How Should the House Be Heated?

VI. What Can Be Done to Disguise the Radiator and Register?

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IN previous articles on house heating, we have been thinking of the heating plant as a whole, weighing the advantages of different systems against their disadvantages. We have been thinking principally of the mechanism down in the cellar — out of sight and, in a sense, separate from the real house in which the owners live and entertain their friends.

But the *radiator* is always with us and is bound to be more obtrusive than appears from the simple rectangle marked 'Radiator' on the architect's plans. When we move into the house, we are perhaps shocked to learn that this rectangle had a third dimension which we did not sense — and now the radiator is coming just where we wanted a certain picture or a bit of plain wall space, or a favorite piece of furniture. And somehow its very form is not attractive, it is so mechanical in appearance and so reluctant to fit into the scheme of things as we idealized it when our house took form on the architect's blueprints.

Now this article is written to show that there are ways to make the radiator fit into the artistic plan better than we have supposed, and that the beauty of the house may not be wholly marred.

At the beginning it must be pointed out that such methods as are outlined here do cost a little more than the usual installation, but if the house is built for the owners to *live* in and not for business investment alone, this extra cost may be found not too great and distinctly worth while. But more of this later.

We shall first consider the radiator for either steam or hot water systems. There are four ways of making the radiator more acceptable, as follows:

1. Improvement of form.
2. Painting to agree with color scheme of the room.
3. Enclosing behind panels or screens.
4. Use of indirect radiators.

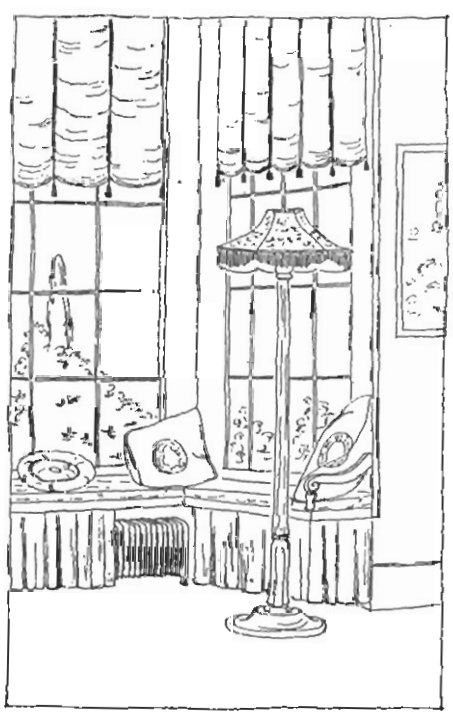


FIG. 2. RADIATOR COVERED BUT NOT ENCLOSED

The ordinary steam or hot water radiator is made of very thin cast iron, a marvel of the foundryman's art — but with what little grace of form! We have improved somewhat in dropping the old ornate and intricate detail in favor of a smoother surface. Yet even now there is much to be desired in the form of most of the radiators as we must buy them. Some manufacturers of this apparatus are giving considerable study to the question of refinement of radiator form.

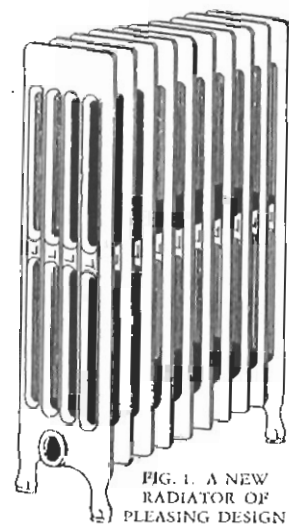


FIG. 1. A NEW RADIATOR OF PLEASING DESIGN

It has been from French sources that one manufacturer has drawn forth one of the best contributions to the development of beauty in the heating art. The designer of this type of radiator, shown in Figure 1, said, 'My ambition is to design a radiator of such refined lines of classic architecture, that in its finished state it may justly be regarded as an object of art, forgetting for the moment its paramount utility. It must be of lesser proportions than any existing radiator, yet its warming power must equal, if not exceed, that of the best now known. The bulky and obtrusive waterways must be replaced by a daintily balanced array of small columns, terminating in unbroken lines of harmonious grace.'

The reader may, by inspecting Figure 1, judge for himself the success of the designer in giving this radiator the beauty he dreamed of. As to its space requirements, a comparison with other radiators made by the same manufacturer shows that for the *same height* and the *same amount of heating surface*, this type takes up about 20 per cent less floor space.

The extra cost of such a radiator to the owner will be four to six dollars per radiator, depending upon the size.

Formerly, we slavishly copied the well-nigh universal plan of covering the radiator with a coat of shining silver or gilt color, which only made the radiator stand out more decidedly from its surroundings. To-day, we are painting the radiator with some color which harmonizes with wall or woodwork, and this makes it become a part of the room itself.

The use of silver or gilt (commonly called aluminum bronze or gold bronze) is not only poor *art*, in my opinion, but has been shown to be poor *science* also, because these materials cut down what we may call the 'transmission capacity' of the surface of the radiator.

Just what is meant by this term may need explanation. We know that a square foot of bare unpainted radiator surface will let through only a certain number of Calories or British Thermal Units (B. T. U.) in a given time when there is a given difference in temperature between the steam or water *inside* and the adjacent room air *outside* (assuming the air to be still). With steam radiators we have usually a temperature of about 212 degrees *inside* and 70 degrees *outside* making the temperature difference 142 degrees. With hot water radiators, we have a temperature difference of 90 degrees or less. Doubling the temperature difference will practically double the amount of heat let through per square foot — provided of course we have the boiler and fuel available to furnish the extra heat. If we coat that surface with say a bronze paint, it is found that for the same temperature difference, a square foot will let through only about 80 to 85% as much heat as when bare and unpainted. Some writers say it is thus '80 to 85% efficient.' With this phrase I take decided issue, because it conveys a wrong impression to many casual readers. It does *not* mean that a correspondingly greater amount of fuel will be burned. It means only that (for a given temperature difference) a *greater amount of radiator surface must be installed to let the same amount of heat through in a given time.*

A simple analogy may help to fix this idea. The radiator surface is like a screened hole in the bottom of a tank filled with water. The amount of water which will pass through one

FIG. 3. RADIATOR IN A BOXED GRILLE

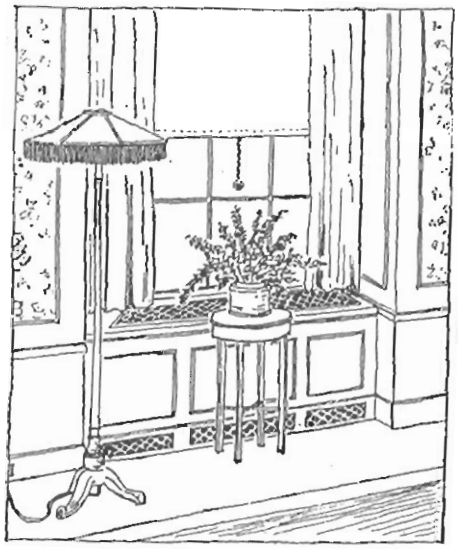


FIG 4. RADIATOR ENCLOSED WITH TWO GRILLES

square foot of the screened area in a given time is like the amount of heat in thermal units passing through the radiator surface — it depends upon the height of water above the hole just as the heat-flow is dependent upon the temperature difference. And just as a fine screen will let through *less water per square foot* for a given height, so will one kind of radiator surface let through *less heat per square foot* than another surface for a given temperature difference.

The table below shows the *relative* transmission capacities of radiator surfaces painted in different ways.

Condition of Radiator Surface	*Relative Transmission Capacity*
Unpainted (100 taken as convenient standard)	100
Painted with aluminum or gold bronze.....	80 to 85
Painted with white enamel.....	101
Painted with maroon japan.....	100
Painted with white zinc paint.....	101
Painted with green enamel (no lustre).....	96

From this it appears that while the bronzes lower the capacity, the white paints even increase it. The reason for the former is thought to be the flaky composition of the powder from which the bronzes are made.

Even more striking is the evidence from other tests that it is the *outside* coat which determines the capacity of the surface. That is, we find that even if the low capacity bronzes are used for a primary coat, and the outside coat is white paint, the transmission capacity will be the same as if both coats were white paint. But do not forget that the lower capacity can be overcome by increasing the size of the radiator.

A painting contractor of wide experience uses bronze for a priming coat with the belief that the outside coat is discolored by the heat less than it would be with the usual priming coat. Whether this practice is justified, I cannot say. At least, it does no harm.

Finally, if you *prefer* the silver or gilt color, let me suggest a way to get a better color effect. Mix dry one part of aluminum (silver) bronze powder with two parts of gold bronze powder. Then add the usual oil to make the paint. This mixture results in a soft straw color not unlike that of the best Japanese grass cloths. You can vary the proportion to suit your taste.

The plan most likely to appeal to those who desire extreme subordination of the radiator is to hide it or partly conceal it. This is possible by many clever devices, such as covering with panels or screens, fitting into niches, or using parts of bookcases or space under window seats. Several possibilities are suggested in Figures 2, 3, 4 and 5.

The fact to be kept in mind in all such attempts is that the *transmission capacity* may be lowered considerably if the radiator is shut up too much. Just as explained above in connection with painting, the lowering of transmission capacity simply requires the purchase of *more radiator surface*.

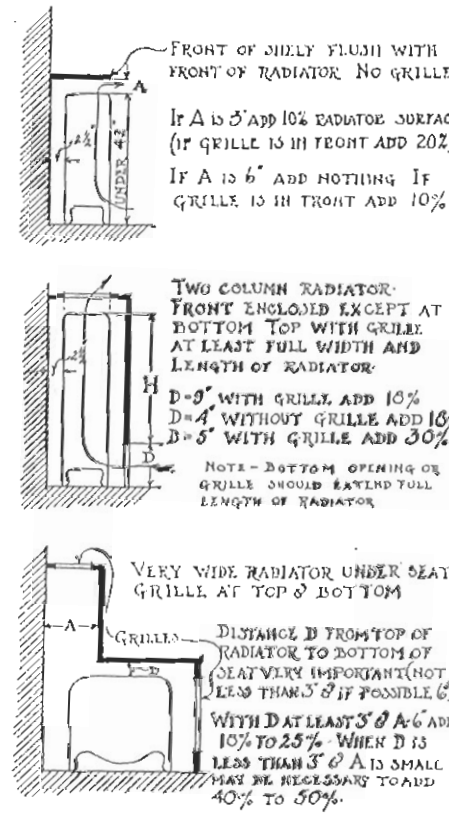
The reason that enclosing a radiator lowers its transmission capacity is not only that the enclosure interferes with its *radiation* of heat, but also that it prevents the air from circulating freely over the warm surface and carrying away the heat by what we call *convection*. Hence it is of great importance to allow sufficient openings to provide for air circulation to and from the radiator.

Experimenters have been at work in recent years on the problem of the effect of various types of enclosures upon the transmission capacity of radiators. Space does not permit of more than a few examples, but those given here show the *more* common enclosures used.

The numerical values * given in connection with these sketches show what per cent increase should be made in the number of square feet of radiating surface installed, as compared with the same radiator *not* enclosed and set in the ordinary way ($2\frac{1}{2}$ inches from the wall) in what is ordinarily called still air.

For example, if a room should require an ordinary unpainted radiator with 40 square feet of radiating surface to keep the temperature up to 70 degrees on a zero day, an enclosure like Fig. 6 would require you to add 10% to the radiating surface; that is, you would have to install 44 square feet. The increase is generally obtained by having another section added to the length of the radiator.

*These values are average figures from two sources: (1) Prof. Brabee, as reported in Heating and Ventilating Magazine, May 1914; (2) John R. Allen, in Journal of Am. Soc. Heating and Ventilating Eng'rs, January 1920. Do not use them without referring to original sources where height of radiator and other details are specified.



FIGURES 6-7-8

A few suggestions may be given for those who contemplate the use of enclosed radiators:

1. The cost of the extra radiator surface required, due to lessened transmission capacity, would be about 75 cents for each square foot added. If we specify 40 square feet for an ordinary radiator, and the enclosure requires 10 per cent additional surface, the extra cost would be 40 x .10 x $.75 = $3.00 per radiator.
2. The expense of painting the radiator is saved by enclosure.
3. The panelling should have a removable cover or grille for getting at the valves and connections. In fact, it is advisable to have all the panels or screens easily removable for cleaning and repairs due to leaks.
4. For hot water systems, shut-off valves could be omitted entirely, as the regulation of temperature *should* be done at the boiler. If the room becomes over-heated, you can cover the grilles temporarily.
5. Have *all* openings or grilles extend the *full length* of the enclosed radiator, and top openings or grilles at least *full width* of radiator.

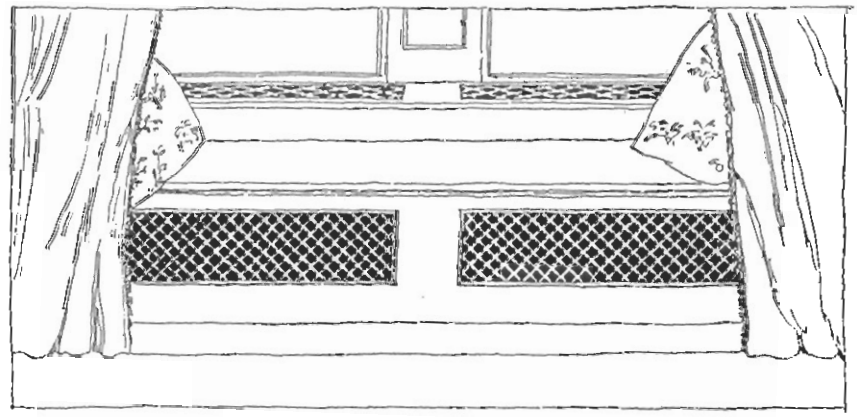


FIG. 9. RADIATOR UNDER WINDOW SEAT WITH UPPER GRILLE IN WINDOW SILL

It is possible in some cases to *eliminate* the radiator entirely, and use indirect radiation surface, — that is, a special form of radiator in a box

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