

"properly vented" on the main house drain pipe, and consider any one "criminally" negligent who does not do so.

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The question as to whether a trap, with a fresh air pipe above house-side of seal, should or should not be put in the main line of private sewer at or near the curb wall, for intercepting the gases from public sewers, is a very important one, and the verdict, in my opinion, should not be incorporated into the code of sanitary science of plumbing without giving it a very careful study. I will endeavor to discuss the objections raised to a trap thus placed in the sewer.

*Objection 1.* "They obstruct the flow of drainage, and cause accumulations of foulness in house drains." The flow of sewage is just as rapid to and from (for all practical purposes) the trap with it in or out. It is true, that when there is a small quantity of sewage flowing it will be retarded a trifle while passing under divisions wall of trap, but if there be a large quantity sufficient to fill, or nearly fill, the sewer there will be no retardation, because the air will be forced out of a fresh air pipe, and part of water in trap be pushed through by the momentum given to the air at the introduction of the water, and when the water passes beyond the trap there will be a suction action that will clean out any sediment that may be in it; and were it not for the slow draining of the water on the inside of sewer the trap would be left without a seal. The sewage of a trap is constantly being changed, either by the use of leaking of plumbing fixtures, or by the drainage of the soil; and if it is true, as has been stated, that matter entering into sewers requires about six hours before the dangerous gases are generated, they will not often be found in sewer on account of trap. The trap will not be choked by anything that will pass under the division wall of the smaller traps that should be placed in the waste pipes, near the plumbing fixtures. Roof water-pipes should not be connected direct with a sewer without an intervening catch basin, having a partition so constructed that it will prevent floating articles from flowing into sewer, and at the same time admit of a current of air to and from the roof to fresh air pipe. No trap will be choked with grease that has the soil and water from water closet in daily use passing through it. The amount of foulness accumulating would be at the trap, if at all, and the gases generated from it would be so small that the air of the sewer would be but slightly deteriorated by it. If the specific gravity of the air on the public sewer end of trap was lighter than that of air on house end the gases would be slowly passing through that way and *vice versa*; now, if the air entering through fresh air pipe is not sufficient to oxidize the impurities of gases thrown off the area of a six-inch circle (for it is only at the house end of trap that the foulness will effect the sewer odors, and this is an evil that can be remedied by suitable flushing arrangements), the air from each junction's proportionate part of public sewer and an additional length of twenty-five feet of private sewer, being foul itself, will never accomplish the oxidation of gases in the balance of house sewer.

*Objection 2.* "Air admitted by ventilation above the seal, and passed all through a trapped house drain, is found by experience to be fouler than air drawn from a sewer." It seems to me that this assertion cannot be maintained, for how is any mortal able to determine the proportion of foul matter that enters each of sewer, causing the generation of the two separate compounds of sewer gas? Again, how is he to know what condition the air currents were in when he took his samples of gas to test? I have known the air currents to be down the vent pipe through the roof, when water would be thrown into a branch of vent pipe, or after water had flowed past the junction of vent pipe with sewer, or if the wind were blowing towards the side of a house higher than the vent pipe, also when there was a break in the sewer under house, or from the subsiding of the waters of a public sewer after a rain storm. The air currents are sometimes out of vent pipe, as when the waters of public sewer are above the outlet of private sewer, the flowing of water in any of the branches of private sewer will cause it, or when the outlets of public sewer is filled, and large bodies of water flowing from a section of higher grade; or if the outlet is not filled, and wind blowing towards it; or if the wind were blowing towards the front of the house, and a trap with fresh air pipe was in sewer, the air would be forced down the fresh air pipe and out the vent on roof. Again, there may be no perceptible current, but simply an oozing out of air by the expansion of the gases by fermentation. This is when the outlet of private sewer is covered with water, or if there be a trap in without fresh air pipe.

I have worked in situations where there would be a current of air coming out of a soil pipe, and yet the odor would hardly be perceptible, but I invariably had very sick headaches when at such jobs. My men and I have less inconvenience when the odors from their offensiveness appear to be more dangerous, and I am inclined to the opinion that it is the unknown and unheralded foe we have the most to fear from. At one job we were altering I found a trap at foot of soil pipe, and the ordinary bath room fixtures on second floor, and a two-inch iron pipe extended from soil pipe through roof; before we disturbed the work I sniffed the air about a foot from the vent pipe on roof and noticed no odor; yet when I sniffed close to open end of pipe I noticed a very faint odor. I applied a lighted match to it, and instantly a bluish flame burned down the inside of pipe for about five minutes. I then made a small hole in the sewer above the trap, and snuffed at the vent pipe on roof, and there was a very strong, perceptible odor about three feet from pipe. So I think, although the odors escaping from vent pipe when there is a trap with fresh air pipe are more disagreeable to the sense of smell than those from the pipe without trap, it does not prove that it would be safer to do without it, for there are many causes wherein there would be a difference in the quality and quantity of the two gases.

*Objection 3.* "The trap does not offer any effectual resistance to air from sewers when there is a pressure." It is true that a column of water two or three inches high will not offer sufficient resistance to keep back all the air that may be forced up private sewer under heavy pressure, but I think it is a very rare occurrence, if at all, that all of the water in a trap would be forced back so as to admit of a volume of air equal to the size of pipe; and this would be diluted with the air from (or forced out of) fresh air pipe at curb wall, and if found to be troublesome there it could be arranged to go to roof of house. Where public sewers have a low grade, and consequently a sluggish stream of sewage, and a large percentage of junctions connected with occupied buildings, the outlet of private sewer will be partly, if not wholly, covered with water. Therefore, dependence upon private sewer ventilation for ventilating the public sewer would not be reliable. Public sewers should be ventilated in many cases by a separate system of their own; yet there are situations where the public and private sewer ventilation can be in unison.

*Objection 4.* "That the danger of disseminating contagion originating with them, through tenement and apartment houses, is probably greater with a trapped house drain than it would be from an open connection with the sewer." Suppose a contagious disease germ is present in the line of private sewer; will it not propagate faster where it is nurtured by pure sewer air than by sewer air diluted with fresh air? We are taught that in order to purify sewer air it must be freely mixed with fresh air. Without a trap every pipe is filled with the impure gases from the public sewer, together with what other gases as are generated within the waste system of house, and every motion communicated to the air of public sewer (when the circumstances are favorable) exerts an evil influence upon all traps at plumbing fixtures in house; and no matter how expensive a system of sewer ventilation a party may have in their house, their waste water pipes will be filled with gas of the same quality as may be in the public sewer. The gases arising at curb wall (except in severe storms) can be prevented by extending the vent pipe of soil pipe up within and two feet above the kitchen chimney flue.

The benefits of trap arranged, as explained in the beginning of this letter, are:

It to a great extent separates the gases of public sewer from those of private sewer, thereby lessening the chances of contagion from epidemic districts.

Each building can carry out its own system of sewer ventilation. In case of break in house sewer it lessens the liability of house being filled with sewer air of full strength. The fresh air pipe is an additional escape to pressure in private pipes, and admits of an oxidation of the impure air within sewer. It is a safeguard against the private citizen impeding the flow of public sewer by being careless with his own sewer. I have never found a trap choked up that could not be charged to the faulty construction of some part of the sewer, or when the catch basins from some cause had the water level lowered down below its trap, and floating substances had got into sewer, and then into the trap; but even this can be prevented by properly arranged catch basin. I would have to know all about the sewerage of a city before I would say a trap should be put in or left out, as described in the beginning of this letter, in the private sewer. If all cities' sewerage were arranged as those of Chicago, I would insist upon a trap being put in. If I have thrown any light upon this important subject my time has not been spent in vain.