

AN
IMPROVED SYSTEM

—OF—

STEAM HEATING APPARATUS,

—INVENTED BY—

E. F. OSBORNE, M. E.

ST. PAUL, MINN.
1879.

STEAM-HEATING

—AND—

Ventilating Apparatus,

—AS—

Perfected, Simplified, and Adapted Especially for

Hotels, Asylums,

AND PUBLIC BUILDINGS GENERALLY.

—BY—

+ E. F. Osborne,

Heating and Ventilating Engineer,

SAINT PAUL, MINNESOTA.

—:O:—

In this System special attention has been paid to
Economy in Fuel and Facility in Handling.

A Few Remarks in Relation to Steam Heating.

ST. PAUL, Jan. 24, 1879.

The subject of steam-heating in comparison to its magnitude, has received less scientific attention than almost any branch of engineering in the world. The idea of its being a subject worthy of attention, seems to have been scouted by almost every one. We have boilers, engines and pumps, in which hundreds of thousands of dollars have been expended to make them as near perfect as the present advanced state of engineering science will admit. We pay thousands of dollars for patented improved boilers that will evaporate ten or eleven pounds of water per pound of coal, and have them set on the most improved plan regardless of expense. Radiators, of the most approved and expensive designs are furnished for radiating the heat so developed, but the intermediate parts, such as pipes, fittings, etc., the sizes and arrangement of the same is nearly always left to any party who may be convenient and have tools of proper size to enable them to handle

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STEAM HEATING APPARATUS.

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882 the work entirely regardless of the fact that the connections from the boilers, to the radiators and radiators back to the boilers again are the *most important* factors in the construction of a successful steam heating apparatus, as on these connections depend largely the amount of radiating surface required. The quietness of the apparatus, the facility of handling, and, last, but not least, the amount of fuel consumed. It may be set down as a positive fact, that the average high pressure steam-heating apparatus does not waste less than 40 per cent. of the steam that is generated by the boilers, many, much more, a few less. This seems a large loss, but it is a *fact*, nevertheless, as I demonstrate, wherever I overhaul an apparatus. In order to construct an economical and successful steam apparatus, it should be designed by a thorough engineer, and each part calculated on strict scientific principles, (not by guess, as is often the case,) and the design carried out in all its details, by competent and experienced workmen. No worse mistake can be made, than that any man, because he is a good mechanic at steam, gas fitting or plumbing, is necessarily an "heating and ventilating engineer." In fact there is no one man within my own knowledge that can be recognized as authority on either the two subjects of heating and ventilating, much less the additional ones of gas and hydraulic engineering. One of the best *designed* heating and ventilating apparatus I have ever seen was utterly ruined by the manner in which the *apparent* insignificant details were executed, and yet the workmanship was good. The fault is almost always in the design, rather than in the workmanship. However, the design may be faulty, and the construction good, or the construction faulty, and the design good, in

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either case no satisfactory results can be expected, but when the design and construction are both faulty, as is too frequently the case, nothing but trouble and expense can be expected.

Parties who put a large amount of money into a steam-heating apparatus ought to receive something in return; and should, in all cases, demand from their heating engineer, that the apparatus, for which he demands such large sums of money, will at least heat in all of its parts readily with at most, a pound pressure of steam above the atmosphere, (a few ounces is ample). No cracking or snapping should be tolerated under *any condition in any part*, and no steam or hot water should be allowed to go to waste from any branch thereof; and whenever the setting of the boilers and arrangement of smoke-flues, &c., are left with him, (and they always should be, as that is an especial part of his business), he should so arrange the boilers, flues, etc., as to produce the most steam with the *kind* of fuel used; and, whenever bituminous coal is used, there should be little or no *black smoke* developed. A large volume of black smoke issuing from a chimney is an infallible witness that some part, if not all, of the generating apparatus is badly designed. In the vicinity of a hotel this is especially annoying, and *generally* smoke prevention results in economy in fuel.

An apparatus constructed as above suggested is one of the best monuments for its designer, a credit to its constructor, and a constant source of satisfaction and comfort to its owner and user, and when parties, who pay the bills, will demand and accept no other, the Steam-Heating Engineer and his business will take their proper place in the engineering world.

Very respectfully yours,
E. F. OSBORNE.

I have left out all cuts, illustrations or descriptions of my system, from the fact of the difficulty of either representing or describing it properly. An apparatus that looks very simple, when put up in place, looks very complicated when on paper in a drawing. But I have large drawings explaining the subject, which I will forward to parties who, with a view to its adoption, wish to investigate the subject, and who will return the same to me when they have examined them.

**Osborne's System of Steam-Pipe Fitting
for Heating, Drying and other
Purposes, Invented by
E. F. OSBORNE, St.
Paul, Minn.**

IN introducing myself and subject, to the general public, I expect, and shall undoubtedly receive considerable adverse criticism, especially from those who are in the steam-heating business. Therefore, I shall express no opinions, but simply state facts, and to substantiate these statements which I claim as facts, I will refer to the parties for whom I have done work, and to the contracts under which that work has been done. As a preliminary statement, I would say, my system consists of an improved method of arrangement of apparatus, and the connections between boilers and heating surface "for conducting steam to the heating surface" and returning the water of condensation to boilers. To insure economy in fuel, ease of management and enabling the engineer to run various portions of the "job" on different pressures at the same time

as in hospitals and hotels where heating, laundry and kitchen work, require various pressures at the same time, and which can be adopted and used without reference to any particular kind of boilers, radiators, traps, &c., and is equally adapted to both direct and indirect radiation. Institutions using either of the old systems can have them rearranged to this system, using the boilers, radiators and other materials now in use. See letters of engineer State Capital, St. Paul, and F. S. Gilson, Nicollet House, Minneapolis. Heretofore there has been in vogue two methods, or systems of steam piping for heating purposes called respectively "The Low Pressure System" and the "High Pressure System." The first named system is correct in principle so far as relates to the arrangements of the pipes and radiators, and is, or should be, the basis of *all systems* of steam pipe-fitting, where steam is used for heating purposes. This system can only be advantageously used, however, on small jobs where steam is required for no other purpose except heating and ease of management, and economy in fuel is of secondary importance. In this system the water of condensation returns directly into the boiler, and of course the heating surface in the building has substantially the same steam pressure, as the boiler.

The term "Low Pressure system" applies only to the *system* of arranging the apparatus and not to the absolute pressure carried on the apparatus, in fact I have known a so-called "Low Pressure" apparatus to be run on 120 lbs. of steam.

The so-called "High Pressure" system is noted for nothing particular, except an entire absence of *all system*, its enormous waste of fuel, and the incessant cracking and snapping, which is almost invariably experienced, and which is in fact so annoying as to frequently cause guests to avoid

stopping at the hotels where it is in use. The term, "High Pressure System," refers only to the manner of arranging the apparatus, and not to the absolute pressure carried.

In my improved system, I have combined the good features of both the high and low pressure systems, and discarded the bad features. A few of the good points, in my system are named below. These results I have, and will, guarantee, and give bonds to accomplish.

First.—Steam shall circulate *freely in all parts* of the largest apparatus, with not to exceed one pound pressure of steam above the atmosphere.

Second.—There shall be no hammering or snapping in any parts of the apparatus.

Third.—The apparatus shall work equally well, with 1 or 100 lbs. pressure of steam.

Fourth.—A floor below the boiler can be warmed just as *effectively* and *economically*, as any other floor.

Fifth.—Whenever required, and parties desire to incur the additional expense, such parts of the apparatus as desired can be so arranged, as to preclude any danger of freezing, and I will *positively* guarantee against frost; such parts of the apparatus, as are so arranged, without regard to the temperature to which such parts are exposed, or whether such parts are in use or not.

I will now make some comparison between my system, and other systems. 1st, with the ordinary high pressure trap and tank system as exemplified in hotels in New York, Chicago and other cities. In my system the saving of fuel is never less than 20 per cent, seldom less than 30 to 40 per cent, and often more. The engineer's duties are reduced $\frac{1}{2}$ to $\frac{1}{3}$; the fireman's duties are of course reduced in direct proportion to the fuel used. The wear and tear on boilers, grates,

pumps, &c., is reduced from 20 to 40 per cent. The expense for repairs are never to exceed one-half, and in fact are very trifling. The feed water as it goes into the boiler, is seldom less than 200 deg. and often 220 to 240 degs. Far.

There are no air or drip pipes connected to chimneys or sewers, which is necessarily the case with the old system, and which, it is well known, causes serious loss in fuel, by the continuous discharge of steam and water, saying nothing of the extra care and time required of the engineer. All parts of the apparatus are under the immediate supervision of the engineer who can tell at a glance what is going on in almost any part of the apparatus. Sixty pounds or more of steam may be carried in the boilers, for the purpose of running the engine, elevators, &c., forty pounds more or less on the kitchen or laundry, and for other purposes; running the main building on any pressure desired; from one pound, upward, and all the exhaust steam from engine, kitchen, laundry or other apparatus, is used for heating.

And all water from each and every branch of the apparatus, including kitchen and laundry, is returned direct into the main apparatus, and thence into the boiler. To those who are not familiar with this subject or to engineers who have run the old trap and tank system, this may seem almost impossible, but I have done and am doing repeatedly all that I claim above.

In comparison with the Low Pressure System, my improved system offers the following advantages for large jobs. It is more economical from the facility with which it can be handled. Steam can be used at different pressures for different purposes at one and the same time. A basement can be warmed equally well as an upper floor and

yet the boiler be located above ground with *no loss of heat*. Should the boiler foam badly, (a trouble frequently experienced with low pressure boilers, and almost invariably with sectional boilers.) nothing but dry steam will enter the pipes of the apparatus. In conclusion, I would say my improved system is adapted for work of any magnitude, from heating one room to heating a thousand rooms.

My system is fully covered by patents, and hereafter infringers will be held strictly responsible for its use.

I will hold myself in readiness to meet boards of trustees, or other parties wishing to consult with me on the subject, either in the United States or Canadas.

IN response to my letters of inquiry as to the practical working of my system, I have received, among others, the following letters:

The Bennett-Osborne M'fg Co. of St. Paul, Minn., have put into the Second Hospital for Insane, at Rochester, Minn. "Osborne's Improved System of Steam Heating Apparatus," which upon test proves satisfactory. The trustees, accompanied by an experienced engineer, after examination, give emphatic approval of the system of heating, and its efficiency, its peculiar quietness, and its economy in the use of steam. The testimony of the engineer, "that this is the most complete heating and noiseless system he has ever seen," was presented to the Trustees.

A. H. KERR,

Sec'y of Board of Trustees.

RECORD OF "TEMPERATURES."

January 9th, 1879.

TIME.	Outside	Inside	Temp. of		Steam in	Steam on
	Temp.	Temp.	Feed Water.	Lbs. on Tank	Boiler.	Boiler.
5 A. M.	16 B'w Z	78 A'e Z	211	Degrees, 5 Pounds.		30 Pounds.
7 " "	14 " "	78 " "	210	" "	7½ "	25 "
9 " "	14 " "	80 " "	211	" "	10 "	35 "
" "	12 " "	76 " "	208	" "	2½ "	35 "
12 " "	10 " "	76 " "	208	" "	1 "	35 "
1 P. M.	6 " "	74 " "	208	" "	1 "	35 "
2 " "	6 " "	74 " "	208	" "	1 "	30 "
" "	10 " "	72 " "	200	" "	2½ "	25 "
6 " "	10 " "	52 " "	200	" "	2½ "	25 "
8 " "	10 " "	74 " "	210	" "	5 "	35 "
10 " "	10 " "	74 " "	210	" "	5 "	35 "

I would say that the different pressures on the tank was caused purposely, to see what pressures it worked at,

Respectfully submitted,
W. H. PEARCE,
1st Engineer.

I. E. Tank, pressure, mean pressure on the building.

E. F. OSBORNE, Esq.
Dear Sir:

During the several years which your improved system of steam heating has been in this hotel under my charge, I am pleased to state that although this was the first apparatus of the kind put in, it has worked to my entire satisfaction. Every thing heats up at once, without noise, and it works equally well with exhaust or live steam, with one pound or with fifty pounds

pressure. We can heat the entire house, and the gauge showing no pressure at all. With my experience with the old trap and tank system, I do not believe we could run this house on less than fifty per cent. of additional fuel, if we had that system. I have no doubt but that the additional cost of your apparatus has been more than saved, every 2 years—in the economy in repairs and engineers salary alone—saying nothing of the fuel saved. Even in very cold weather we only use one boiler to heat and furnish steam and power, including elevator, for this whole house, beside barber shop, and Turkish bath rooms and three stores.

I do not think this is equaled in the United States. The peculiar advantages of being able to run the boiler on a high pressure for power, laundry and kitchen work, and at the same time run the heating apparatus on lb. "more or less as required," of steam with no waste through traps, &c., cannot be over estimated. The heating surface on same floor with boiler, or even on the floor below work equally well with that on other floors.

CHARLES MORTON,
Chief Engineer, Merchant's Hotel,
St. Paul Minn.

I cordially endorse the Statement of Chas. Morton, engineer, in every respect. The working and heating is perfect in every part of the house.

A. ALLEN,
Prop. Merchants Hotel.

ROCHESTER, MINN., Jan. 13, 1879.

To whom it may concern :

On the 9th day of January, 1879, I visited the Second Hospital for Insane at Rochester, Minn., for the purpose of examining previous to the acceptance of same, the heating apparatus put in by the Bennett Osborne Manufacturing Co., of St. Paul, Minn. I have thirty (30) years' experience in Heating Apparatus, and this one is the most quiet in its

working of any I have seen, and is so simple in construction that is a wonder to me that some one has not thought of this plan before. In this plan are embodied every good feature that is necessary for a perfect working apparatus—the supply of perfectly dry steam to all the coils, the farthest coil receiving as much heat and working with the same reliability as the nearest one. The entire absence of clicking and snapping so common in a steam heating apparatus. I can cheerfully recommend Bennett-Osborne Manufacturing Co.'s plan of heating to any one who contemplates heating by steam.

Respectfully,

W. H. PEARCE,

Chief Engineer for First Hospital for Insane.

St. Peter, Minn.

General Sup's Office; }
West Wisconsin Railway; }
HUDSON, Wis. }

E. F. OSBORNE, Esq., St. Paul.

Dear Sir:

The steam heating apparatus attached to our shops at Eau Claire, and to our shops and General Offices at Hudson, which were put in under your personal supervision and management have thus far proved in every way satisfactory.

Yours Truly,

E. W. WINTER, Gen. Supt.

In addition to the above the Bennett-Osborne Manufacturing Co. are now introducing it into the large store of Noyes Bros. & Cutler, St. Paul, Minn.

The flour Mill of J. A. Christian and Co. and in parts of the Washburn Mill B, Minneapolis, Minn. In this mill they require three [3] different pressures, one for general heating, and two for heating and steaming wheat, and yet all the water of condensation returns direct to the boiler with no loss, nor the use of any pumps or automatic traps.

I would also refer to the following parties for whom I have done more or less heating, or work of kindred

nature:

Gov. C. C. Washburn,	Minneapolis,	Minnesota.
Hon. R. J. Baldwin	"	"
Hon. G. L. Becker,	St. Paul,	"
" Richard Barden,	" "	"
" John Wann,	" "	"
Capt. A. Tainter,	Menomonie,	Wisconsin.
J. H. Knapp, Esq.	"	"
D.R. Moon, Esq.,	Eau Claire,	"
Hon. D. M. Sabin,	Stillwater,	Minnesota.
Board of Education,	Minneapolis,	"
" " "	Stillwater,	"
" " "	Winona,	"
" " Trustees Hospital for Insane,	St. Peter,	"

Officers of Minnesota Capitol Building, St. Paul, "

Nicollet House,

Minneapolis, Minn.,

Jan. 4th, 1879.

Mr. E. F. Osborne,

St. Paul, Minn.

Dear Sir:

In answer to yours of late date, asking a statement of facts concerning our heating apparatus, put in (or remodelled) from the old, to *your improved system*, would say, the apparatus was originally put in in 1871 on the usual trap and tank system, under that system the heat was inadequate, we could not warm our house. The almost incessant pounding, hammering and snapping were very annoying, while our engineer was kept continually piling in the fuel, and crowding the boilers, but with very unsatisfactory results. In the fall of 1877 you examined the apparatus, and proposed that if we would allow you to remodel our work (using your improved system) you would guarantee us satisfactory and economical results. The work was done on your plan and under your supervision, and you have given us all you promised; our house is warmed to our entire satisfaction, without a sound in any of the radiators or pipes, which before was so annoying. This

arrangement admits of using any pressure desired on the various departments of the house, such as running the engine, laundry and kitchen work, which is a great convenience and saving in fuel, and puts the entire apparatus more fully under the control of the engineer. We added 25 per cent. to our heating surface, heating additional halls, etc., but notwithstanding this, we have never been obliged to put boiler pressure on the building, while before this work was done, full boiler pressure was not sufficient for the work we were then doing. *We are now using $\frac{1}{3}$ less fuel than before, although our work is 25 per cent greater,* the work of the engineer is much less, as well as wear and tear of apparatus, in a few words, we are highly pleased with the apparatus as now constructed. You have given us all, and more, than you promised.

We will cheerfully show the apparatus to any party wishing to negotiate for its use, and we further take pleasure in endorsing you as possessed of superior knowledge of steam apparatus in all its branches.

Yours very truly,
F. S. Gilson & Co.

St. Paul, Jan. 1st, 1879.

E. F. OSBORNE—

DEAR SIR :—In reply to your request for a statement from me in relation to your improved system of steam heating, I am more than pleased to say that since its introduction into the State Capitol of Minnesota, it has exceeded my most sanguine expectation. All parts of the house heat up at once with no noise whatever, such as is usually termed pounding, hammering and serging. All the pipes, radiators, &c., working as quiet as an ordinary stove. Some seven years ago when I assumed charge of the steam-heating apparatus of the Capitol, it was a noisy affair, which a number of the ex-Governors and State officers will bear me witness, requiring great care, and was also expen-

sive in fuel. When I speak of fuel, I speak of something which is quite an item in this cold climate, and it is worth any one's time to study economy in heating. I can consistently say that since your system of heating was introduced there has been from twenty to twenty-five per cent saved in fuel which the books in the State Auditor's office will show. I, therefore, have no hesitation in saying that your improved system is far superior to either the old-fashioned high-pressure trap and tank system, or the modern low-pressure system. You know that I speak from actual experience, extending over a period of ten years. I have had all the systems under my charge since employed in the State Capitol, and none has been so satisfactory to all the occupants of the building as your improved system to whom you have liberty to refer at will.

In this cold climate it is almost impossible to run a large job on the low-pressure system, unless under very favorable circumstances, and no well-informed person would think of using the old trap and tank system with its unlimited loss of fuel, never less than 15 to 20 per cent., and usually much more, not saying anything about the disagreeable noise, &c., that arises from the pipes. Therefore, taking everything into consideration, I sincerely think your improved system the best of all, and without doubt by far the best for all public buildings, asylums and hotels, and I would also say further that if any one is contemplating heating by steam or otherwise, they ought to study your new system of steam-heating, and any one wishing, I shall be pleased, at any time to show them the apparatus at the State Capitol.

I am very respectfully yours,

GEO. R. MORTON,
Chief Engineer State Capital, St. Paul, Minn

REFERENCE LETTERS ON DRAWING.

BOILER, ENGINE, PUMP, &c.

A	represents	Main Steam Pipe.
A'	"	Boiler.
A''	"	Engine.
A'''	"	Steam Pump.
A''''	"	Steam Pipe to Pump.
A'''''	"	" " " Engine.
A''''''	"	Water Pipe to Boiler.

MAIN HEATING SYSTEM.

B	represents	Throttle Valve.
b	"	Steam Gauge.
D	"	Main Steampipe.
D'	"	Drip Pipe.
E	"	Equalizing Pipe.
F	"	Receiving Tank.
G	"	Main Seal Pipe.
H	"	Return Pipes.
I	"	Circulation Pipes.
i	"	" Valve.
J	"	Radiator.
J''''	"	Indirect Radiator.
L L	"	Exhaust Pipes to Pump and Engines
m	"	Glass Water Gauge.
N	"	Ventilating Radiator.
N'	"	Cold Air Flue from out doors.
N''	"	Opening to admit air from inside.
O	"	Outlet to Tank F.
P	"	Blow-off Pipe to Sewer.
QQ	"	Low Water Line in Tank F.

SECONDARY SYSTEM.

d	Steam Pipe.
e	Equalizing Pipe.
F'	Seal Tank.
gg	Seal Pipes.
o	Overflow Pipes.
qq	Low Water Line.

KITCHEN SYSTEM.

D'''	Main Steam Pipe.
E''	Equalizing Pipe.
F''	Combined Tank and Trap.
G	Seal Pipe.
h	Return Pipe.
J'' J'''	Radiators.
k	Coffee Pot.
rr	Low Water Line.

E. F. OSBORNE,
MECHANICAL ENGINEER,

ST. PAUL, MINN.



Contractor for Heating and Ventilating Public and Private Buildings by Steam and Hot Water.

Plans, Specifications and Estimates furnished on short notice.

* Men and Tools sent to any part of the country.

Engines indicated and adjusted.

Dealer in Wrought Iron Pipe and Fittings, Engines, Condensers, Pumps, Boilers, Waste, Oil, Packing, &c., &c.

