grounds: 1st, Because none of the traps to which they were attached could ever have been in danger of being siphoned, or the back-air pipes would have passed down air to break the vacuum in the waste pipe, and to relieve the draw or suction on the water seal of the traps, and if any air had ever passed down the vent pipes there would have been no cobwebs choking them. 2nd, That they create complications, expensive intricacies and obstructions, interfering with the smoothness of the waste water flow, and are liable to become blocked up with the most poisonous and dangerous part of the sewage, viz., the frothy scum odors.

In the experiments the committee noted the influences of the sewage and air on various sized soil pipes at various grades and inclinations, also in vertical and horizontal position, and studied various sized traps, back-air pipes and connections, and depths of water seals. The influences on the flow of sewage, when the soil pipe was extended through the roof and the end left full open; when only partly open; also when the head of the soil pipe was totally closed up, and when the heads of the soil pipes and the back-air pipes were enlarged in the usual way immediately before passing through the roof. Also the action and influences on the private drains when main line traps and breather pipes were used. They found that a solid piston or column of water was only formed when the waste water from the fixtures was passing through inclined and horizontal pipes. And we know that when a piston is formed that there will be a suction of air or a vacuum behind the column that would siphon the trap or a number of traps, under certain conditions; but as such conditions never occur when the plumbing is installed by a competent person and used properly and in an ordinary way, it is a waste of money and is contrary to sanitary science to use back-air vent pipes.

They appear also to have proved that there is a limit to the pressure of the suction and the vacuums caused by water pistons, which can be overcome by arranging the plumbing so that no inclined branch can be longer than 39 inches, or by increasing the depth of seal in the traps, and by increasing the size of the waste pipes to about three times the capacity of the strainer or the mouth of the inlet. But our experience has proved that all risks can be avoided by making the branch from each fixture as short as possible, and branching them direct and almost level into a line of waste pipe that is extended through the roof, and the end left opened, so that the air can be drawn down when necessary. See illustration and full explanation in the issue of this journal for April, 1897.

The committee found that there was no advantage in increasing the size of the head of the soil or ventilation pipes as is customary at present, except it was possible to decrease the interior by hoar frost in winter, and this they were unable to demonstrate. When water was poured down one of the smaller fixtures it dashed against the opposite side of the vertical soil pipe, and at once resolved itself into fine, single threads, as if delivered from a sprinkler, and the number of threads increased in proportion to the amount of water poured down, until the bore of the soil pipe was entirely filled with thread, which acted as an air injector into the sewers and aerated the waste water passing down at the commencement of its flow towards the sewer mouth. In order to gain a knowledge of the amount of air sucked into the soil pipe an anemometer was carefully fixed on the mouth of the soil pipe above the roof, and one bucket of water was poured down a fixture when the anemometer showed that three cubic feet of air had passed down, and when four pailfulls were rapidly discharged down a fixture there were 17¼ cubic feet of air carried down with the water. Supposing the four pails held two cubic feet then it would prove that the water carried over eight times its own bulk of air with it down the soil pipe into the drains. When water was poured in at the top of the vertical soil pipe the moisture of air sucked in was only half the amount that was drawn in when discharged into the soil pipe through a branch. When the head of the soil pipe was partly closed the number of threads was reduced proportionately, and the seals of the traps showed signs of agitation, and when the top of the soil pipe was closed altogether and the four buckets of water were poured down quickly the water did not break up in threads, but formed a piston which siphoned the traps of all the fixtures except those that branched into a secondary line of waste pipe that had an open end above the roof. When the sewage was flowing through the horizontal sewer it formed a concave surface which largely increased friction and reduced the speed.

When any of the small waste pipes were extended at the upper end and the end left open so that air could pass down when required, the same result was obtained as when experimenting on the soil pipe.

It was shown that when a main interception trap was used, that it not only modified the speed and partly obstructed the flow of sewage, but it prevented any of the air carried down by the soil and other waste water pipes from discharging into the street sewer where its aerating functions are so necessary to commence the purification of the sewage in the drains and assisting in preventing sewer gases generating in the sewers. It was also shown that when the main interception trap is omitted there is a superior and self-cleansing flow of sewage, and that large volumes of air pass forward to the street sewer, creating a healthy atmosphere and circulation of air down the soil pipe through which the fluid is passing, and up other soil pipes that are at the time standing idle.

These experiments, especially those that show that air is carried down with waste waters and that the main trap is a dangerous obstruction, fully explain the reasons why those towns that do not use back air pipes and that extend their soil pipes from the crown of the drains to the highest point of the roof and which make every rain water leader and waste water pipe to pass to the street sewer without any obstructing trap or sharp angles or interruptions of any kind, are almost free from odors in the houses and streets, and free from diseases that can be traced to sewer gas poisoning. While, on the other hand, those cities which have adopted the principle of interception, traps, back air ventilation pipes, with all their intricate complications, are often quite the reverse, and of disease a great deal is found among the inhabitants who happen to live in the modern built houses where the obstruction system has been installed. And this is in spite of the fact that the same towns often spend large sums of money in flushing drains and artificially ventilating the street sewers, a thing which is never necessary if the sewers are laid down properly and the straight unobstructed system is adopted. The city of Cologne has now had enough of the complicated system of plumbing and draining and in future will avoid such expensive luxuries and again allow their sewage water to leave inhabited premises with as much expedition as possible, and secure all the aeration it can throughout the journey to the outfall, without making itself a nuisance to the public.

The Cologne investigation has a bearing on sewage purification. It will be remembered that more than twenty years ago Dr. Pasteur, of Paris, and Dr. Warrington