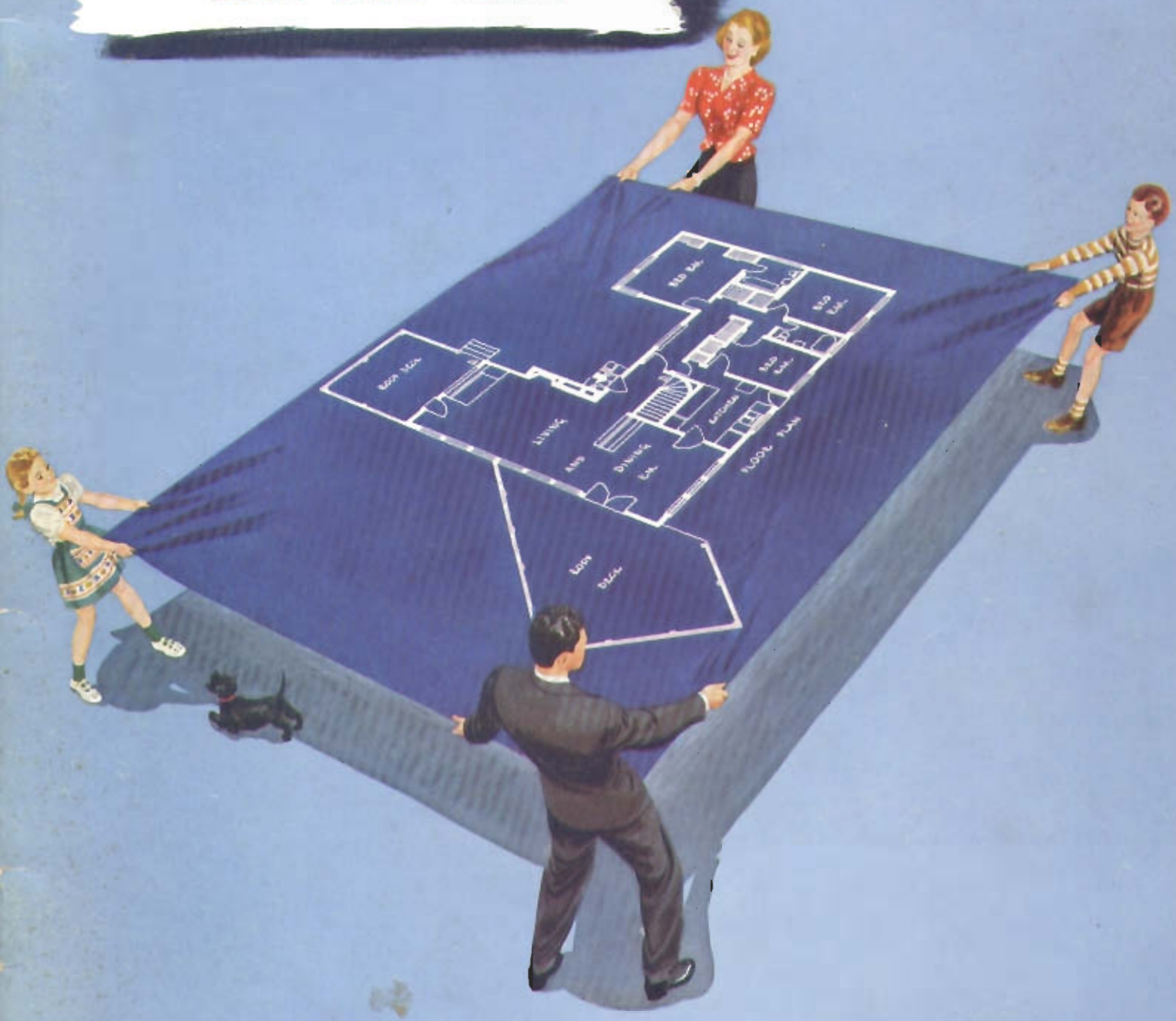
How to Choose a Heating System For Your New Home



A report on concealed radiant heating, published for prospective home owners by

A. M. BYERS COMPANY

makers of Genuine Wrought Iron Pipe.

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Yesterday's Heating in Today's Homes?

WHEN that progressive citizen of the Stone Age, J. Clarence Cavedweller, built a fire in the middle of his one-room-and-no-bath residence, he installed the world's first house-heating system.

Clarence thought it was a pretty swell system. Of course, the floor would often be cold when the ceiling was hot, and many a chilly draft found its way under his mammothskin smoking jacket, and the side of him near the fire would be roasting while the far side froze—but Clarence didn't care. He remembered the icy winds outside, and figured that any heat at all was clear gain.

Clarence's twentieth century descendants, the C. Cavedweller Smythes, are inclined to be very snooty about Clarence's heating arrangements. *They* have central heating. There's a heat source in every room, but the fire is downstairs. Mr. Smythe doesn't even have to drag in dead trees to keep it going.

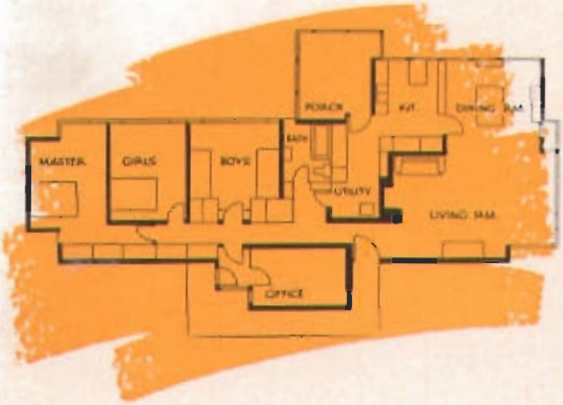
What the Smythes don't realize is that, in its basic principles, their heating system closely resembles that of Ancestor Clarence. In both homes a "hot spot" in the room sets up air currents which carry the heat around the room.

The floor in Mrs. Smythe's house isn't *much* colder than the rest of the room (although the children aren't comfortable there). The drafts aren't *very* bad (though Mrs. S. always keeps a light scarf handy). The radiator isn't as hot as a fire (though it did startle the baby when she backed up against it).

Yes, the Smythes feel that their system is much better than that in the Cavedweller home—but actually it still has many of the stone age disadvantages, though to a lesser degree. Those air currents, for example, which carry the heat also carry a load of dust and dirt, depositing it wherever a current hits wall or ceiling. Mrs. Cavedweller didn't care. Spring house cleaning to her was simply a matter of shoveling out the winter's accumulation of gnawed bones and other rubbish. Mrs. Smythe, however, has attractive wallpaper, frilly curtains, and such. She wants her home to be attractive—and those deposits of dirt spoil the appearance of the room in spite of frequent cleaning and redecorating.

Even if Mrs. Cavedweller had cared, there wasn't anything she could do about it. Mrs. Smythe *does* care—and there *is* something she can do about it when she and Mr. S. plan their new home.

That something is radiant heating—the *first fundamentally new idea in heating in a hundred centuries.*



Myron H. Coss, Portville, N. Y., contractor, chose radiant heating for this new home.

...a small home in New York

NOW let's see how radiant heating works out in a smaller one-story home.

This home was built by Myron H. Coss of Portville, N. Y. for his own family. Plans were drawn by Raymond Viner Hall, who has also pioneered in the application of radiant heating in extensive small homes building projects.

After two years' experience with radiant heating, Mr. Coss reports that he has had no difficulty in maintaining an even temperature regardless of weather, in spite of a glass area more than three times as great as the glass area in the average home.

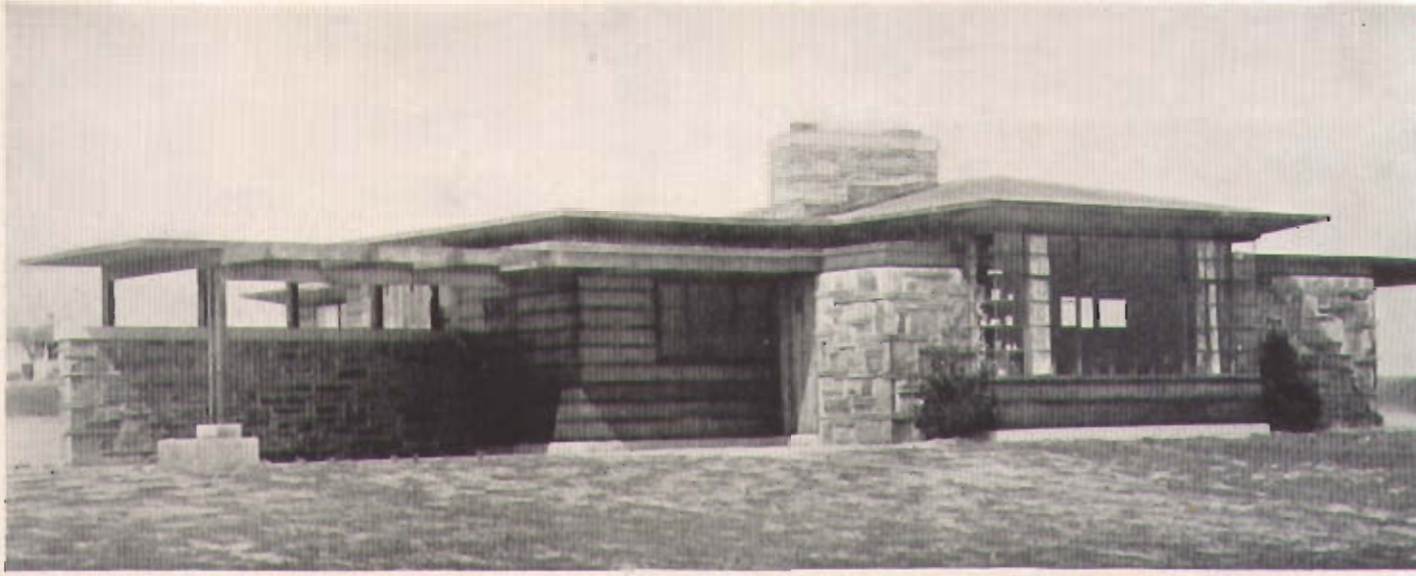
Their three children, Mr. Coss says, especially appreciate the comfort of radiant heating, since they are able to play and keep warm on the draft-free concrete floor. Mrs. Coss, too, likes the comfort but she also likes the cleanliness of the system and the absence of radiators or registers.

Mr. Coss uses gas as fuel for the heating system and also for his hot water supply. His largest monthly gas bill during the past two years was $18.

Rough stone used for the fireplace, chimney, and a portion of the outer wall, gives an unusual effect. Wrought iron radiant heating coils are buried in the floor.

Glass is used extensively, especially in the combined dining and living room.

...on a Pennsylvania hillside



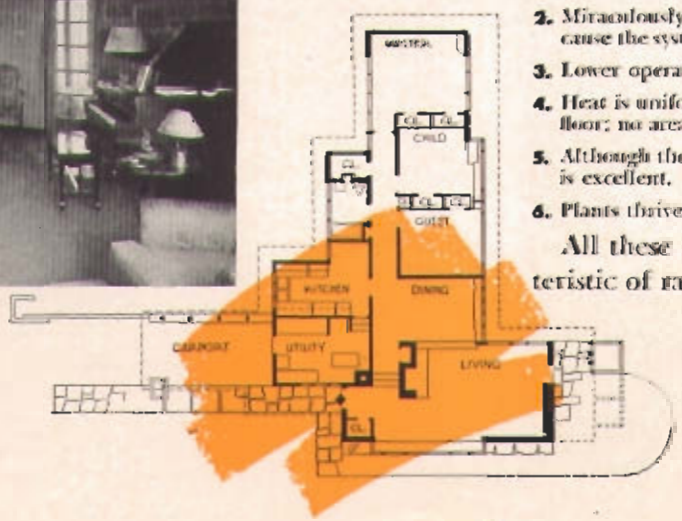
Distinctly modern is the home of Mr. & Mrs. William Moorhouse, near Lancaster, Pa.

HERE is the home of Mr. and Mrs. William Moorhouse, located on a gentle slope overlooking the city of Lancaster in south-central Pennsylvania. It is a very modern one-story structure, without basement, designed by Philip F. Hallock and R. V. Hall. The location and the large glass area, to say nothing of the dimensions of the living room, add to the heating problem, yet radiant heating has solved it without difficulty.

The huge window, extending the full length of the living room, again emphasizes one of the very great merits of radiant heating. The whole space under the window is used for bookshelves —*there is no radiator or register in the room.*

Family life centers in this living room with its broad window and cheery fireplace.

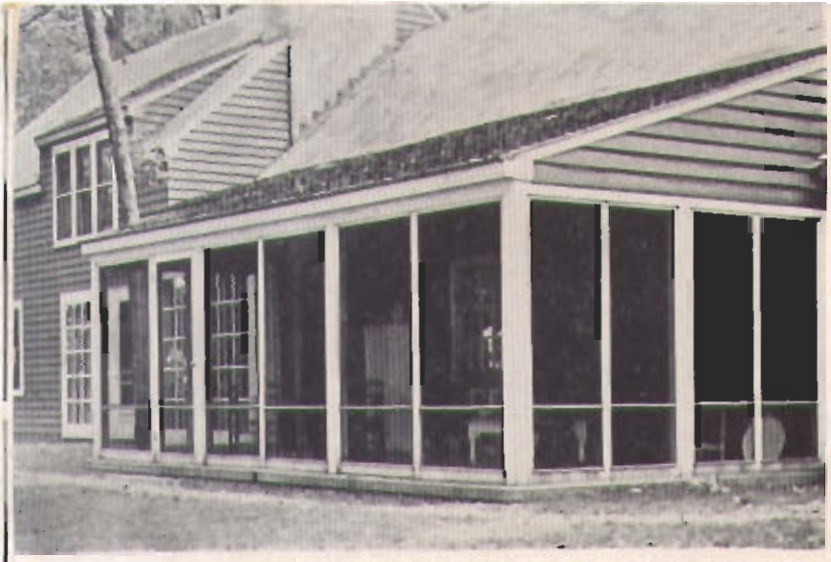
This corner of the living room shows how skillfully built-in and movable furniture can be combined. The hidden wrought iron heating coils do not interfere with furniture placement.



Two winters in their new home have given Mr. and Mrs. Moorhouse ample time to make up their minds about radiant heating. These are the advantages they report:

1. More body comfort and uniform air moisture content, winter and summer.
2. Miraculously little dusting and cleaning required, because the system of heating does not circulate dust.
3. Lower operating costs.
4. Heat is uniform. There are no layers of cold air near the floor; no areas of "burned out" air toward the ceiling.
5. Although there is no apparent air movement, ventilation is excellent.
6. Plants thrive, since the air retains normal humidity.

All these things, as we shall see, are characteristic of radiant heating.



Farm home of Mr. and Mrs. E. C. Witwer, near Niles, Michigan.

. . . on a Michigan farm

MR. and Mrs. E. C. Witwer and their two children live on a 77-acre farm, about five miles from Niles, Mich.

Here's Mr. Witwer's account of their radiant heating system:

"I consider the installation of a Radiant Heating System in my home as the best feature in the building.

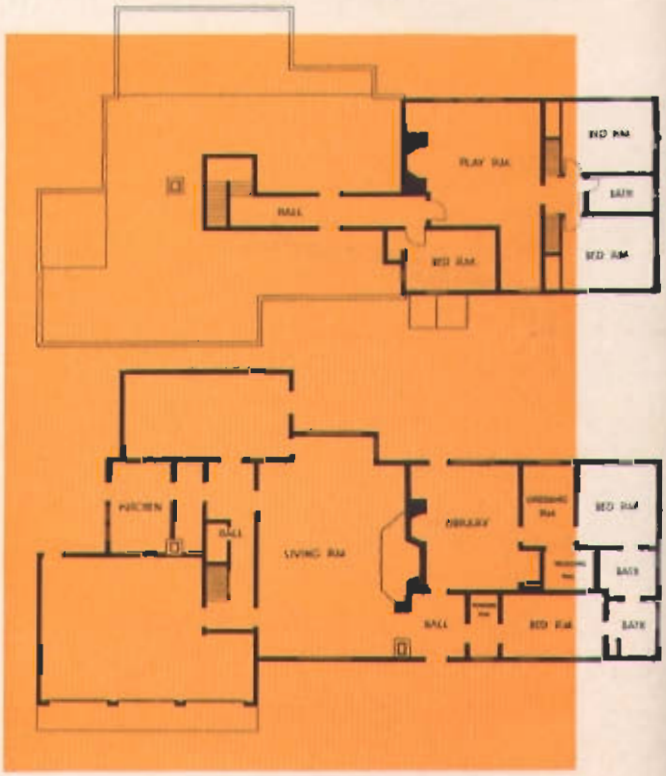
"The system has been operating for two winters, one very severe, and the other rather mild and I am sure, with this experience, of complete satisfaction under practically all weather conditions.

"In fact, there isn't a single point of complaint that can be mentioned."

The Witwer home is a two-story frame building, with basement, designed by N. Roy Schambleau. Heating coils for the first story were imbedded in the concrete floor. Ceiling coils were used for heating the second story.

Modern comfort and old-fashioned charm are combined in this bedroom. Wrought iron ceiling coils were used on the second story.

Old and new are again skilfully blended in this living room, with its huge brick fireplace and its large window area. Wrought iron floor coils warm the room.



20th Century Homes with 20th Century Heating

Mr. & Mrs. H. W. Seaman,
Avonmore, Pennsylvania.
Joseph Hoover, architect.

Mr. & Mrs. R. L. Hoover, Oklahoma City, Oklahoma. W. N. Eaton, architect.
(Radiant heat in flower-sun room and hall.)

Mrs. Martin Coffey, Concord, Massachusetts.
H. W. Brown, architect.

Home in Barrington, Illinois.
Designed by George Fred Keck.

Miss Hulda Natz, West Mifflin Borough, Pa. Designed by
Mrs. Cornelia Berndtson, under the supervision of Frank Lloyd Wright.

Dr. & Mrs. C. E. Ward, Durham, North Carolina.
William van Eaton Sprinkle, architect.

Mr. & Mrs. R. E. Palmateer, Emporium, Pennsylvania.
Raymond Viner Holl, architect.

Mr. & Mrs. T. B. Weaver, Omaha, Nebraska. Designed by
Roy F. Zehm, for his own occupancy.

What Radiant Heating Gives You

SO IT GOES, large houses and small; one story or several stories, with basement or without; floors of concrete or of wood, either bare or covered with linoleum, rubber or asphalt tile, or with full width carpets, large rugs or scatter rugs; cold winters and mild; with coal, oil, or gas as fuel—always, radiant heating wins the same enthusiastic approval.

Comfort, first of all. There are no drafts, no cold floors, no currents of hot air. The temperature stays even throughout each heating area, right at the point you want it. Modern radiant heating systems, controlled by thermostats, respond quickly to changes in temperature.

The air stays moist enough for health—it is not "burnt out" by being heated far above normal body temperature.

Rooms are cleaner. Conventional heating systems must, if they are to be effective, set up currents of hot air. These air currents carry dust and dirt with them, depositing streaks of dirt on curtains, wallpaper or paint. Frequent cleaning and redecorating become necessary.

There's still another reason for the greater cleanliness of radiant heating. Ever notice how the colder walls of a room seem to get dirtier than the others or how the dirt seems to follow the plaster spaces between the lath, making a regular pattern on the ceiling? That's because dirt clings more readily to colder surfaces. With radiant heating, wall and ceiling surfaces are evenly warm, so that dirt doesn't cling as easily.

Lower operating costs are reported by many users. Heat is distributed with less loss by radiation than by convection (air currents) but that is only part of the story. We are comfortable at somewhat lower temperatures in a *radiant-heated* room, because our bodies do not lose heat as rapidly. Both of these factors mean that less fuel is needed—and that is exactly what owners of radiant-heated homes report.

The installation cost of a radiant heating system is comparable to that of conventional steam or hot water systems. Cellars are a matter of choice; they are not necessary for comfort in a radiant-heated home, and the boiler of the heating system can be located in a laundry, utility room, or closet. If you don't want a cellar you can save the cost of excavation.

There is greater flexibility in design and decoration when radiant heating is used. The greater areas of glass which are characteristic of modern architecture can be used more freely. There are no registers or radiators to break up wall spaces or interfere with the arrangement of furniture.

In short—with radiant heating, every type of home gives you more in comfort, convenience, and appearance, at comparable or lower installation and operating costs.

What is Radiant Heat?

WE CAN understand radiant heating easily if we review a few facts about heat—facts which were new discoveries a generation ago, but which are now in every junior high school textbook in general science.

One of the first things people noticed about heat was that it seems to flow from one object to another—from a warm object to a cooler one—until both are the same temperature. That is probably the reason that, as late as a hundred years ago, chemistry textbooks taught that heat is a fluid, which they called caloric.

We know now that heat is a form of energy, just like electricity, and that it travels in three ways—by conduction, convection, and radiation.

Put one end of an old fork or other metal into an open gas flame. In a few minutes the other end, also, is too hot to touch. The fork hasn't moved, but heat has traveled from one end to the other by *conduction*.

Put a pan of water on the stove. You can soon see bubbles forming at the bottom, while the top is still cool enough to touch. In a few minutes more, however, the water starts to move; that from the bottom rises, the cooler water at the top takes its place. Soon it is bubbling vigorously. *Convection* has started—that is, the actual movement of heated material from one place to another.

That is the way rooms are heated by the conventional systems. In a furnace, or by a radiator in the room, air is made hot. Hot air rises, cooler air moves in to take its place, and soon there is a definite current of air in the room—heated air above, cooler air below.

The third way heat travels is by *radiation*, just exactly as radio waves or light waves or the rays from the infra-red "heat lamp" travel—in the form of electro-magnetic energy. *Not until they strike some object which absorbs them*, are these rays changed back into heat energy. (That, incidentally, is the reason why the sun's rays do not warm the great, airless spaces beyond the earth's atmosphere.)

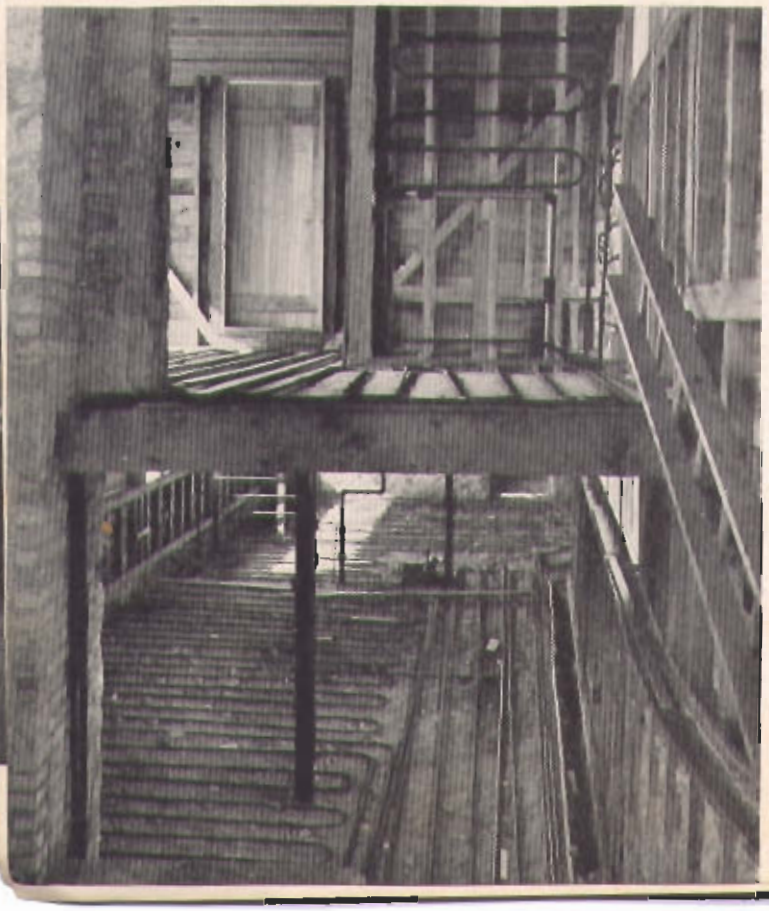
Now we begin to see why radiant heating systems have come into use only in our time. We had to wait until men learned what heat is, learned that radiation was one way by which it traveled.

We had to realize that heat is generated within our own bodies, and that to keep us warm we need only to retain that bodily heat. We had to understand that gentle radiant heat would keep us more comfortable than blasts of air many degrees hotter than body temperature.

Then it was necessary to learn how to transfer heat by radiation with the least possible waste, to check and test and experiment, then check and test again until radiant heating ceased to be a laboratory demonstration and took its place among the great home conveniences.

How Radiant Heating Systems Work

Setting floor joists on the concrete makes it easy to install ordinary wood floors above wrought iron radiant heating coils.



Here wrought iron floor coils are used in the second story. Lower floor is of concrete; on upper floor a thin layer of concrete is poured over wrought iron coils laid on wood. Wrought iron wall coils may be used where extra heat is desired, as in bathrooms.

AS THE preceding pages suggest, the really new thing about radiant heating systems is the way the heat is *distributed*, not the way it is produced. Hot water is usually preferred to steam, though either may be used, and the boiler will be exactly the same as with a conventional steam or hot water radiator system.

The fuel used can be coal, oil, or gas—cost and convenience will be the determining factors, just as with any other system.

The difference is that instead of a small surface, like a radiator, heated to a very high temperature, you have a very large surface heated to somewhat less than normal body temperature. Usually this surface is the floor; it may be the ceiling; or, in special instances, it may be a portion of the wall area. In homes of more than one story, exactly the same rules apply, but there is more opportunity for combining various methods (for example, ceiling coils for one story, floor coils for another; extra wall coils in bathrooms, etc.). All of these have been used, and all have been satisfactory. There are theoretical arguments for each, but in actual practice, differences tend to be negligible. Re-radiation helps to produce an even temperature throughout the room, regardless of the source of the original radiation.

Heating coils may be installed in many different ways. For floor installations in houses of the conventional type one way is to lay a false floor over the joists, lay sheets of insulating material over this, then lay the pipe. The finished floor is laid on nailing strips placed between the coils.

In recent years concrete floors have become increasingly popular especially when there is to be no basement. In this type of construction the usual practice is to build a foundation wall from below the frost line to any desired

height above ground. The space within the walls is levelled off, firmly tamped and covered to the depth of six inches or more with crushed stone or gravel. Over this is placed a coil or grid of pipe, preferably wrought iron since it must be highly resistant to corrosion.

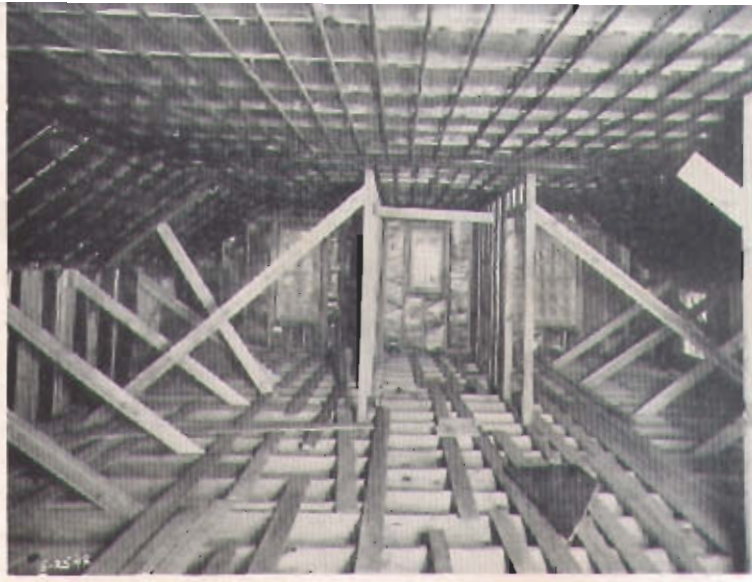
This can be laid out by any competent heating engineer. Knowing the type of room that is to be heated, he can compute the size and length of pipe needed to keep every room comfortable, regardless of outside temperature.

When the grid or coil is in place, concrete is poured over it, and this concrete slab is the heat source for the room. Since concrete can be finished and waxed to make it very decorative, this slab often constitutes the floor of the room. If desired, practically any type of flooring, including wood, linoleum, and asphalt or rubber tile, can be laid over it, just as is now done in many fireproof apartment buildings.

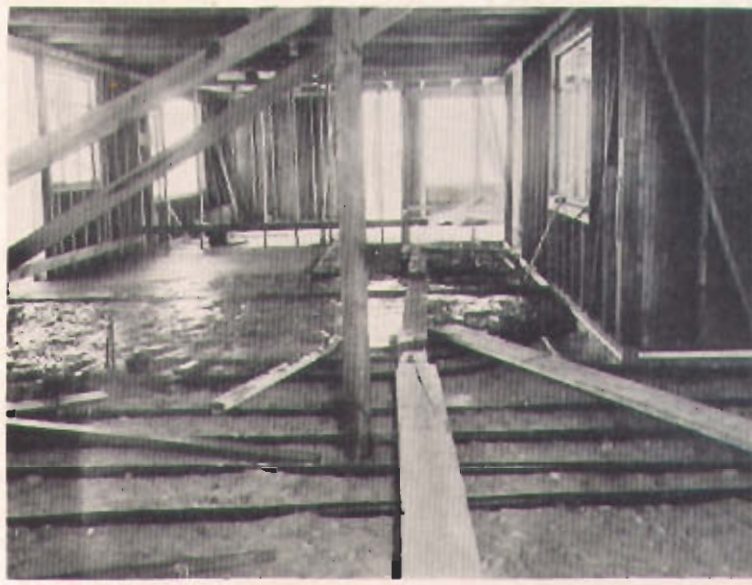
Since the temperature of the floor slab is designed to be slightly below that of the human body, it feels neither warm nor cold to the touch, but like the Little Bear's porridge, is "just right." This means that rugs or carpets may be used as your plan of decoration requires. They are not necessary, as they are with heating systems which leave floors cold.

Radiant heating systems are entirely automatic. Furthermore, separate controls may be provided for different floor areas, even for each room, so that the family can have every part of the house just as they want it.

When radiant heating systems are installed in old buildings, several methods are used. The choice depends on the type of building and the nature and extent of remodeling to be done as well as on heating needs. Pipes may be laid under the floor between joists, or on top of old floors, in ceilings, or in walls. Sometimes considerable ingenuity is required—but no more than architects usually exercise in modernization.



Wrought iron pipe may be installed in the ceiling if desired. In this house floor coils are used in the first story, ceiling coils in the second.



As more people get used to the idea of concrete floors, this method becomes increasingly popular. Such floors can be very attractive, and in a house with radiant heat they are entirely comfortable.

How Much Does Radiant Heating Cost?

MANY of the radiant heating systems now in use actually cost less than conventional steam or hot water systems; some cost a little more. Either way, the difference will be slight.

Only your architect or heating contractor can give you an accurate estimate, because so many different factors must be considered. The size and location of the house, the direction it faces, the material of which it is built, the prevailing winter temperatures, the window area—all these things and many others must be taken into account.

You can, however, get a rough idea of the cost of radiant heating in the home you plan to build by reviewing the experiences of other home owners. In all of these, wrought iron pipe was used for the heating coils, as assurance of dependability and durability.

These are typical:

1. Seven rooms, one story, no basement. Redwood and cypress frame construction. Oil burner. Total cost $12,000; cost of radiant heating system, $900 —7.5% of total cost.

2. Ten rooms, one story, no basement. Combination of frame, concrete block and stone construction. Gas boiler. Total cost $14,000; cost of radiant heating system, $900 —6.5% of total cost.

3. Six rooms, one story, partial basement. Cinder block construction. Gas boiler. Total cost $6,500; cost of radiant heating system $523 —8% of total cost.

4. Six rooms, two stories, partial basement. Stone, Coal-burning boiler. Total cost $8,000; cost of radiant heating system $625, or 8% of total cost.

5. Six rooms, one story, no basement. Frame. Gas boiler. Total cost $5,200; cost of radiant heating system $500 —9.6%.

6. Ten rooms, two stories, basement. Stone and cinder block. Coal-burning boiler. Total cost $25,000; radiant heating system $1,460 —6%.

7. Seven rooms, one story, partial basement. Concrete block. Total cost $6,500; radiant heating system $490 —7.5%.

8. Six rooms, one story, no basement. Stone and frame construction. Total cost $8,500; radiant heating $802 —9.5%.

9. Six rooms, two story, no basement. Frame. Oil burner. Total cost $10,000; radiant heating system $1,062 —10%.

Where Does Byers Come In?

AS YOU have probably noticed, there has been no reference in this booklet to any "brand" of radiant heating system. That is because radiant heating is not a "package" or unit supplied by any manufacturer. It is *a method of distributing heat,* using boilers and controls available from many manufacturers. When you hear the term "Byers Radiant Heating," it merely means that Byers Wrought Iron pipe has been used for the coils.

A. M. Byers Company is interested in radiant heating because *pipe* is especially important in this type of heating, and a very large proportion of contractors responsible for radiant heating installations have found in Byers genuine wrought iron exactly the kind of pipe that is needed.

Some reasons for this are obvious. Wrought iron pipe is an excellent material to weld, and it can be easily bent into desired shapes. Both characteristics are essential in the construction of radiant heating systems.

Installations are tested at pressures far above those used in actual operation, so contractors know, before the concrete or plaster is in place, that the system is tight. They also know, from the history of hundreds of various types of Byers installations that wrought iron resists corrosion.

Wrought iron is also desirable because it transmits heat readily. The warmth of the water or steam circulating in the pipes is passed on to the concrete slab or other heating surface with a minimum of loss, whereas some other materials strongly resist the transfer of heat from the water to the floor.

Finally, there is the factor which engineers call the "coefficient of expansion." Translated into everyday language, that means simply the rate at which a substance "grows" when it is warmed and "shrinks" when it cools.

We know that some substances expand more quickly than others when they are heated. If you have ever dipped the top of a stubborn fruit jar into hot water, you have taken advantage of this fact. You made the top expand by heating it; then removed it before the glass of the jar expanded, too.

The *amount* of expansion for each degree the temperature rises is not the same for all materials. You can see what would happen if two materials which expanded differently were fastened together. Something would have to give away.

You can see, too, that when pipes are buried in concrete or plaster, both the pipes and the material in which they are imbedded must expand equally, or the cement or pipes may be damaged. However, *wrought iron* has almost exactly the same "coefficient of expansion" as concrete or plaster, and hence can be imbedded in either without the slightest risk.

What Home Owners Say About Radiant Heating

Illinois—"Compares favorably with other kinds of heat because it is so comfortable, and so much cleaner. Fuel cost is considerably less."

"Temperature seems to be always agreeable. Cost is much less. For the past year fuel bill was $215, fully half of which was for hot water for domestic purposes."

New Mexico—House now occupied by army officers, who sum it up in four words—"The heating is swell."

Ohio—"Wonderful. Floors warm, and with children there is much less noise with concrete than with wooden floors. Children can play on the floor without danger of drafts. House stays cleaner. Curtains and drapes stay clean all winter."

"A lot more comfortable than other types of heating. No drafts, and we find that a temperature of 65 degrees is adequate. As for cleanliness, there's no comparison. Drapes and walls stay clean. It is hard to judge costs, but we believe that in spite of extra large glass areas our fuel bill is no higher."

"Well satisfied. House now sold, in order to be nearer town, but we will certainly specify radiant heating when we build again."

Georgia—"It is more comfortable than any other type of heating I know for two reasons: because it does not dry out the air and it always feels as fresh as outdoors, and because it is warmest around the ankles, which is the best place for it."

FUEL COSTS (NATURAL GAS) IN FIVE PENNSYLVANIA HOMES

	INSULATION		CUBIC FEET CONSUMED				ESTIMATED ANNUAL HEATING COST
Cubic feet of heated space	Ceiling	Walls	1942-43	1943-44	1944-45	Average	
No. 1 15,700	4" rock wool	Aluminum foil	205,000	196,000	201,000	200,000	$106.00
No. 2 7,500	4" rock wool	Al. foil or paint	180,000	159,000	150,000	163,000	86.00
No. 3 7,400	4" rock wool	None	198,000	163,000	177,000	179,000	95.00
No. 4 8,100	4" rock wool	None	202,000	195,000	194,000	197,000	104.00
No. 5 7,400	4" rock wool	None	147,000	135,000	131,000	138,000	73.00

These five homes are in a single development in northwestern Pennsylvania. In this area there are approximately 6500 degree days in a normal heating season, using 65 degrees Fahrenheit as a base figure.

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