## Reasons for Failures of Heating Systems\*

## BY J. D. HOFFMAN.

THE time has come for a campaign of education for more satisfactory heating and ventilation in the homes of our country. Buildings of larger proportions have been carefully worked out, because of their importance as public utilities, have been treated with such respect by both architect and engineer as to insure fairly satisfactory service. The home of the private citizen of moderate means, on the contrary, still suffers grievously, and the need for such agitation is apparent. The society should do this and some means should be found through which to educate the public to demand and see that they get more satisfactory heat in their homes.

## POOR BUILDING CONSTRUCTION.

The recent coal situation has served the purpose of calling to the attention of heating and ventilating engineers that in the future the economic problems of the home must necessarily become more vital factors. Heretofore they have pacifically endeavored to fit their heating and ventilating systems into ill-conceived and poorly constructed houses, and have trusted to their ability as engineers to overcome the handicap imposed upon the systems by architects or constructors who knew little and cared less about the requirements of home comfort. The heating and ventilating engineers this past winter have shown their willingness to do anything in their power to tide over the acute stages of panic and suffering due to the fuel They have unceasingly counseled shortage. "fewer fires" and "more economic firing," because under the conditions this was all that could be done. Then, nothing counted as much as direct coal saving, but now that the stress of severe winter has passed, we may ask ourselves: What and how may the heating and ventilating engineers do to assist in laying the foundation of a more effective economy in the years just ahead?

I have especially in mind some of those conditions (principally residential) that not only work against economic heating, but absolutely prevent it in a large number of cases. Some of these conditions are due to the mistakes of the architect with knowledge aforethought or otherwise, some of them to those of the heating man (or hardware man) who installs the system, and some to those of the householder who practising false economy is not willing to pay the price of good work.

CAMPAIGN NEEDED FOR BETTER BUILT HOUSES.

We need to urge a campaign for better built houses—houses that are made to *live in*, and not

merely to rent or to sell. It is a sad commentary on our domiciles, but it is a fact that the average residence is a satisfactory habitation for only nine months in the year. It has been stated that 75 per cent. of built in 1912 cost each the residences This ratio, if correct, has \$5.000 or less. probably not changed much in the interim. From what I know of the methods of construction of the average residences of this class, I am safe in venturing that 75 per cent. of this number are not satisfactorily heated. Further, I am willing to venture that 75 per cent. of the number not giving satisfaction are failing, not so much from the lack of gray matter on the part of the heating man, as from unsatisfactory house design and construction.

In most of the ordinary balloon-framed houses the sheathing is very inferior in grade and loosely butted at the edges, when there should be solid boards and lap joints. Some of the houses have no building paper or its equivalent, some have one course of the building paper, and a few have two, but very few courses are laid with care to serve as an insulation. Two courses of paper in face contact are, it should be stated, inferior to one course with the sheathing, and one course woven in and out over the studding; or, to one course with the sheathing and one course on the inside of the studding, with strippings under the laths to bring the plaster free from the paper surface. Again, suppose the wall is well protected against inleakage, but the upper and lower ends of the spaces between the studs are open; in this case there is free connection of air upwards between the inner and outer layers of the wall and the heat that should be kept within the room is dissipated to this air current and lost to the at. tic, and the conditions are worse than the open wall in that the heat is lost and there is no corresponding physical benefit from inleakage.

TYPICAL CASES OF POOR BUNGALOW CONSTRUCTION.

One of the worst types of construction, and one I have frequently met with, is the bungalow type second floor outer wall, which offsets within the plane of the first floor outer wall. Irrespective of the type and quality of main wall construction (balloon-frame, brick or stone), the second floor wall is studded down from a ceiling level near the roof line, lathed and plastered on the inside of the studs and on the ceiling; and the outside of the studs and joists left open to the cold spaces under the roof. In two, otherwise well-designed and properly-heated stone bungalows called to my attention recently, where the heating systems were pronounced

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