

## C. A. Dunham Company

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C. A. Dunham Co., Ltd.,  
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Sales Offices: Calgary, Alberta; Halifax,  
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The Dunham Differential Vacuum Heating System and individual parts of the apparatus used in that system are fully protected by United States Patents Nos. 1,644,144, 1,706,401, 1,727,965, 1,761,819, 1,771,077, 1,792,213, 1,802,383 and 1,802,384 and Canadian Patents Nos. 282,193, 282,194, 282,195, 292,558, 308,943 and 291,134 (British). Additional patents in the United States, Canada and foreign countries are now pending.

The Dunham Systems of Heating, adapted to different classes or types of building are as follows:  
 The Dunham Differential Vacuum Heating System.



Over eighty sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Dunham heating engineers are available for counsel at every one of these offices and the accumulated knowledge of the entire Dunham organization is put at the disposal of the architect or engineer in scientifically and economically laying out any Dunham Heating System.

The Dunham Vacuum Return Line Heating System.  
 The Dunham Return Heating System.  
 The Dunham Home Heating System.  
 Each of these several designs is a com-

plete two-pipe system, the great efficiency of which is made possible by the use of the Dunham Radiator Trap, which is installed at the return outlet of each radiator or

pipe coil, where it stands guard against waste of steam and constantly relieves the radiation of the enemies of heating efficiency—air and water.

## THE DUNHAM DIFFERENTIAL VACUUM HEATING SYSTEM

This system is a two-pipe system in which steam is supplied to the radiators at sub-atmospheric pressures and in quantities varying with the need for heat. It is so designed that a relatively constant difference in vacuum is maintained automatically between the radiators and the return piping (the vacuum in the return line being slightly higher), thereby assuring a circulation of steam to and within the radiators whenever there is demand for heat.

It is simple in its component parts, requiring that:

- (1) A properly controlled vacuum pump having capacity to create high vacuums economically be provided.
- (2) The traps function under vacuums as high as 25 in.
- (3) The radiator valves be of the all metal packless type and be equipped with regulating plates having the proper size orifice for the amount of radiation.
- (4) The temperature controlling equipment be selected to meet the requirements of the individual installation.

The system is flexible in operation resulting in comfortable and economical warmth for occupants in the milder months of early Fall and Spring as well as the extreme cold months of Winter. This is accomplished by increasing the vacuum (which is synonymous with "cooler steam") during the mild weather and by lowering the vacuum or if necessary operating under slight pressure (which is synonymous with "hotter steam") during the extreme cold weather. During very mild weather the radiators are only partly filled with steam under high vacuum.

The average system of heating is ordinarily designed with sufficient radiation to heat a building to 70 degrees when the outside temperature is at the lowest for the season. However, since the low or minimum temperature is reached or approached only on a few days during the heating season it follows that the system has too much heating capacity during the average weather condition, and since no provision is made to vary sufficiently the temperature of the steam supplied to the radiators, the rooms become uncomfortably overheated.

The Dunham Differential Vacuum Heating System prevents this heat waste which amounts to 25 to 50 per cent of the steam consumption for the heating season.

Heating with Steam of Variable Temperatures—Cool Steam (133°F.)  
 Warm Steam (133° to 212°F.)  
 Hot Steam (above 212°F.)

It is generally agreed that there is a large amount of heat wasted in mild weather because buildings are overheated. The cause is that the heating system is operated on and limited in its operation to pressures above atmospheric, even in mild weather. Steam pressures ranging from a few ounces to 2 or 3 lb. afford but a small operating range of steam temperatures to meet changes in weather conditions. That is, steam at a relatively constant pressure is usually supplied to the radiators regardless of what the outside weather may be. The heat output of the radiators will therefore be entirely too high in mild and moderate weather, when only a fraction of the radiation installed would actually be required to balance the heat loss of the building and maintain the desired and comfort giving room temperature.

Daily weather reports show that the temperature rises and falls quite rapidly over the greater portion of the country. Temperature changes of 40 deg. per day occur each winter in the Chicago area, while daily changes of 20 deg. are but slightly higher than normal. To this variation in heat demand must be added the cooling effect of wind, if a true picture of the great fluctuations in heating requirements is wanted.

This statement of the great variation in weather conditions from day to day is simply to point out that the ideal in heating is to have output of the system just equal to the heat loss from the building if uniform room temperature is to be maintained and heat waste through overheating is to be eliminated, and the accompanying excessive open window heat loss is to be prevented.

The Dunham Differential Vacuum Heating System accomplishes this without any complicated or delicate equipment, or any greater variety of appliances than is used by the ordinary Vacuum Return Line Heating System.