C. A. Dunham Co.

Administrative and General Offices: 450 East Ohio Street, Chicago
Factories at Marshalltown, Iowa, and Toronto, Ont., Canada

BRANCH SALES OFFICES:

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C. A. DUNHAM CO., LTD., General Offices and Factory, Toronto, Ont.
1523-41 Davenport Road

BRANCH SALES OFFICES: Calgary, Montreal, Ottawa, Toronto, Winnipeg, Vancouver, Halifax.

FOREIGN SALES OFFICES: 18 St. Thomas Street, S.E.I., London, England; St. John's, Newfoundland

Distributors: Munsing & Co., Paris, France, 47 Rue Fontaine-au-roi

Manufacturers of The Dunham Differential Vacuum Heating System and Specialties

The DUNHAM HEATING SERVICE

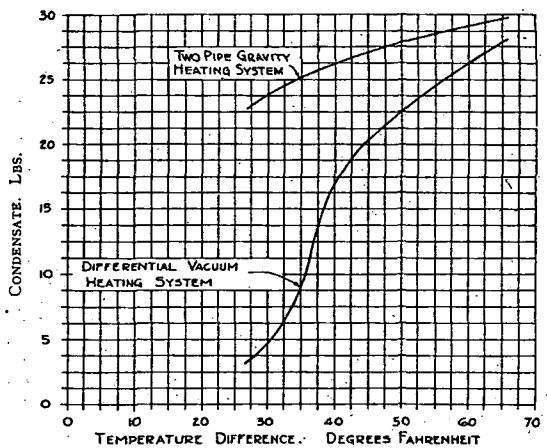
This Service is delivered through over 70 Branch and Local Sales Offices throughout the United States, Canada and the United Kingdom. These Branch and Local sales offices bring Dunham Heating Service as close to your office as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

DUNHAM DIFFERENTIAL VACUUM HEATING SYSTEM

U. S. PATENT No. 1644114

(Additional patents in the United States, Canada and Foreign Countries applied for, and pending)

This system will heat properly any building without the usual fuel and heat waste caused by overheating and by *excessive* window ventilation. It furnishes steam to the radiators at the rate they are using it, by circulating it at a high degree of vacuum or sub-atmospheric pressure, with correspondingly low radiator temperature; or by operation of a control valve it can be operated as a mechanical vacuum return line system at the pressure above atmosphere, which the weather condition calls for.



Condensate in Lbs. per 100 Sq. Ft. of Net Radiation per Hour

A fixed differential with the return pressure always lower than the radiator pressure is maintained. This produces circulation with sub-atmospheric pressures (vacuums) on the steam side of the system. Economical operation is the natural result of such performance. The system is simple in design, durable and flexible to meet varying weather conditions. The outstanding feature of economy of operation is accomplished by supplying heat to the radiators at the rate the building is using it, by;

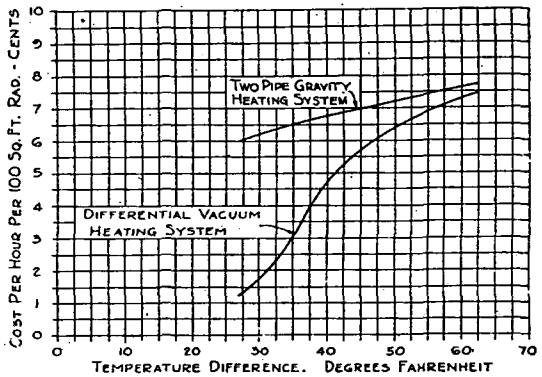
Regulating the sub-atmospheric pressure, or

the degree of vacuum, at which the steam circulates in the supply piping and radiators.

Controlling the vacuum in the return piping so that a substantially constant difference in pressure is maintained between the radiators and return piping at all pressures.

Briefly the operation of the system is as follows:

The generation of steam, when starting with a cold boiler under vacuum, begins at a much lower temperature due to sub-atmospheric pressure because of the vacuum produced by the pump. This results in an appreciable saving of fuel.



Cost of Heating 100 Sq. Ft. Net Radiation per Hour based on Gas at $1.00 per 1000 Cu. Ft.

The steam expands under this vacuum condition and fills the radiators (just as it does when generating on pressures above atmosphere) with the result that substantially the entire radiator surface works at temperature corresponding to the vacuum maintained in the system. The Differential Controller on the pump maintains the condition in the return at a pressure less, or a vacuum greater, than in the radiator. Circulation is thereby maintained irrespective of supply pressure or vacuum. The system fills with steam at the various sub-atmospheric pressures. The Dunham Radiator Traps on the radiators function under these wide ranges of pressure. All air and water is released from the radiator, but steam is not released. See Chart 1060A on page 581 for explanation.

In severe weather the pressure can be regulated to supply steam at such a rate that in the boiler, supply piping and radiators, pressures at or greater than atmosphere will be maintained while operating as a mechanical vacuum return line system.

During the Fall, mild Winter and Spring weather, the steam is circulated under the sub-atmospheric pressures and vacuum condition necessary to provide

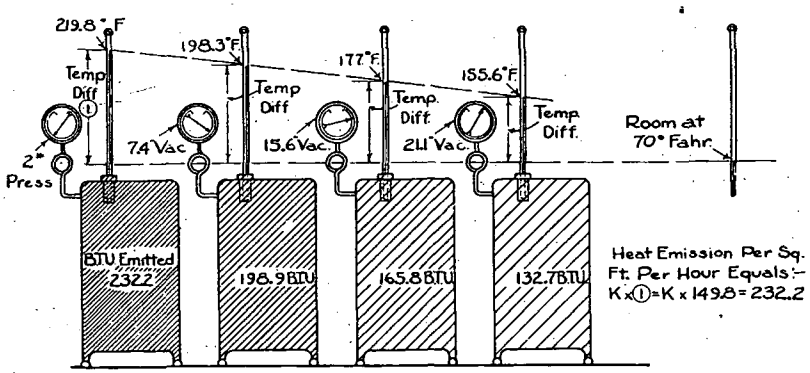


Fig. 1083
The Heat Emitted by a Radiator Depends on the Temperature Difference Between Radiator and the Air of the Room
Radiator Temperature Depends on Pressure of Steam in Radiator