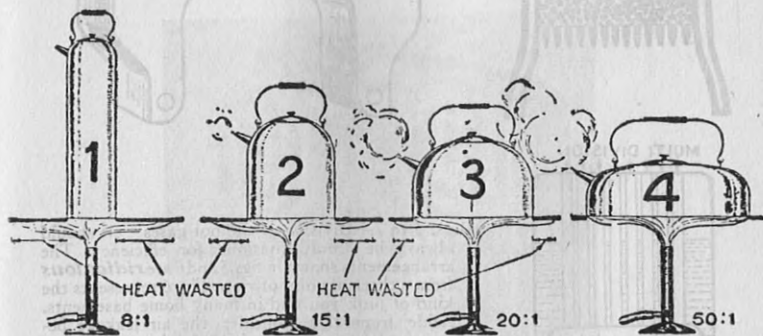


CHAPTER 6

House Heating Boilers

Ques. What can be said, if anything, in favor of early cast iron sectional house heating boilers?

Ans. Nothing.



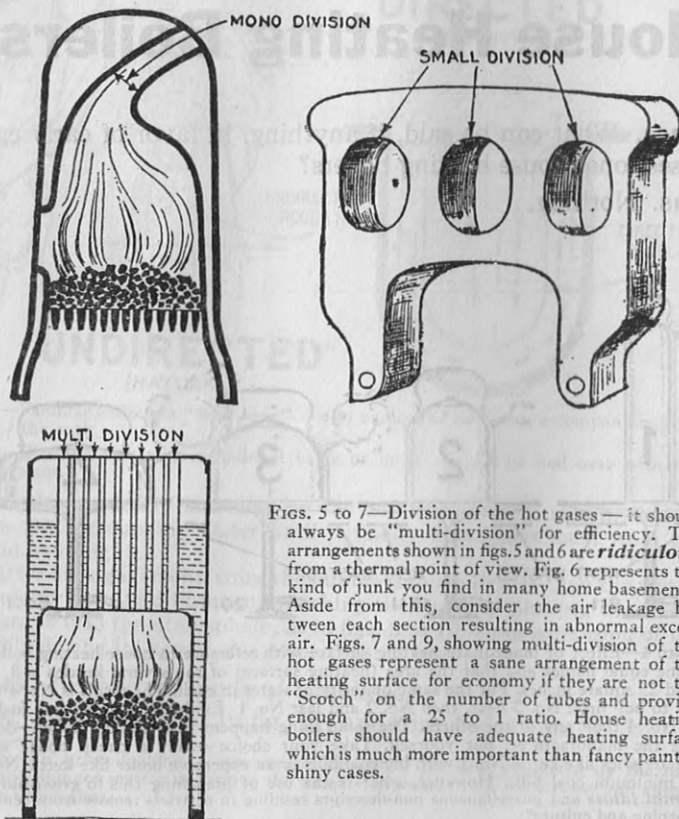
Figs 1 to 4—Effect of inadequate heating surface with reference to house heating boilers. Assume equal flames and that the area (heating surface) of the several kettles is 8, 15, 20 and 25 square inches. Put the same quantity of water in each. The result is No. 4 will begin to boil first; No. 3 next, then No. 2 and last No. 1. Evidently it takes less fuel to heat No. 4 than any of the others. The same thing happens in a heating boiler—don't blame the manufacturer, but yourself. Take your choice—buy a cheap boiler with characteristics like kettle No. 1 with big coal bills or an expensive boiler like kettle No. 4 with minimum coal bills. However, what is the use of preaching this to **greenhorns**, **thermal idiots** and miscellaneous non-descripts residing in districts remote from centers of learning and culture?

Ques. Why?

Ans. Where is the heating surface—in the stack?

Ques. What has been done to make these boilers less wasteful of fuel?

Ans. Various attempts have been made to decrease short



FIGS. 5 TO 7—Division of the hot gases — it should always be “multi-division” for efficiency. The arrangements shown in figs. 5 and 6 are *ridiculous* from a thermal point of view. Fig. 6 represents the kind of junk you find in many home basements. Aside from this, consider the air leakage between each section resulting in abnormal excess air. Figs. 7 and 9, showing multi-division of the hot gases represent a sane arrangement of the heating surface for economy if they are not too “Scotch” on the number of tubes and provide enough for a 25 to 1 ratio. House heating boilers should have adequate heating surface which is much more important than fancy painted shiny cases.

circuiting and increase the heating surface by increasing the number of passes and by providing fins, pins, ribs and what not cast integral, etc., also baffling is resorted to.

Ques. What item should every manufacturer of cast iron boilers state in his catalogue?

Ans. The amount of heating surface.

Ques. What is the usual construction of a vertical cast iron sectional boiler?

Ans. It comprises a base section (in the case of coal, containing the grate), a fire pot with space all around for the water, and piled up on top of this are one or more intermediate “pancake” sections and a top or dome.

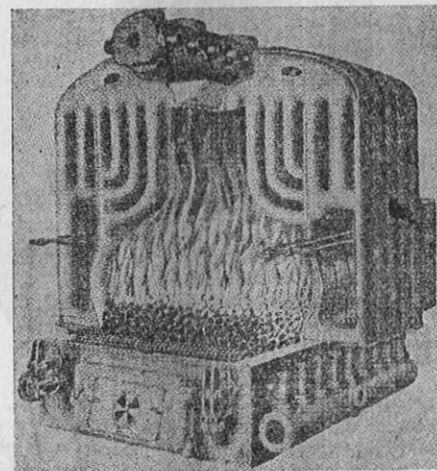


FIG. 8—An excellent design of cast iron sectional heating boiler with special reference to the amount of heating surface provided.

Ques. How can the efficiency of this type of boiler be increased?

Ans. By piling on more intermediate sections increasing the heating surface in amount, depending upon the number of sections piled on.

Ques. Why didn't they pile on intermediate sections to begin with?

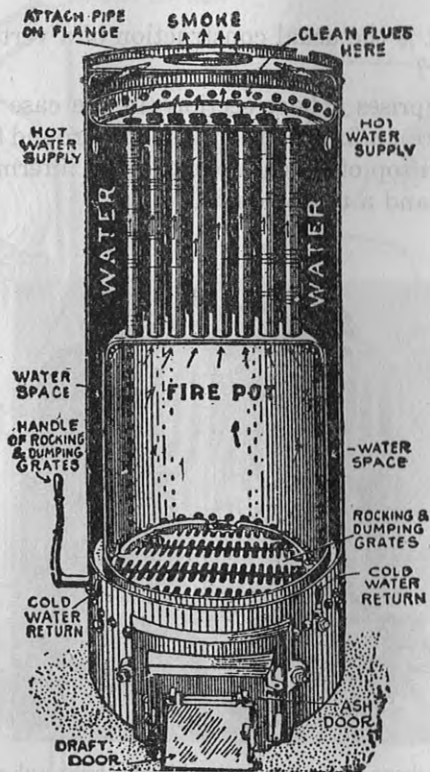


FIG. 9—Vertical coal burning boiler. An example of multi-division of the hot gases. It is easily converted to oil burning, and if a 25 : 1 ratio is provided, will be found very efficient.

Ans. Usually due to ignorance of the house owner and architect and desire of the contractor to get the job by putting in a low bid—everything too small—this goes for the whole heating system in some cases.

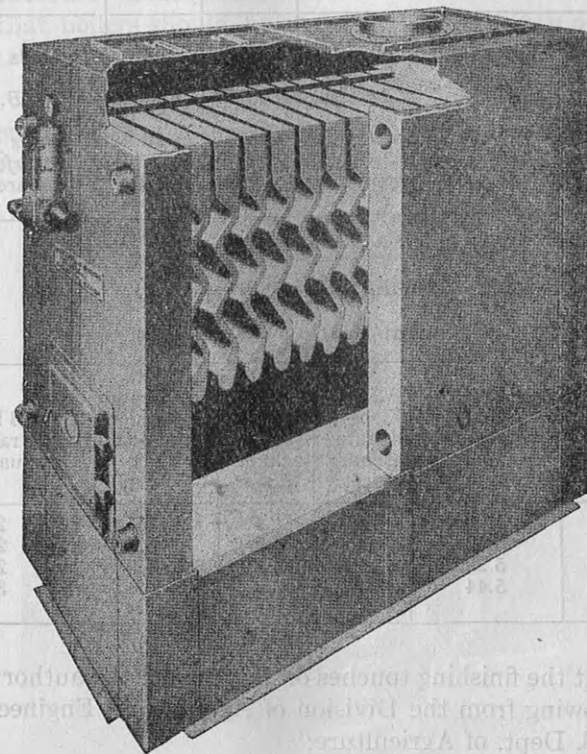


FIG. 10.—Cutaway view of Water film boiler showing single series with one row of generators. By the use of generators placed over the combustion the greatest amount of heat is transferred to the water contained therein. The generators are constructed with zig-zag walls to give more heating surface. This construction also causes the flames and heat from the combustion to be baffled back and forth between the generators and to strike the heating surfaces at right angles.

Results obtained with coal burning boilers are given in the following tables, according to Kent—they speak eloquently for themselves.

Proportions and Performance of Heating Boilers

	Low boiler	Medium boiler	High boiler
1 square foot of grate should burn.....	3	4	5 pounds coal per hour
" " " " " " develop..	30,000	40,000	50,000 B.t.u. per hour
" " " " " " will require....	15	20	25 square feet heating surface
" " " " " " supply.....	120	160	200 square feet radiating surface

Note also the following table from Kent:

Steam Heating Boiler Tests

Number of boiler	Fuel anthracite pounds per square foot of grate	Area of grate square feet	Number of sections including dome.	Steam produced per pound of coal	8 hour rating square feet
0	4.39	1.23	1	7.5	200
1	5.12	1.23	2	8.	250
1½	5.28	1.23	3	8.5	275
2	5.44	1.23	4	9.	300

To put the finishing touches on this matter the author quotes the following from the Division of Agricultural Engineering of the U. S. Dept. of Agriculture:

“Tests conducted by the Engineering Dept. on 25 inch round hot water boilers showed some interesting results as to saving realized by the addition of numbers of sections.

The smallest was a four section boiler consisting of base, fire pot, one intermediate section and dome. The next boiler had two inter-

mediate sections making a five section boiler and the largest had three intermediate sections making a six section boiler.

To achieve the same heating results No. 2 boiler required 15% less fuel than No. 1, and No. 3 required 25% less fuel than No. 1.”

These results should be sufficient to convince even a *thermal idiot* that boilers should be provided with *plenty of heating surface*.

Ques. What names are given to vertical cast iron boilers with respect to the number of intermediate sections provided?

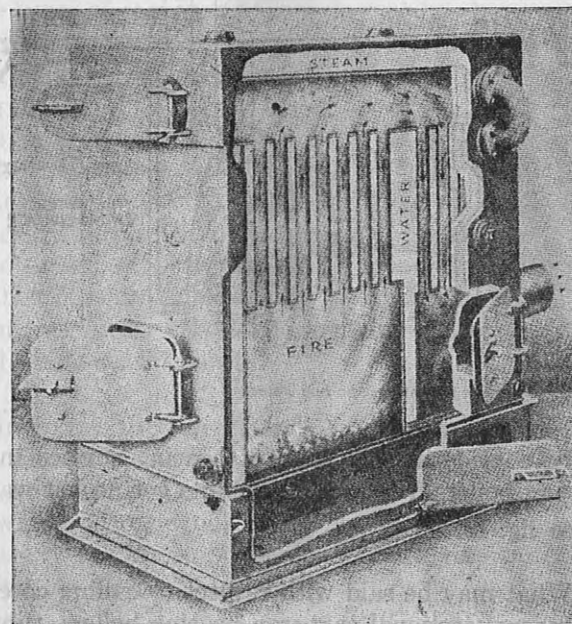


FIG. 11—Sectional welded steel heating boiler for either steam or hot water. Note the submerged tubes giving multi-division to the hot gases which is a prime condition for efficiency.

Ans. Low, medium and high.

Ques. What is the best form of heating surface and why?

Ans. Tubular, because it is the most efficient.

Ques. Why?

Ans. It provides a multiplicity of paths of small cross sectional area for the escaping hot gases of combustion.

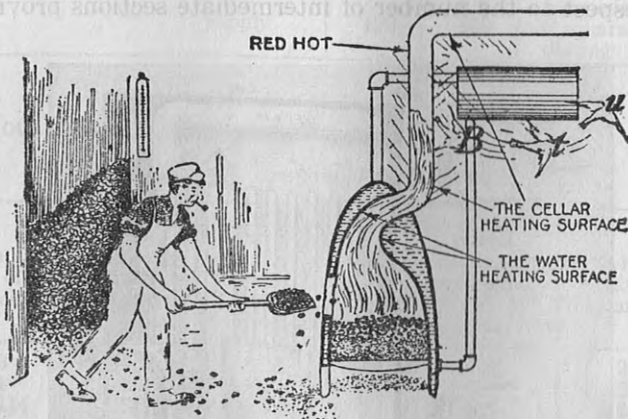


FIG. 12—Why the tenants get no hot water.

Ques. In considering the lack of heating surface in some house heating boilers, why do the tenants get no hot water?

Ans. See fig. 12.

Ques. What may be said with respect to calling cored cast passages in some sectional cast iron heating boilers, tubes?

Ans. Ridiculous, they are far from being tubes—simply hot air agents talk.