the opening. As the opening is into a portion of the drainage system that is unprotected by a trap, it cannot, of course, communicate with the interior atmosphere of the house; it must be connected by a pipe either with the open air outside of the house, or with the air of the upper part of the soil pipe, above all fixtures. The ability of this pipe to transmit air in the volume required depends on its size and on its directness. A one inch pipe, one foot long, for example, may admit air fast enough, while a longer pipe of the same diameter, or a smaller pipe of the same length, would not do so. One or other of he defects above indicated may very easily defeat the object, and, in so far as the opening may be decreased by the accumulation of waste matters, the object, which is fully secured while the work is new, may be permanently defeated by a condition that occurs after a little use. What seemed originally to be adequate security may become untrustworthy in time.

Then, again, the trap to which such back ventilation is applied depends for its efficiency on the permanence of its water-seal. A water-seal which has no other exposure to the air than it gets under ordinary circumstances, will not be so reduced by evaporation as to lose its value for a considerable period; but with back ventilation, a current of air is established through the pipe in the immediate vicinity of the trap, and evaporation becomes more rapid, destroying the seal by removing the water in a very short time. It was an unsealing due to evaporation that first caused me to discard the method. I believe, most firmly, that when the system of back ventilation, as now practised, is applied to all the traps of a house, the destruction of the seal by evaporation will be much more to be feared than it would be in the same set of traps by siphonage only if not vented.

Traps are also frequently emptied of their water by capillary attraction. When a rag, a bit of string, a matting of hair, or any other porous substance having one end immersed in the trap, has the other end extending over the bend and leading into the discharge pipe, traps having a seal of only the ordinary depth may be emptied in a short time by this action alone. In other cases, and even where the traps are considerably deeper, the capillary material, by increasing the evaporating surface, greatly increases the liability to evaporation in the presence of the current of air produced by the venting-pipe. While, therefore, this capillary action is not an infrequent source of the failure of a trap which is not ventilated, it is also an aid to the destruction of the seal when it is ventilated.

Mr. Putnam's experiments were conducted in logical order. He first demonstrated that the air rushing through the trap to supply a vacuum caused by a flow in the piping beyond carries the water with it as a matter of course. Some of this water, striking against the walls of the trap, is thrown back to its original position, so that the whole volume of sealing-water is rarely removed with a single motion, whatever the form of the trap. However, he found that, sooner or later, under a sufficiently continued movement of air, the whole of the water, even in a deep trap, might be so withdrawn as to break the seal permanently. The time required for this depends very much upon the number of surfaces of the wall of the trap tending to throw the water back into it. It was found that, of the common traps, the ordinary "pot" or "bottle" trap offered the greatest obstacle to siphonage. It was assumed that "the severest test for siphonage to which a trap could possibly be subjected in practice would be that which would be sufficient to siphon out an eight inch pot-trap or a ventilated S trap constructed in the usual manner." The apparatus used was strong enough to destroy in one second the seal of a one and one-quarter inch S trap, having a one and one-quarter inch vent-opening at the crown, having a one and one-quarter inch smooth lead pipe, sixteen feet long, connected with it, and to siphon out an unventilated pot-trap eight inches in diameter, having a seal four inches deep. It was shown by this apparatus that a reduction of diameter of the vent-pipe, or an increase of its length, lessened the stability of the trap. The experiments demonstrated that none of the ordinary traps can withstand a not unusual siphonic action, even with what would be considered adequate ventilation. These experiments were repeated in a great variety of ways with the same general result.