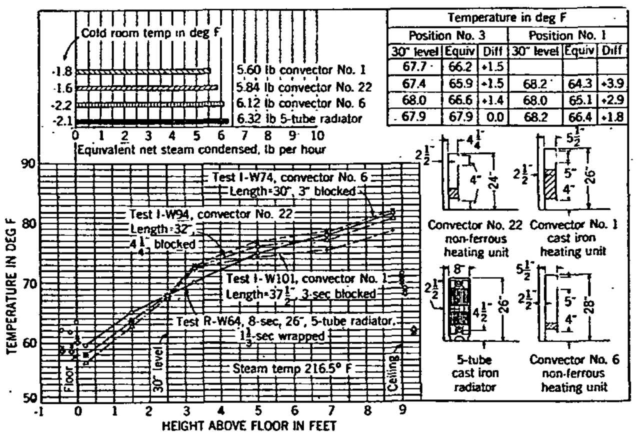
For a radiator, the finish coat of paint affects the heat output. Oil paints of any color will give about the same results as unpainted black or rusty surfaces, but an aluminum or a bronze paint will reduce the heat emitted by radiation. The net effect may be a reduction of 10 per cent or more in the total heat output of the radiator[5,6,7].

Radiator enclosures and convector casings affect the heat distribution within the room as well as the total amount of heat supplied by the steam or hot water[8].

Heating Effect

For several years the term *heating effect* has been used to designate the relation between the *useful output* of a radiator, in the comfort zone of a room, and the total input as measured by steam condensation or water temperatures[9, 10]. The application of such a heating effect factor is a recog-



	Temperature in deg F					
	Position No. 3			Position No. 1		
	30" level	Equiv	Diff	30" level	Equiv	Diff
5.60 lb convector No. 1	67.7	66.2	+1.5			
5.84 lb convector No. 22	67.4	65.9	+1.5	68.2	64.3	+3.9
6.12 lb convector No. 6	68.0	66.6	+1.4	68.0	65.1	+2.9
6.32 lb 5-tube radiator	67.9	67.9	0.0	68.2	66.4	+1.8

Fig. 2. Temperature Gradients and Equivalent Temperatures for Radiator and Convectors with Common 30 in. Level Temperature

nition that some radiators and convectors use less steam than others for producing equal comfort heating results in the room.

No standard method for evaluating the heating effect of radiators and convectors and correlating it with comfort has yet been accepted. One method, with test data[11] on radiators and convectors, and making use of

[5]Heat Emission from Radiators, by K. F. Rubert (Cornell University, *Engineering Experiment Station Bulletin* No. 24, 1937).

[6]Comparative Tests of Radiator Finishes, by W. H. Severns (A.S.H.V.E. Transactions, Vol. 33, 1927, p. 41).

[7]Heat Loss from Direct Radiation, by J. R. Allen (A.S.H.V.E. Transactions, Vol. 26, 1920, p. 11).

[8]Heat Output of Concealed Radiators, by E. A. Allcut (University of Toronto, *School of Engineering Research, Bulletin* No. 140, 1933).

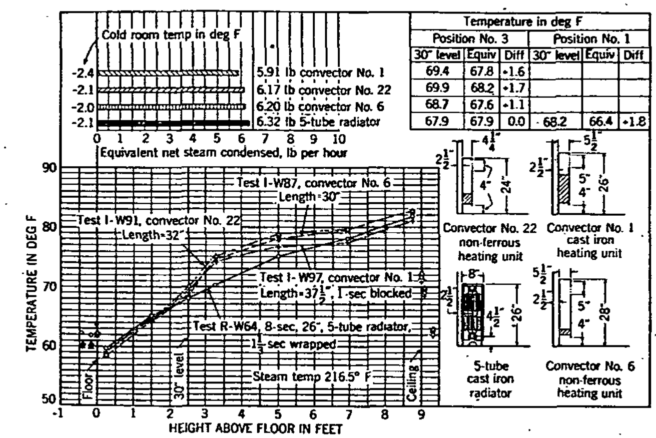
[9]The Heating Effect of Radiators, by Charles Brabbeé (A.S.H.V.E. Transactions, Vol. 33, 1927, p. 33).

[10]University of Illinois, *Engineering Experiment Station Bulletins* Nos. 192 and 223, and Investigation of Heating Rooms with Direct Steam Radiators Equipped with Enclosures and Shields, by A. C. Willard, A. P. Kratz, M. K. Fahnestock and S. Konzo (A.S.H.V.E. Transactions, Vol. 35, 1929, p. 77).

[11]A.S.H.V.E. Research Report No. 962—The Application of the Eupatheoscope for Measuring the Performance of Direct Radiators and Convectors in Terms of Equivalent Temperature, by A. C. Willard, A. P. Kratz and M. K. Fahnestock (A.S.H.V.E. Transactions, Vol. 39, 1933, p. 303).

the eupatheoscope for evaluating the environment produced, has been suggested by the University of Illinois. The principle underlying the eupatheoscope involves the measurement of the heat loss from a sizable body by radiation and convection, when the surface is maintained at some constant temperature. Through the use of this instrument and its calibration curve, non-uniform environments may be referred to uniform environments in which the air and all surrounding surfaces are at the same temperature. The temperatures of the uniform environments are referred to as equivalent temperatures.

Data given in Fig. 2 show that while the air temperature at the 30-in. level is the same for the three convectors and the one large-tube cast-iron radiator, in position No. 3 in the test room, the equivalent temperature is 1.5 F lower than the air temperature in the case of the three convectors,



	Temperature in deg F					
	Position No. 3			Position No. 1		
	30" level	Equiv	Diff	30" level	Equiv	Diff
5.91 lb convector No. 1	69.4	67.8	+1.6			
6.17 lb convector No. 22	69.9	68.2	+1.7			
6.20 lb convector No. 6	68.7	67.6	+1.1			
6.32 lb 5-tube radiator	67.9	67.9	0.0	68.2	66.4	+1.8

Fig. 3. Temperature Gradients and Equivalent Temperatures for Radiator and Convectors with Common Equivalent Temperature

and the same as the air temperature in the case of the radiator. The difference between the minimum and the maximum amount of heat required to maintain the common air temperature at the 30-in. level is of the order of 13 per cent.

In Fig. 3 are shown the results of tests made with the same three convectors and the one large-tube cast-iron radiator, so adjusted in size that each gave approximately the same equivalent temperature in the No. 3 position in the test room. The difference between the minimum and the maximum amount of heat required to maintain the common equivalent temperature is of the order of 7 per cent.

The Kata thermometer[12], the thermo-integrator[13,14], and the globe[15]

[12]The Kata Thermometer—Its Value and Defects, by W. J. McConnell and C. P. Yaglogiou. (Reprint No. 953 from *U. S. Public Health Service Report*, pp. 2293-2337, September 5, 1924).

[13]The Thermo-Integrator—A New Instrument for the Observation of Thermal Interchanges, by C.-E. A. Winslow and Leonard Greenburg (A.S.H.V.E. Transactions, Vol. 41, 1935, p. 149).

[14]The Calibration of the Thermo-Integrator, by C.-E. A. Winslow, A. P. Gagge, Leonard Greenburg, I. M. Moriyama and E. J. Rodee. (*The American Journal of Hygiene*, Vol. 22, No. 1, July, 1935, pp. 137-156).

[15]The Globe Thermometer in Studies of Heating and Ventilation, by T. Bedford and C. G. Warner. (*The Journal of Hygiene*, Vol. 34, No. 4).