restore. J. Fobes, 3235 Mount Curve, Altadena, CA 91001.

PORT ANGELES, WA. Information, old photos/postcards, related to Port Angeles, Washington, Clallam County, and the Olympic Peninsula area, for inclusion in historic preservation project. Mike and Paula Doherty, 617 So. B St., Port Angeles, WA 98362.

ONE LAMP POST. About 16 ft. tall, manufactured approx. 1910, with globes of white glass. Contact Don Robertson, 539 S. Baltimore, Hastings, NE 68901.

GET IN ON THE OHJ'S REVENUE-SHARING PROGRAM

Your Group Can Be Eligible For A $1,000 Grant

THE OLD-HOUSE JOURNAL is giving away money... $5,000 to be exact. We'll be awarding five unrestricted $1,000 grants in December to five separate preservation groups in the U.S. And your group could be eligible.

THE OLD-HOUSE JOURNAL isn't being totally altruistic. Rather, we're trying to help those groups that are helping us. Here's our reasoning: The soaring cost of paper and postage is making it ever more expensive to sell subscriptions through the mail. At the same time, with government budgets being slashed everywhere, funds for preservation are dwindling.

SO IT ALL SEEMS QUITE LOGICAL: Rather than pour money into direct mail, why shouldn't we give that money instead to organizations that help us sell subscriptions?

WE'VE DEVELOPED a two-part plan to generate funds for preservation groups:

(1) THE REVENUE-SHARING PROGRAM: All preservation groups are eligible to sell OHJ subscriptions (new or renewals)—at a discount—to their members. Then, you get to keep 50% of all funds you collect. For every 10 subscriptions (the minimum) you send in, you get to keep $60.

(2) THE GRANT PROGRAM: The OHJ will award an unrestricted $1,000 grant to each of five groups participating in the Revenue-Sharing Plan. Winners of the five grants will be determined by a drawing to be held in December. Winning organizations will be drawn by Henry McCartney, Coordinator of the Neighborhood Conservation Program for the National Trust. Names of the five winners will be published in the February issue of The Old-House Journal.

JUST ABOUT ANY GROUP fostering restoration or preservation is eligible to participate in this Revenue-Sharing and Grant Program: Block association, neighborhood group, historical society, or city or state preservation society.

FOR THE NECESSARY FORMS to make your group eligible for a $1,000 grant and revenue-sharing, call or write:

Sally Goodman
Grant Program Coordinator
The Old-House Journal
69A Seventh Avenue
Brooklyn, N.Y. 11217
(212) 636-4514

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The Old-House Bookshop

☐ 1981 OHJ CATALOG—Sources for hard-to-find old-house products & services. Most complete & up-to-date directory available anywhere. Softbound. $10.95. ($7.95 to current OHJ subscribers.)

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☐ MOULDINGS & ARCHITECTURAL DETAILS OF THE LATE 19th CENTURY—Reprint of a mouldings & millwork catalog published in 1898. Shows doors, mantels, etched glass & many hundreds of other architectural elements used from 1870's thru 1900. Over 1,200 illustrations. 288 pages. Softbound. $14.00.

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☐ HOLLY'S HOUSE BOOK—Style book & interior decorating guide for the 1860's thru 1880's. Contains reprints of 2 influential books by Henry Hudson Holly: "Country Seats" (1863), & "Modern Dwellings (1878). 389 pages.Softbound. $13.95.

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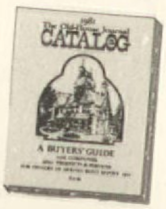

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The Old-House Journal

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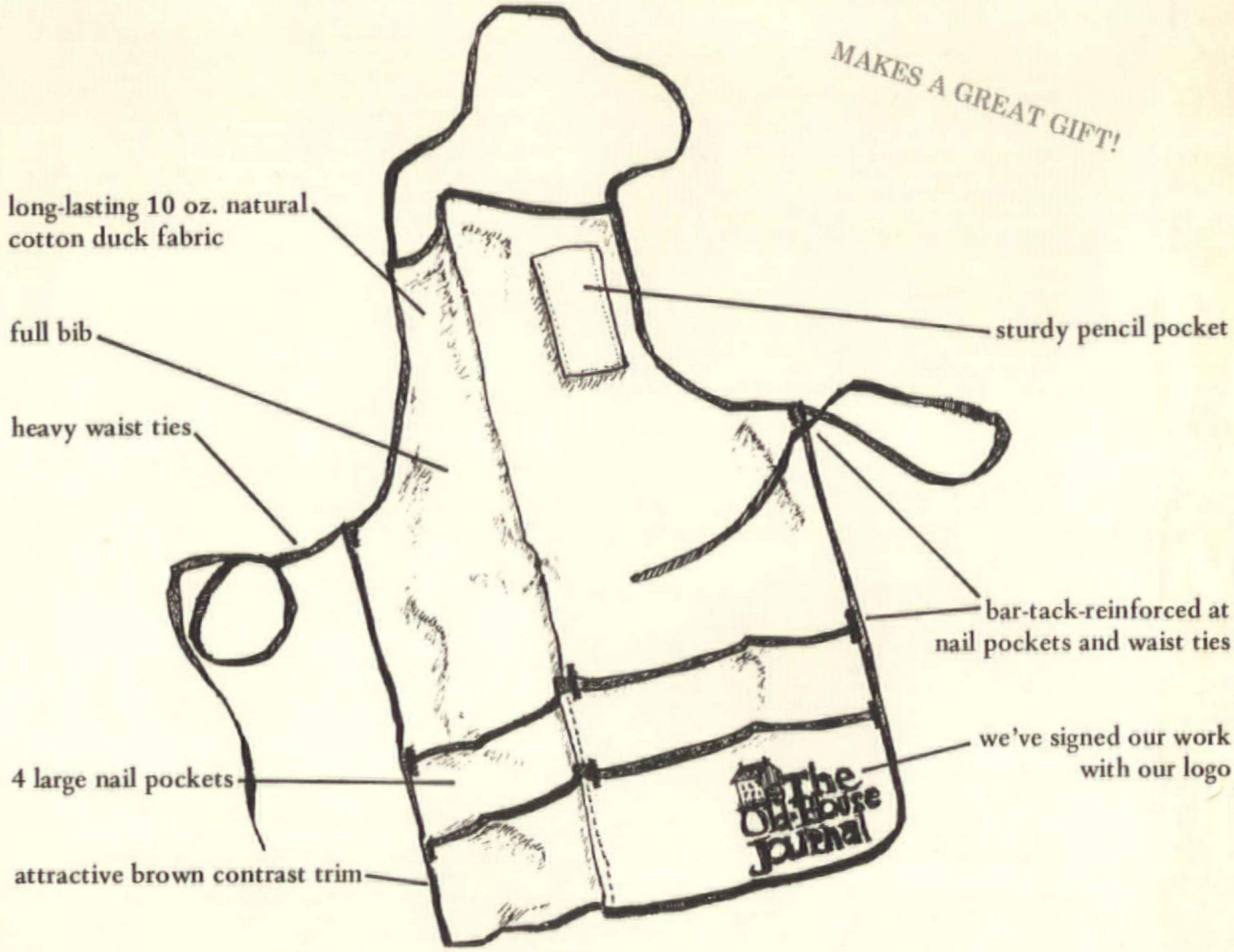

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GLOSSARY

active solar—Methods of using the sun's energy for space or water heating, which require input of energy from other sources. Solar systems that use electric or fuel-driven pumps, for instance, are active. In such systems, point of collection is usually removed from point of use.

BTU—British Thermal Unit, or the amount of heat needed to raise one pound of water one degree Fahrenheit. (Engineer's heat-loss calculations are expressed in BTUs lost.)

cellulose insulation—A loose-fill insulating material made from shredded newspaper, etc., which has been treated for fire retardancy. Cellulosic insulation is an increasingly popular choice with contractors because it is versatile, made of recycled material, and no longer seems to present serious problems of flammability or settling.

conduction—The ability of solid objects (like window glass) to transmit heat. Double-glazing and movable "night" insulation both cut conduction losses through single-glazed windows.

convection—This is a fancy word for a draft. Convection is an air current caused by the natural tendency of warm air to rise and cool air to drop. This is how old-fashioned radiators warm a roomful of air; they'd be better called "convectors."

degree day—The average number of degrees-Fahrenheit below the **base temperature** of 65 degrees, per day of the heating season. A January day with an average temperature of 31 degrees has 34 degree days. Degree days are added to find a heating-season total. For example, NYC has about 5200 degree days per year; Hawaii has close to 0.

envelope—The walls, floor, and roof of a building: that which separates the indoors from the outdoors. Most energy-upgrading of existing buildings involves making the envelope more efficient.

hybrid solar—Use of the sun's energy through chiefly passive means (i.e., direct gain), but with some assistance from other energy sources. Distribution of passively warmed air by an electrically powered fan is an example of a hybrid solar system.

infiltration—A word for unwanted ventilation. Buildings lose winter heat, gain summer heat, and admit winter cold by infiltration through voids in the walls, cracks, ill-fitting windows, etc. High infiltration means a high rate of air changes per hour **(ACH)**.

movable insulation—This is also called night insulation. It almost always refers to tight-fitting insulation placed over window glass to block conduction losses at night, or all day on north-facing windows (winter) or south-facing windows (summer). It's "movable" because a window that is at times useful for solar gain, ventilation, or a view, may be at other times responsible for conductive heat gain or loss.

passive solar—Methods of using the sun's energy without any mechanical backup or use of auxiliary energy sources. Passive (and sometimes hybrid) solar methods, because they are simpler and less expensive, usually make the most sense for existing buildings.

payback—The number of years it takes for a capital investment (say, for new storm windows) to pay for itself in energy saved by its use.

R-value—This is the resistance to heat loss of any given material. ($R = 1/U$) Commercial insulating materials give their R-value per inch on the label.

retrofit—A noun or verb referring to something that is added or changed in an existing building. Blowing insulation into the cavity of an existing wall is a retrofit.

thermal mass—Any dense material used to store heat, which it will give up gradually to surrounding objects or air. Soil, stones, masonry units, tile, and water are all often used as thermal mass.

Trombe wall—A glass curtain wall built in front of a masonry wall to create a "greenhouse effect" for collecting the sun's heat.

U-value—In lay terms, U-value is a measure of conductive losses through any given material or combination of materials, such as a wall "sandwich." ($U = 1/R$) U-value is a coefficient which expresses transmission of BTUs per hr. per sq.ft. per inch of thickness per each degree of temperature difference between inside and outside.

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