

## LECTURES ON VENTILATION.

*Delivered before the Franklin Institute.*

By L. W. LEEDS, Esq.

(Continued from page 216.)

We have here a diagram, prepared at the request of some gentlemen of his city,\* showing some suggested modifications of the ventilation and warming of the Hall of Representatives. It is proposed to draw off the foul air both at the top and bottom.

That taken from the bottom is to be drawn through the present inlet registers, and that from the top to escape around the sides of the glass as at present, and through the illuminating loft to the external air.

Now, with a little ignorance or carelessness it would be very likely to be so arranged that discharging the air in two opposite directions might make confusion, and that it would, at times, all draw up, and the foul air, instead of escaping at the floor, would flow in there; and at other times it would escape at the floor and come in at the ceiling; but it is very easy to avoid such action and with entire certainty.

This is the proper manner to arrange all large buildings intended to be occupied by a considerable number of persons; there should be escapes for foul air thoroughly distributed over the floor, also liberal escapes from the ceiling, and these should be kept constantly open when the room is occupied, and there is no practical difficulty whatever in doing this.

It was originally intended to overflow the hall with the fresh air driven in by the fans; but, practically, this is not the general condition. Several experiments, tried at various times, indicated a strong current setting into the Hall of Representatives from the corridors through every door, both above and below, so that practically the main room is supplied by air from the surrounding passages; we consequently recognize this fact and act accordingly. Arrangements should therefore be made to keep the air in these passages as nearly pure as possible.

It is proposed to warm the floors of the hall slightly in excess of the temperature of the room, say to about 80° or 85°, which would still be below the temperature of the body; and also to have all the exterior walls warmed so that there would be a gentle radiation from all the solid bodies in the room. When we are not losing heat by con-

\* Rand, Perkins & Co., of Philadelphia.

duction, from contact with a cold floor, and are receiving radiant heat from all the surrounding walls, instead of parting with the warmth of our bodies to these walls, we can afford to be surrounded with and have the luxury of fresh, cool, invigorating air for breathing.

As the corridors would be largely warmed by radiation, the air in them would be cooler than the indicated temperature; it would, consequently, flow into the hall underneath the air longer contained there.

It is not intended, however, to depend exclusively on the supply of air from the corridors in case the doors should all be intentionally or accidentally closed; there would be an abundant supply of air from portions of the perforated ceiling. In winter arrangements would be made to warm this to the required temperature, but as so considerable a portion of the warmth of the hall would be furnished by direct radiation, it would only be necessary to have this air heated to  $50^{\circ}$  or  $60^{\circ}$ ; consequently, being slightly heavier, it would easily fall in gentle, well diffused currents, to take the place of the foul air drawn out both above and below.

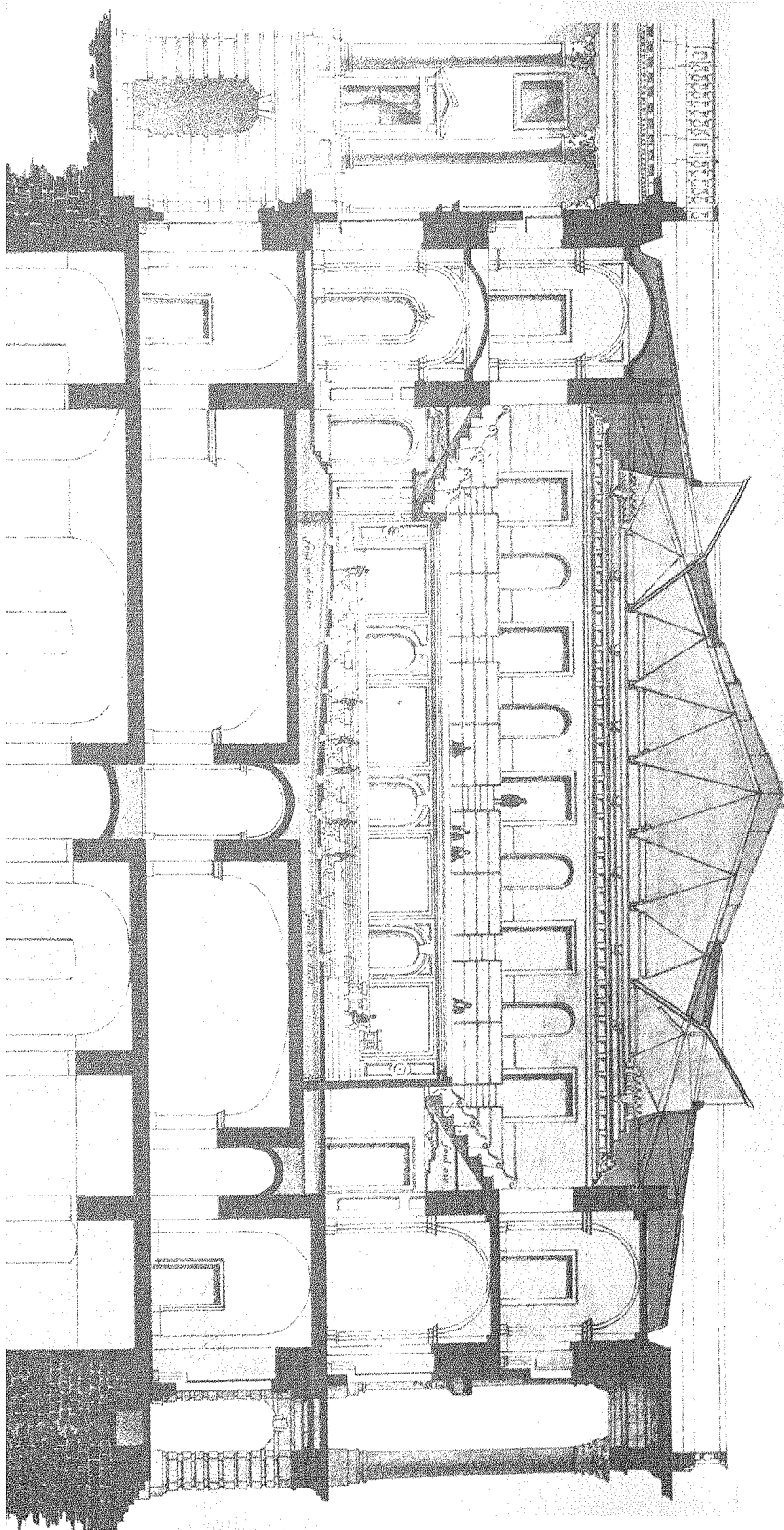
Many persons are afraid of a draught of cold air upon their heads, but if the surrounding conditions are right this is just the position to have it strike the body. For instance: I have stood on the hot plates in front of the boilers in the hold of a steamship, with my back towards the hot boilers, and had a perfect torrent of very cold air falling on the head, which felt delightful.

The firemen are constantly subjected to this without injury, but if they go on deck and stand in a draught, or cool off quickly, *away from the radiant heat*, they frequently take severe colds.

One difficulty about having a cold draught upon your head; it is very apt to be *colder* on the feet, but that part is frequently not noticed.

It is also proposed to put in a row of dormer windows, that would let in more sunlight, and perhaps some of the direct rays of the sun, and in summer would be very useful in catching the breeze as it passed and throwing it directly into the hall as you see here (refer to diagram). It is proposed to entirely disconnect the illuminating loft, so as to avoid the possibility of a returning current of foul air as now occurs; also to make an additional plastered ceiling and a confined air-space to prevent the rapid cooling effect of the exposed copper roof.

It is proposed to dispense with the fans entirely, which I consider



about the greatest nuisances in the building, and rely exclusively on heated shafts.

The same amount of heat applied to a well constructed shaft will probably move a much larger amount of air, at a great deal less cost, and requiring no expensive engineering attendance.

I believe if this plan was carried out it would make a very satisfactory building; perhaps the Hall of Representatives would not be quite equal to a single room, with the walls and floors warmed, and large windows on all four sides for the free admission of air and sunlight, but it would be so much better than many of our public halls, that by comparison it would be considered very good.

*The Treasury Building, at Washington*, is one of the most substantial and expensive executive buildings in the world, having cost some \$5,000,000.

No expense has been spared in any part to make it the most perfect, comfortable, and convenient building that the ingenuity of man could devise.

I wish you to make a distinction here between the errors of original design and construction, and the troubles resulting from its shameful abuse, because the former show the deficiencies of correct knowledge in this respect among the best informed architects and builders; but the most shocking condition of the old building and ill health of the occupants, as I found them, result very largely from the shameful abuse of it after its completion, and show us the want of general information in the public, which will prevent the very best arrangement that could possibly be made becoming an intolerable nuisance, as was the result here.

It must be remembered that this whole block has been many years in building and reaching its present size. The plans represent it, as now finished, as a single completed building, but we must examine it in parts, according to the ages in which it was built.

The old front on Fifteenth street has been built probably fifty or seventy-five years—quite long enough, at any rate, to show in its original construction those ample old-fashioned fire-places where hickory wood, and plenty of it, was burned in each room.

And when these were in full blast an examination of the absentee list would show a much smaller proportion of excuses for sickness from foul air diseases than at present, with these fire-places carefully boarded up or walled on top, and all the rooms heated from one large central boiler in the cellar.

Most of this part of the building has been remodelled, so as to be heated by radiation from hot water coils in each room, great care having been taken to shut up all crevices to prevent any cold draughts.

The south wing and west wing have been completed much more recently—mostly within ten years. This is the portion of the building which I wish you to examine more carefully.

That cleanly and refined system of murdering human beings, which has spread like a devouring pestilence over our whole land, came into general use about the time this building was designed.

I mean that miserable system of warming our rooms by currents of over-heated, debilitating and ruined air.

At that time I myself was one of its zealous advocates. I had already noticed the universal complaints of the occupants of rooms which were heated by currents of air from the common hot air furnace, but supposed it resulted from some peculiar effect produced by the overheated iron, and consequently went energetically to work to remedy these evils by warming all the air, by bringing it in contact with metal surfaces moderately warmed by circulating hot water.

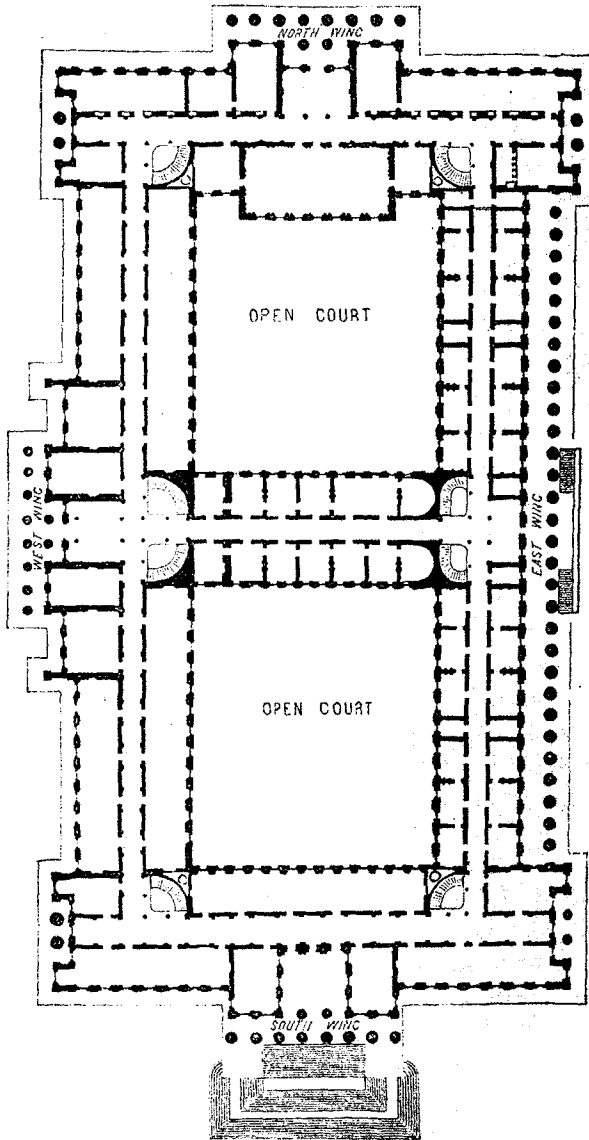
I persevered many years, inventing and patenting in this country and in Europe, new and improved devices for accomplishing this object, fully believing that a building, constantly overflowed with this mild, warm, summer-like air, must be the perfection of artificial heating.

And yet I was chagrined and mortified that many sensible people, with good independent judgment, would still insist upon it that they felt better, their heads were clearer and brighter, in a room heated by an open fire than in a room heated by my hot water apparatus.

It was thus forced upon me, little by little, year by year, that there was a very essential difference between the room heated by an open fire and one warmed by currents of heated air.

I was just going to say I *soon* learned, but I *didn't*. I *slowly* learned that all warmed air was unwholesome and debilitating; that it was not the manner of warming, but it was the fact of its being warmed; that the sun itself could not warm it so as not to produce this debilitating effect, as witnessed by the fearful mortality whenever the air in summer reaches nearly the temperature of the body.

In proportion to my convictions of the unwholesomeness of warmed air did I advocate the introduction of direct radiation—first one-quarter, then one-third and one-half, and perhaps some time I may believe in *heating* by radiation entirely. But there is one practical difficulty



about this, and that is, where the necessary air for ventilation is passed through the room, and it is quite cold, it is so difficult to avoid unpleasant draughts; it requires very careful diffusion.

There are, consequently, fewer complaints of such draughts when

all that air is warmed, especially as all the occupants are so stupefied they have not much energy left to do anything—not even to find fault.

(To be continued.)

## Franklin Institute.

*Proceedings of the Stated Meeting, Nov. 25, 1871.*

The meeting was called to order by the President, Mr. Coleman Sellers, at the usual hour.

The minutes of the last meeting were read and approved.

The Actuary submitted the Monthly Report of the Board of Managers, and reported that, at their stated meeting held November 8th, donations to the library were received from

The Institution of Civil Engineers—their proceedings for 1870–71. The War Department at Washington—the Practical Use of Meteorological Reports and Weather Maps. The Geological Society, of London, and Literary and Philosophical Society, of Liverpool, Eng.

The Actuary also reported that, at their last meeting, the Managers had passed the following

*Resolution*, That the thanks of the Board of Managers be and are hereby presented to Prof. Henry Morton, for the interest manifested in the success of the Institute, in tendering his services, without compensation, as a lecturer at the Academy of Music.

In relation to this subject, Mr. Orr moved the following :

*Whereas*, Prof. Henry Morton has informed the Board of Managers that he declines any pecuniary remuneration for his late lecture at the Academy of Music, therefore

*Resolved*, That the Institute duly appreciates the substantial kindness from its late Secretary, and offers cordial thanks for the same ; and directs that a copy of this preamble and resolution be transmitted to Prof. Morton by the Secretary.

The Committee on the Horse-Power of Boilers reported progress, and was continued.

The Secretary next read his Monthly Report on Novelties in Science and the Mechanic Arts, when the meeting adjourned.

WILLIAM H. WAHL, *Secretary.*