Plant Extensions and New Fields of Service Feature Year's Work of District Heating Utilities

IMPORTANT district heating extensions, notably the change-over from hot water to steam in Indianapolis and the new underground construction in Boston, were among the significant developments reported at the twenty-first annual convention of the National District Heating Association, in St. Louis, June 3-6.

Many of the companies also are becoming interested in the air-conditioning field as a means of building up their power load. As one of the delegates expressed it: "From our point of view, air conditioning is interesting to us entirely from the power standpoint so that we have the anomaly of the electric power department, rather than the heating department, going after this business." At the same time it is worth while to note that the Union Electric Light and Power Company of St. Louis exhibited with considerable pride an air-conditioning system in the company's sales offices which serves to cool the main showroom on the ground floor and many of the executive offices on the ninth floor.

In seeking new sources of business some of the companies have devised an ingenious arrangement for utilizing unit steam heaters in the casings of warm-air furnaces, thereby substituting steam for the direct firing of the furnace.

There was plenty of evidence that district heating is making notable progress and that, speaking generally, the companies are in a favorable position.

New officers of the association proposed by the Nominating Committee, of which J. H. Walker was chairman, are:

President, Landon Shaw Smith, Rochester Gas and Electric Corp., Rochester, N. Y.; first vice-president, W. W. Stevenson, Allegheny Steam Heating Co., Pittsburgh, Pa.; second vice-president, E. E. Dubry, Detroit Edison Co., Detroit, Mich.; third vice-president, J. E. Seiter, Consolidated Gas, Electric Light and Power Co., Baltimore, Md.; secretary-treasurer, D. L. Gaskill, Greenville, O.

Landis Shaw Smith

President of the National District Heating Association

Mr. Smith was educated at the Mechanics Institute, of Rochester, N. Y., and at the University of Michigan, where he studied electrical engineering.

During the World War he was connected for six months with the Ambulance Service and for a year and a half was pilot instructor and aerial gunnery instructor in the U. S. Army at Mount Clemens, Mich.

After the war he became connected with the Rochester Gas and Electric Corporation as sales engineer on industrial gas and refrigeration work. Since 1922, Mr. Smith has been sales engineer for the company on district steam sales and service and heating and ventilating problems. At present he is in charge of the company's division of steam sales.

Executive committee, above-named officers and J. E. Hillemeyer, Union Electric Light and Power Co., St. Louis, Mo.; and William J. Baldwin, New York Steam Corp., New York.

Morning Session, June 3

A full attendance greeted President J. C. Butler when he called the convention to order at the Coronado Hotel in St. Louis, June 3. After a welcome to St. Louis extended by the secretary of Mayor Victor J. Miller, and the response of Secretary D. L. Gaskill, President Butler presented his annual report.

In his report President Butler said in part: "It has been a year of advancement—not necessarily spectacular, for the nature of our business is such that its progress is slow but substantial. It may not have equaled the phenomenal growth of the past few years but with few exceptions we can look upon it with pride.

"The general curtailment in building since the first of the year has, to a great extent, reduced the demand for increased plant capacity and service extensions. Many companies have ample capacity as a result of recent additions and improvements. For this reason there will be little need for many large developments this summer.

"With the let-up in new building, it is necessary to solicit prospective business which has been difficult to obtain in the past—business which was neglected to care for that which came to us without much effort or solicitation."

Mr. Butler referred to the decision of the Executive Committee to issue membership certificates and to the testimonial dinner tendered last Fall by the Executive Committee to Alex Dow, president of the Detroit Edison Company, on the occasion of his election to honorary membership in the association.

Mr. Butler also commented on the paper prepared on "The Present Status of District Heating in the United States," by J. H. Walker and A. R. Mumford, with the assistance of the Educational Committee of the National District Heating Association, presented at the World Power Conference held in Berlin, June 16 to June 25.

In referring to the association's *Bulletin*, Mr. Butler stated that it was planned to issue the *Bulletin* bi-monthly, instead of quarterly.

On the subject of the National District Heating Association Handbook, Mr. Butler stated that the Educational Committee, assisted by Professor Hotchkiss, and under the leadership of Chairman J. H. Walker, has outlined a complete and comprehensive program for the compiling and publishing of a new handbook. It is expected that the new edition will be issued some time during the coming year.

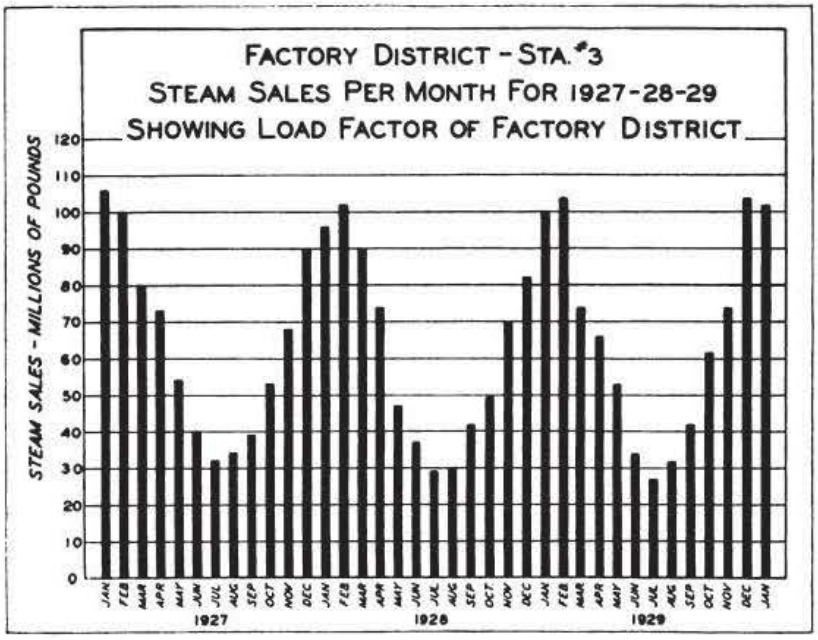
Secretary Gaskill reported an increase in the association's membership from 327 to 338 members.

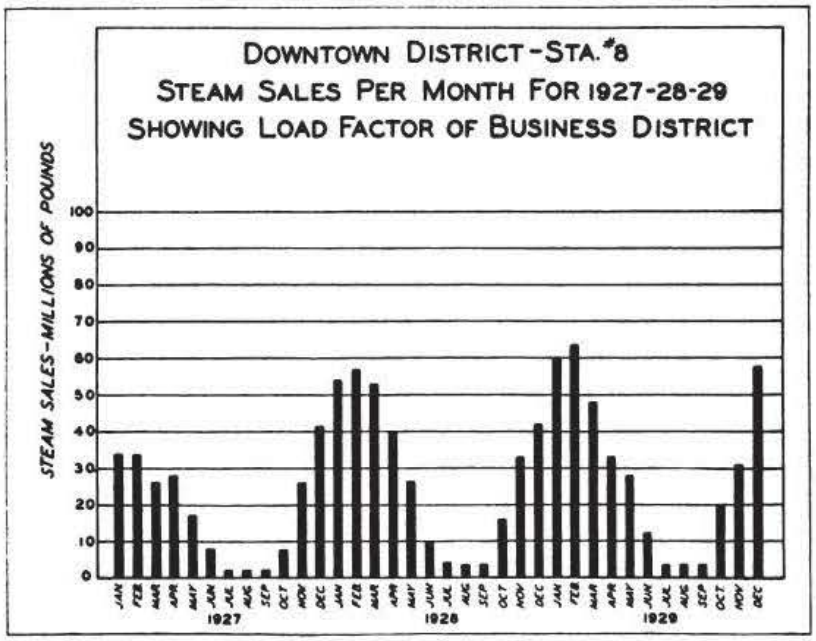
On the subject of the *Bulletin* of the association, Mr. Gaskill stated:

"There was some talk during the past year of working out an arrangement with some one of the trade journals so that the *Bulletin* might be discontinued and the work done through the columns of such a journal. I am not averse to such a plan and if such an arrangement could be worked out to advantage so that it would still reach the membership of our organization, I believe it should be considered. However, it is to be remembered that any trade publication will go only to those who are actual subscribers thereto, and it is a well recognized fundamental plan that no association can afford to operate without having some means of tying-in with the membership and bringing to them at periodical times something that will show the work of the association as it is progressing."

He reported total receipts for the year of $12,154, and total expenditures of $13,197. The balance on hand at the end of the year was $2928.

Chairman J. H. Walker, of the Educational Committee, outlined plans and methods that are being followed in the preparation of the new edition of the association's Handbook. He was followed by Prof. C. H. B. Hotchkiss, of Purdue University, who has charge of the compilation of the material for the new edition.





Comparative Steam Sales and Load Factors in Factory and Commercial Districts of Rochester, New York

N. D. H. A. Handbook

Professor Hotchkiss stated that whereas the present edition of the N.D.H.A. Handbook makes no claim to be a complete treatise or textbook on the subject, the new edition will veer more towards the textbook idea and its scope expanded to include material on such non-technical subjects as rates, management, etc. Aside from these changes, the new edition will correspond to the first edition.

Three general headings will carry the material: 1, general information and data; 2, steam heating, and 3, hot water heating. It is planned to devote over half of the book to the data on steam heating. Preparation of the chapters will be delegated to sub-committees. Chapter outlines are tentatively as follows:

Chapter		Pages
	Introduction	10
I.	General Data	20
II.	Customers Heating Systems	20
III.	Customers Miscellaneous Apparatus	20
IV.	Steam Distribution	70
V.	District Steam Plant	30
VI.	Steam Meters and Metering	30
VII.	Hot Water Heating	20
VIII.	Rates and Rate Making	40
IX.	Sales Activities	20
X.	Economical Use of Steam	20
	Total	300

Afternoon Session, June 3

With Vice-President L. S. Smith in the chair, Chairman E. E. Dubry of the Research Committee presented his report. It included a comparison between industrial and business steam heating districts, together with a study of residential and apartment house-heating when this class of buildings is not adjacent to the existing district heating system. Another subject incorporated in the report was a discussion of the steam accumulator and its possible uses in a district heating system.

Under the first topic Mr. Smith described the development of district heating in Rochester, N. Y., where his company is located. At first the service was limited entirely to the factory district and gradually grew until now the company has 134 customers using 820,000,000 lbs. of steam annually. In the business district, the service which was inaugurated in 1925, is now serving 154 customers with a consumption of 365,800,000 lbs. annually, so that the amount of steam sold in the factory district having fewer customers is over twice that sold in the downtown district. At the

How Central Plant Heat Is Advertised in Connection with a Residential Building Project

Note distribution piping laid on ground to reduce construction costs

same time the distribution system of the factory district is 42,000 sq. ft. of pipe surface, while the downtown district is 77,000 sq. ft. or nearly twice as much. Consequently, the amount of steam sold per square foot of pipe surface is four times as much in the factory district as in the downtown district.

As Mr. Smith pointed out, the steam mains in the factory district were built at a decidedly lower cost than those in the downtown district. Moreover, much of the factory distribution system was installed some years ago when materials and labor were cheaper. These and other factors account for the fact that the downtown district heating system costs nearly four times as much as that for the factory district. This means that the amount of steam sold, per dollar of distribution investment, in the factory district is approximately eight times the amount of steam sold, per dollar of distribution investment, in the downtown district.

Although the figures on the cost of the heating plants of the two districts are not comparable because of the different ages, location and construction of the plants, it is noteworthy that the heating plant of the factory district is located where property and rent are fairly cheap. In contrast to this is the expensive location of the plant in the business district. In addition, coal has to be trucked across the city to this plant.

Mr. Smith presented charts which emphasized the superiority of the industrial district to the business district. Again, rates for the downtown district are approximately 20% higher than those for the factory district, due to higher costs of construction and supplies. Mr. Smith announced that the Rochester Gas and Electric Corporation recently has purchased an isolated plant in an entirely different section of the city which is to be utilized to serve another manufacturing area.

In the committee's study of residential and apartment house-heating in isolated districts, eleven systems were investigated, of which three served apartment houses only, four served both apartments and residences, and four served only residences. All of the systems in the last two groups were started originally in connection with building projects under these conditions. The heating systems were built to pass on to the property owners in the districts served, certain charges which paid either for the entire distribution system, a portion of it, or more than its actual cost. This charge merely was added to the selling price of the property and since it was only a few dollars per foot it did not interfere with the ready sale of the property.

It was the committee's observation that where district heating service was available property sold more easily than without it, and it was quite common to see large display board advertisements featuring "Central Plant Heat." All of the heating properties inspected, with two exceptions, were making additions to the plants or to the systems or both. The larger plants were equipped with stokers and coal and ash-handling apparatus. The smaller plants were hand-fired. In one fair-sized system oil was burned. In two cases super-heated steam was used to insure dry steam on the customer's service connection.

In all the systems visited one man was in responsible charge of the entire heating project and also controlled its finances. The rates of the systems were all different, some having combined "readiness-to-serve charge" and a consumption charge, while others had a straight consumption charge, and the rest had a straight consumption charge with a coal clause. In order to compare the various heating charges all the rates were applied to the same building with the following results:

Residence at 5271 Cass Avenue, Detroit, Mich.

Installed radiation.....660 sq. ft.
Theoretical radiation.....732 sq. ft.
Building volume, gross....30,114 cu. ft.
Heated space.....29,100 cu. ft.
Outside wall area.....3348 sq. ft.
Heat loss.....2510 B.T.U. per Deg. F.
Steam consumption.....289,300 lbs. for season 1928-29
Cost of anthracite coal.....$356 for season 1927-28
Cost of anthracite coal....$332.60 when corrected to temperature of 1928-29

Data on the use of the steam accumulator was presented in the concluding section of the report. This apparatus was described as a tank of water equipped with the necessary regulators and steam lines so that by the addition of high-pressure steam its temperature and pressure can be raised to a high level during off-peak hours. In this way the amount of heat per pound of water in storage is increased.

During the peak-load period the pressure of the accumulator is reduced and the heat added during the off-peak period is released in the form of steam at the lower pressure. This equipment has been quite popular in Europe for many years.

It was shown by the study that the cost of an accumulator depends upon the number of pounds of steam released per charge and that the equipment is especially adapted to a load with a high peak of short duration rather than a moderate peak of long duration.

Although this type of equipment, concluded the report, might not be justified in heating plants located in the business district of a modern city due to space required for its installation, the conditions are quite different where land values are low and where a high demand load is located at the end of a line.

H. J. Bauer, chairman of the Station Operating Committee, took the chair for the presentation of this report. Included in the subjects covered were: "New Plants and Additions," by M. D. Engle, Boston, Mass.; "Boilers and Furnaces," by A. S. Griswold, Detroit, Mich.; "Fuel-Burning Equipment," by J. R. McCausland, Philadelphia, Pa.; "Feed-Water Treatment," by A. R. Mumford, New York, and "Station Records and Statistics," by R. H. McCumber, Rochester, N.Y.

In selecting its subjects the committee sought information on the following questions, covered in the report:

1. What is the trend in design of strictly heating plants?

2. What performance can be expected of boiler plants in central heating plants?

3. How does the fuel-burning equipment of widely-separated plants compare and what are the factors affecting this problem?

4. What steps are being taken by the various companies in treating feed water and are they successful?

5. What records are kept for determining plant performance?

Peak load problems affecting steam heating stations formed the subject of the report on boilers and furnaces and included a tabulation of data on this subject. It was felt that if the cost of outages were similar for different companies, joint action could be taken to obtain a remedy for the condition. It was stated that there exists a common cause for outages which appears to be insurmountable.

In "Fuel Burning Equipment" was included a compilation of data pertaining to fuel and its origin and various types of equipment used for burning fuel, along with data for comparing operation in plants using the same type of equipment. The absence of cinder catchers was indicated and it was brought out that there is an ever-increasing need for equipment of this nature.

Feed-water treatment came in for its full share of attention and was characterized as a matter of extreme importance to plants operating with raw water makeup as high as 90% to 100%.

Data on Operating Statistics

For the Committee on Operating Statistics, Chairman A. D. Leach reported that figures had been supplied by 43 member companies, as compared with 38 companies last year. Among the important items in the report were the following:

Records of 33 companies indicate that 11.4% more steam was sold last year than during the previous year, with a corresponding increase in customers of more than 4% and an increase in connected load of 18.4%. By omitting the partly-estimated figures of one large company the growth in connected load was figured at 10.1%.

There were no notable changes in steam pressures although three companies advised of proposed increases.

The price of fuel declined nearly 7% and the average cost of labor increased about 3%, with a practically stable income in steam load of 85c per thousand lbs.

As Mr. Leach pointed out, a more accurate picture is obtained by reference to the summaries contained in the report. Such matters, for instance, as fuel, oil and natural gas computation, he pointed out, are having an effect on central heating in steam districts.

Other data included in the report follow:

	1929	*1928*
Customers		
(a) Number		
Companies reporting	43	38
Smallest number per company	42	34
Largest number	2,373	2,219
Total of all companies	17,155	14,257
Average per company	399	375
(b) Classification		
Companies reporting	41	36
Residential customers	1,627	1,258
Business customers	12,811	8,760
Power customers	N.R.	.....
Industrial customers	N.R.	.....
Total	14,438	10,018
Per cent residential	11.3	12.6
(c) 35 Companies Reporting Both Years		
Total customers	13,945	13,397
Increase over previous year	548	.....
Per cent increase	4.1	.....
Cost of Fuel—Delivered in Plant		
(a) Coal—Per ton		
Companies reporting	34	29
Minimum price per ton	$2.20	$2.50
Maximum	7.60	7.60
Average	3.73	3.97
(b) Fuel Oil (per bbl. of 336 lbs. ±)		
Companies reporting	5	2
Minimum cost per bbl.	$0.88	$1.16
Maximum	1.21	1.33
Average	1.07	1.31
(c) Variation in Price of Fuel		
Companies reporting both years:		
Coal—decrease over previous year, per cent	6.5	.....
Fuel oil—decrease, per cent	9.1	.....
Connected Load		
(a) Equivalent Direct Radiation (1000 sq. ft.)		
Companies reporting	32	30
Total equivalent direct radiation	54,417	42,562
Smallest company	131	130
Largest (1929 partly estimated)	16,124	11,600
Average	1,701	1,419
(b) Pounds Steam Sold per Sq. Ft. E. D. Radiation		
Companies reporting	32	30
Minimum	363	318
Maximum	684	717
Average (weighted)	500	533
Average Steam Sales (1,000 lbs.)		
(a) Per Customer		
Companies reporting	43	38
Minimum company	108	326
Maximum company	9,235	11,550
Average	1,845	.....
Average (weighted)	1,809	1,780
The same 35 companies reporting both years	2,040	2,038
(b) Steam Sold Per Pound Coal Burned		
Companies reporting	35	27
Minimum company	2.72	3.50
Maximum company	8.13	8.35
Average	6.63	6.55
Invested Capital—Proposed Capital Expenditures		
Companies reporting	27	26
Total invested capital	$91,311,000	$79,575,000
Per cent capital in production plant	56.3	.....
Gross revenue of 27 companies reporting amount of invested capital	$19,870,000	
Capital invested per dollar of annual revenue —weighted average	$4.60	.....
Capital invested (27 companies) per 1,000 lbs. steam sold	$3.69	$4.20
Proposed Capital Expenditures	*1930*	*1931*
Companies reporting	28	12
Estimated expenditures	$5,332,000	$2,816,000
Average expenditure per company	$190,000	$234,000

Evening Session, June 3

An address by President L. A. Harding, of the American Society of Heating and Ventilating Engineers, on "Applications of Heating and Ventilating Research," featured the Tuesday evening session. Owing to the unavoidable absence of Chairman John W. Meyer of the Rates and Regulations Committee,

the report of that committee was put over.

Address of L. A. Harding

Mr. Harding reviewed the work carried out at the A.S.H.V.E. Research Laboratory, particularly with regard to the development of the laboratory's "effective temperature" charts. He also gave a graphic account of recent developments in the art, mentioning particularly the rise of the unit heater which, he said, now had largely displaced fan duct systems in many classes of buildings. He commented favorably on the use of concealed heaters and discussed at some length the panel heating system installed in the British Embassy buildings in Washington. He said, among other things:

Non-ferrous extended surface-type concealed radiators are supplanting the cast-iron radiator, to some extent, in homes of the better class and in some recent office buildings. Appearance and compactness are the contributing factors in this change.

Owing to the comparatively small mass of this type of radiation, the boiler is subjected to a smaller starting-up load for the same length of time allowed for the warming-up period or, conversely, for the same starting-up load on the boiler, the time for heating up the radiator very materially is reduced.

For the same reason, when automatic temperature control is employed this part of the equipment evidently is called upon to perform its function more frequently.

Manufacturers of cast-iron radiation reported sales of 139 million square feet for 1929, so that it cannot be said that this type of direct radiator has become entirely obsolete.

Wednesday Morning, June 4

Wednesday morning's session proved of unusual interest in furnishing information and suggestions in the report of the Commercial Relations Committee regarding the installation and requirements of hot water heaters and economy coils for various types of buildings and the work of the utilization engineering department in making district heating service more popular.

Considerable information was presented in the report for use in selecting the proper size and type of economizer equipment for specific installations. Another feature of the report was the data showing the actual steam requirements for hot water heating.

Information received from six of the member companies on the annual steam requirements for building heating and for water heating was summarized in tabular form. The information covered thirty-two office and commercial buildings in five cities, fifteen hotels in six cities, and fourteen miscellaneous types of buildings in three cities.

Although the information received was considered far from adequate to arrive at a definite average standard requirement, yet, the report stated, it is sufficient to indicate that although the steam required for water heating varies over practically double the percentage range of the requirements for building heating, still it bears quite a definite relation to the building volume for certain classes of buildings. For that reason, the data, it was felt, should be used simply as an experience check on the steam requirements as estimated.

The report concluded with a discussion of various types of water heaters.

It was brought out in the discussion that the Union Electric Light and Power Company has designed a condensate recovery system in which the condensation is admitted directly to the water tank. This arrangement, described by R. McQuitty of the company, aroused so much interest that a number of the members took advantage of his invitation to inspect the installation.

One of the points brought out in the discussion was the comment by J. E. Seiter that high temperatures in the domestic service hot water were more of a disadvantage than an advantage, due to the liability of injury to the fittings.

Mr. Sanford's Address on Steam Utilization

S. S. Sanford of the Detroit Edison Company addressed the convention at this session on the methods adopted in Detroit for securing better utilization

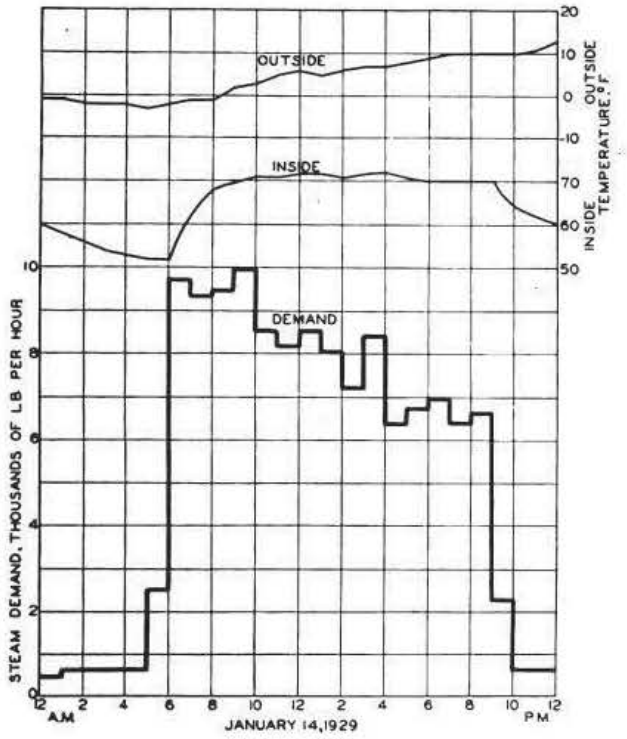


Fig. 1. Load Curve for an Office Building on a Cold Day Showing Shutting-Off at Night

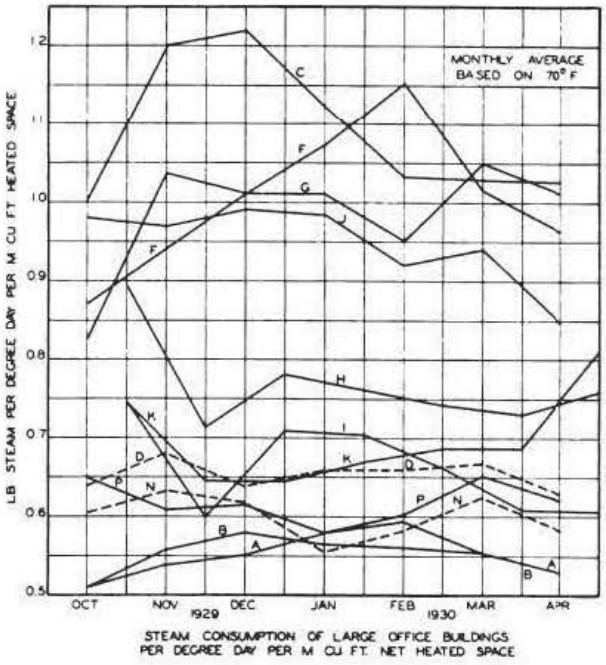


Fig. 2. Steam Consumption of Large Office Buildings per Degree-Day per 1000 Cu. Ft. Net Heated Space

a and b—High vacuum with radiator orifices. c—Vacuum return system (air conditioning in part of building). d—Orifices in radiators and mains (system controlled by roof). f and j—Intermittent control by time-clocks. g—Vacuum return system. h—Orifices in radiators. i, p and n—Moderate vacuum carried in radiators. k—Self-contained thermo radiator valves.