

To these causes he attributes the constant deterioration going on in the ranks of the United States merchant marine and the lamentable short average of the mariner's life, which is only twelve years, seventeen thousand becoming unfit for service or dying every year.

"Is it any wonder," he says, "that there is a scarcity of efficient sailors? that vessels leave port short-handed every day? that shipwrecks and loss of life grow more frequent year by year?"

It is true the latest additions to the fleet of ocean steamers are provided with a considerable number of funnels or air shafts; but under the most favorable circumstances, that is when the wind is blowing against them, the air only gets into the passages into which the air shafts open, but not into the rooms; while on the contrary when the wind and the steamer are both going in the same direction and at about the same rate of speed, no air is forced down the ventilators at all.

Now, lest the owners and architects of ocean steamers might think that I was asking too much for the cabin and steerage passengers and seamen, whose supply of air is respectively bad, worse and worst, let me refer them to Wilson's standard text book on Hygiene, p. 90, where the author says that the Barrack Commissioners of England recommended a minimum allowance of six hundred cubic feet of space per man, but that experiments made by Dr. de Chaumont, Professor of Hygiene at Netley proved most incontestably that even this comparatively large allowance is inadequate for the purposes of ventilation. The author admits, however, that even so small a limit as one hundred cubic feet per man can be kept sufficiently pure, provided the most approved methods of artificial ventilation be carried out.

Having thus briefly shown the defects in the present method of ventilating ocean steamers, let me suggest a remedy.

Happily the latter is as simple and effective as it is important. For although any increase of cubic space for passengers and sailors would greatly increase the cost of carriage, the *number of times* in an hour that the air in that space could be changed, might be very considerably increased at a positively trivial cost.

Dr. W. G. Metcalf, Medical Superintendent of the Ontario Lunatic Asylum, Kingston, writes t

me that the inmates of the main building to the number of three hundred and ninety are actually supplied, by means of a steam fan, with three thousand eight hundred and forty cubic feet of fresh air, each, per hour. And many other prisons and insane asylums on this continent are ventilated in the same way.

Now, I would ask, why could not a similar method be adopted on board ocean steamships? Their shape, resembling a box, completely closed on five sides, with only a few small openings in the sixth, precludes them from any possibility of being effectively ventilated by ordinary means. Why not, therefore, provide a fan blower worked by steam, and which could, no matter which way the wind blew, be relied upon to introduce into every part of the ship occupied by human beings, at least that amount of fresh air which accurate experiments, made by the most reliable scientists, have shown to be absolutely necessary for health.

I cannot believe that the question of cost would be any objection; for the same passengers, or the cabin ones, at least, who are so insufficiently supplied with air are most lavishly provided with every luxury; thousands of dollars being expended on decorations alone; and a surfeit of food being given every few hours during the day.

With the present system of ventilation on ocean steamships under the most favorable circumstances, the steerage passengers are not allowed more than two hundred and sixteen cubic feet of air per hour; while the inmates of the lunatic asylums and penitentiaries never receive less than three thousand eight hundred cubic feet of fresh air per hour, and no civilized country would permit them to be deprived of air to the same extent as the emigrants are.

The only objection that could be raised against the fan ventilator would be the draught; but that could be avoided by having inlet pipes perforated with a large number of small holes, and the speed and pressure so regulated that only the proper amount of air would be distributed and no more.

Such a fan, I am informed by a practical engineer, would cost the small sum of six to eight hundred dollars. It could be driven by all of the numerous small auxiliary engines which have to be kept in readiness for an emergency, such as pumping; while the necessary steam would not cost as much as one cent a day per