

HEATING, PAST *and* PRESENT

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By Alfred G. King



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WHAT I shall say to you may be regarded as a mixture of history, gossip, and personal experience. History is usually quite the truth. Gossip may or not be true, and personal experience, while often very interesting, is sometimes misleading; therefore, if by any possibility I shall make any statements that are not literally true, you may consider that I am relating what I understand to be the facts.

To the older members of the heating profession much of its early history is quite well known. The younger members of the craft perhaps have little or no idea of the early struggles, many disappointments, and few successes, of those men who devoted both time and money to develop and perfect the details of the industry which at this time forms so important a part of our social and business life. In the early days of the industry every installation of a heating apparatus had a history. Many problems were met with each day which had to be mastered, and at that period records were kept of many matters which today would be regarded as trivial and unimportant. Today, as we make use of standardized material and methods, we give little thought to the infinite amount of patience, and almost endless experimenting, exercised by the men who, by their work, made these standards and methods possible.

The First Steam Heating Apparatus.

We may say that the heating business really began with the discovery that steam rising from boiling water, when confined in a tight receptacle, had a certain amount of energy, pressure, or power; though it was many years after this discovery that anyone thought of using it for the purpose of heating. While the fact has been disputed, it is nevertheless quite true, that we must give the credit for devising and installing the first heating apparatus to two Englishmen. About the year 1780 these men, named Boulton and Watts, who were engaged in the engine making business, made use of steam for heating. A little later a Mr. Hoyle, and still later a Mr. Green, both of them Englishmen, devised a form of steam heating apparatus for warming buildings. It was not until the beginning of the nineteenth century that this method of heating was used to any considerable extent.

The First Hot Water Heating System.

There has been quite a little argument among heating men as to whether steam or hot water was the agency first used for heating. I think that there is no question but what

steam was used first, although it is recorded that early in this same century a French nobleman named Chabannes, then residing in England, devised a system of heating by hot water. Chabannes obtained the idea from a French poultry farmer named Bonnemain, who was using hot water in a very crude manner to warm a chicken brooder. Chabannes carried the idea to England and succeeded in interesting some English foundrymen and engineers in the method. Jacob Perkins was one of these men. Perkins and his son later developed the Perkins system of hot water heating which, as you know, was a high pressure system of overhead supply.

Perkins, Son & Company were manufacturing wrought iron fittings and pipe and were exporting some of these goods to this country. Possibly many of you have heard the story of how young Joseph Nason, who was working for the Boston Gas Light Company and using Perkins pipe and fittings, quit his job and went to England (about 1823) to work for the Perkins concern. He remained in England about seven years, during which time he mastered Perkins' method of heating and absorbed much information relating to the manufacture of pipe and fittings. Nason returned to this country and formed a partnership with his brother-in-law, J. J. Walworth. These men were the first people in this country to heat buildings by steam. They were also pioneers in the manufacture of cast iron fittings of all kinds, and the inventors of many of the tools and appliances we use today. In the early days their special business was the fitting up of steam power appliances, etc., for mills and factories.

The First Building To Be Heated by Steam in This Country.

The first building in this country to be heated by steam was the Eastern Hotel at Boston. Other than their mill work this was Walworth & Nason's first heating contract of any importance. It also is interesting to note that they constructed and installed what is said to be the first fan system of heating and ventilating in the world. This apparatus was placed in the Boston Custom House about the year 1850.

In the years following the period of the heating of the Eastern Hotel there were many improvements made to boilers. All boilers in use at this time were of wrought iron construction, the same type being used for heating and for power.

The First Cast Iron Boiler Was Made in the United States.

Before reviewing some of the experiences of the early days of steam fitting (I make frequent use of the term "early days" to designate the period before the heating business was fully established), it may be well to say a few words regarding the advent of the cast iron boiler. I think there is no question but that the first cast iron boiler was made in the United States, and this boiler was manufactured by George B. Brayton at Westerly, R. I. The original

Brayton boiler was used for power and was mounted on a small locomotive. This was in the year 1849. It was not until the period of the Civil War that a boiler of this type was used for heating. This event occurred in 1864 when, after considerable trouble in obtaining the consent of the city authorities, a boiler was placed in a business block on Weybosset Street, Providence, R. I. The Brayton boiler consisted of a series of vertical cast iron sections, each about 4 inches thick and 30 inches high. These sections were mounted on a brick setting and nipped to cast iron steam and return headers on the exterior of the brick work. The furnace, grates, and fire chamber were entirely separate from the boiler proper. Mr. Brayton evidently followed in a general way the method of setting wrought iron boilers in vogue at that time. After exhibiting the boiler at the American Institute Fair at Boston in 1865, where he was given an award and a medal, Mr. Brayton sold his patterns and patents to the Exeter Machine Works, Exeter, N. H., then owned by a Mr. Burlingame.

I would call attention to the fact that at this time all boilers were expected to carry a considerable pressure, and with this fact in mind you can better understand the fight Mr. Brayton had to convince the public that boilers made of cast iron were safe. His efforts in this direction were not made any easier by the fact that the makers of wrought iron boilers saw a new form of competition ahead of them and therefore fought Mr. Brayton every step of the way.

Many Heating Inventions in the Seventies.

Between the years 1870 and 1880 much happened in the heating business that was full of interest and importance to everybody connected with it. John W. Mills, of Boston, invented and placed on the market, through the agency of Geo. W. Walker & Co., Watertown, Mass., a sectional cast iron boiler. This was made in the foundry of Miles, Pratt & Co. The patterns were some years later transferred to the foundry of the H. B. Smith Co. at Westfield, who today are making the boiler in an improved form. We must credit this engineer and inventor (Mr. Mills) with two important improvements in boiler construction; the nipple and lock nut method of connecting boiler sections to headers, and the use of grate bars of the rocking or tilting type.

With reference to grates, some of you are no doubt acquainted with the history of the efforts (1808) of Judge Jesse Fell, of Wilkes-Barre, Pa., to burn the "black rocks" of the Wyoming Valley. He used an open grate or fireplace partially enclosed. It remained for an old country storekeeper to devise the method of coal burning now in use. Samuel Smythe, of Susquehanna County, the keeper of a general store, perfected the first duplex grate and there has never been any material change in it since he devised it.

During the ten year period mentioned Samuel Gold designed the first real house heating system of steam heating. He had already designed the well known Gold pin radiator. His house heating system consisted of a sectional cast iron boiler, such as we now know as the Mercer type, which was set within a brick chamber. Sections of pin radiators were suspended in parallel rows in the chamber above the boiler. The front of the boiler was flush with the brickwork on one side of the chamber, the exterior surface within the chamber being left uncovered. This surface, together with the pin radiation, gave off a large amount of heat which was conveyed to the various rooms through tin pipes and admitted to the rooms through registers much the same as a furnace system. The rooms too far distant from the hot air chamber to be reached in this manner were warmed with direct radiators or pipe coils supplied with steam piped from the boiler. The cold air to the heating chamber was taken from the basement for the original system, but later this air supply was taken from outside the building. The H. B. Smith Company, who were fast gaining prestige as the man-

ufacturers of heating material—boilers and radiators—were exceedingly fortunate in arranging with Mr. Gold to market his apparatus. I believe it is not generally known that Mr. Gold devised the first one-pipe method of steam heating.

The Mattress Type of Radiator.

The older men present tonight know of the mattress type of radiator. These radiators were made of sheets of iron riveted together with the joints soldered to prevent leakage. The steam connection was made at the bottom of one end and for the Gold system the air was exhausted through a small air pipe connected from the end opposite the steam inlet. The air pipes of two or more radiators were frequently joined together. Many of the direct radiators in use at this time were of the mattress type but they occupied so much wall surface that they were not liked. Prior to 1870 Joseph Nason and J. J. Walworth had each designed a pipe radiator which were made by screwing short lengths of wrought iron pipe into a cast iron base in one, two, three or more rows. Between 1870 and 1880 several types of cast iron radiators were invented and placed on the market. The Reed, Mills, and Whittier radiators were some of these.

It might at this time be mentioned that, in the late seventies, W. E. Page, of Norwich, Conn., brought out a cast iron sectional boiler of the round type which in later years, in improved form, had a very large sale. Mr. Page was a prolific inventor and many of the improvements in boiler construction were due to his efforts. The triangular grate bar, and the method of operating several bars in unison by means of cogs, as used in the Volunteer boiler, has been very generally copied by boiler manufacturers.

Many Improvements in Boilers and Radiators in the Eighties.

The succeeding ten year period—1880 to 1890—brought many changes and refinements in the construction of both boilers and radiators. Before 1880 there had been patented a score or more of cast iron boilers but only a half dozen of these had been manufactured in quantity. Within the period mentioned the Barnard, Winthrop, Hobson & Chapin, Auburn, and several others were put on the market.

What about hot water heaters? This question is no doubt in your mind. The old "saddle back" boiler of the Hitchings Company had been offered for sale since 1887 but had been used almost entirely to heat greenhouses and conservatories, a line of work in which this company specialized. Although hot water had been quite generally used for heating in Canada, it was sometime before it was employed to any considerable extent for warming buildings in this country. The Gurney and the Spence boilers, originally made in Canada, were manufactured in a slightly changed form and were placed on the market here. The Gurney was made in the plant of the Gurney Foundry Company and the Spence by the National Hot Water Heater Company, both of Boston. The Perfect hot water heater of the Richardson & Boynton Co. was another of the early types.

In 1887 I accepted a position with the Thomas Smoothing Harrow Company, of Geneva, N. Y., who were making agricultural implements of several kinds. At this time the W. B. Dunning Company, of Geneva, were making the Dunning wrought iron boilers. The Catchpole Manufacturing Co. (another Geneva concern) were making a round sectional boiler put together with bolts and gaskets. Frederick A. Furman had been working in the latter plant and while there had noted the trouble they had with leaky gasket joints. He was imbued with the idea that a boiler should be screwed together and designed a boiler composed of a cast iron steam dome into the bottom of which elliptical-shaped drop legs or tubes were screwed. These tubes had a diaphragm or division extending from the neck of the tube to within about four inches of the opposite end,

the circulation of the water being vertically up and down through the tubes. A row of long tubes, screwed into the dome near the outer edge of the bottom formed the fire chamber, and above the fire from ten to twenty short tubes (the number depending upon the size of the boiler) were screwed into the dome. The original boiler was made as a magazine burner and a cast iron cylinder for a coal reservoir was let down through the dome immediately above the fire.

In 1886 the Thomas Smoothing Harrow Company made some ten of these boilers for Mr. Furman, all of which were used successfully when installed. The year following about forty of the boilers were built on a royalty basis. In the spring of 1888 the company, which was owned by the Herendeen family, father and sons, was incorporated under the name of the Herendeen Mfg. Co. Mr. Furman was given a block of the stock for his patents and was made superintendent of the new company. The manufacture of the Furman boiler was then begun on a larger scale, and as the business grew the manufacture of agricultural implements was discontinued. Meanwhile, Pierce, Butler & Pierce, of Syracuse, N. Y., had obtained a controlling interest in the Catchpole Manufacturing Company, had changed the name of their boiler to the Florida, and had begun a systematic effort to market it throughout the country. I recollect they used the large bill boards along the railroads and in other prominent places, on which were depicted a tropical Florida scene, a Florida boiler, and the caption "A Florida climate within your home in winter." No doubt the efforts of other concerns to market their boilers would prove interesting if they were known. I mention these circumstances as they came under my direct observation.

The original Furman boilers were made for steam only, and all of the advertising literature of the company argued against hot water heating and in favor of steam. As hot water heating grew in popularity they were forced to change ideas and methods and to manufacture the boiler for hot water as well as for steam heating.

During the period 1880 to 1890 the present type of cast iron column radiator with sections nipped together was developed. Following the tube radiator, one of the earliest of the cast iron type was the Bundy Loop made by Bundy & Healy, New York, and later manufactured by the A. A. Griffing Iron Co., Jersey City, a corporation with which Mr. Bundy was connected. The Bundy Loop marked a distinct advancement in radiator efficiency. It was accepted as a standard by the U. S. Government, who at this period were erecting many public buildings throughout the country, and the radiator therefore reached a large sale. The fact that a Bundy Loop radiator could not be lengthened or shortened was detrimental to its continued sale, and the A. A. Griffing Company soon placed on the market several radiators of the sectional or column type of which the Bundy Elite is probably the best known.

When the Heating Business Grew Rapidly.

The heating business now began to thrive and to grow by leaps and bounds. Many new boilers and radiators were developed and placed on the market. About this time the Michigan Radiator Company, of Detroit, was formed to manufacture the Perfection radiator. The Detroit Radiator Company and the Pierce Company of Buffalo entered the field, and likewise the Standard Radiator Company. The Michigan, Detroit and Pierce companies later were merged into what was the original American Radiator Company. The latter history of this corporation is no doubt familiar to all of you.

In the early designed systems of steam heating there was little trouble due to air binding or imperfect drainage, as the pressure of steam carried on the apparatus was sufficient to clear the heating surfaces of air and the water of

condensation. As steam was used more and more for heating, pressures were lowered, first to about fifteen, then to ten, and finally to five pounds or less. Now came the steam fitters' troubles due to air binding, water hammer due to imperfect drainage and the like. Scores of schemes were tried and many types of air valves were developed to provide for the escape of the air to the atmosphere without waste of steam.

The Beginning of Vacuum Heating.

Until a short time prior to 1882 there was no thought of circulating steam except by pressure. On April 4, 1882, there was granted to N. W. Willames of this city (Philadelphia) a patent which covered a method of circulating steam at a pressure below that of the atmosphere by creating a suction on the return and maintaining a partial vacuum within the piping and radiators. This was the beginning of vacuum heating. I shall not discuss the methods used as you are no doubt familiar with its further development. I want to say, however, that but little more than twenty-five years ago it was thought that vacuum methods were adaptable only to large installations, or for large buildings, and yet during this period there have been developed a score or more systems called variously, vapor, vacuum, vacuum vapor, vacuo-vapor, atmospheric, etc., which are suited to small work as well as large, and in which a pressure at or slightly below that of the atmosphere is maintained. I shall not dwell upon these systems as their history is so recent that they are well known.

Methods of hot water heating have also been changed. For years there was practically no improvement in the methods used. The old style large pipe water-logged system has now given place to newer systems of small piping with accelerated methods of circulation.

As hot water circulation was studied, it was found that by the maintenance of a slight pressure upon the system the water could be circulated faster and hotter than in the open system. How much hotter and faster depended upon the pressure carried. The old English method was a pressure system, but extra heavy pipe and fittings were used and these were considered cumbersome and unsightly by the American fitter. The common American plan was to seal the outlet of the expansion tank with a safety valve. This method was found to be dangerous as the expansion tank was usually located in some dark or inaccessible place and the valve was seldom tested to see if it was operative and not stuck fast by corrosion.

All sorts of schemes and appliances were tried, the most popular of which is a mercurial device placed in the expansion line between the system and the expansion tank which admits of a pressure of about ten pounds being maintained upon the system. Several of these devices have been placed on the market, and they have the merit of being absolutely safe. The piping system has likewise received attention, and as now planned is scientifically constructed according to the valve area to be supplied and the position of the radiators to be served.

A history of the heating business, if the facts so often related in fragmentary form could be systematically collected and published, would be of great interest and value. Within the space of an ordinary lifetime, and from the investment of a few thousand dollars, the business has grown until today millions of dollars are invested in the manufacture of heating equipment, and millions of dollars in annual sales are made.

Conner Bros. have opened a plumbing shop at Warwood Avenue and Twenty-second Street, Warwood, W. Va.

Lew Walters, for many years connected with the William Hare Plumbing Co. in Wheeling, W. Va., has opened a plumbing shop at 15 Seventeenth Street, Wheeling.