sound water-trap. *Water-traps, are, therefore, for the purpose for which they are employed, that is, for the exclusion from houses of injurious substances contained in the soil-pipe, perfectly trustworthy.* They exclude the soil-pipe atmosphere to such an extent that what escapes through the water is so little in amount, and so purified by filtration, as to be perfectly harmless; and they exclude entirely all germs and particles, including, without doubt, the specific germs or contagia of disease, which we have already seen, are, so far as known, distinctly particulate."—*The American Architect and Building News.*

SANITATION.

That excellent journal the, *Sanitary Engineer* of New York, remarks as follows:

"The Board of Health and the City Engineer of Springfield, Mass., have adopted the substance of the "requirements for the drainage of every house," published in THE SANITARY ENGINEER for September 1st, 1879, and have officially promulgated them in a circular, which we copy below. We are gratified to find that they have met with such recognition. They were prepared with the co-operation of the best sanitary authorities in the United States, and have borne the test of examination and criticism, so that we can fairly call them The Sanitary Code for American house drainage.

"HINTS ON PLUMBING AND SEWERING—HOW TO MAKE HOMES HEALTHY, AND SAVE DOCTORS' BILLS

"[A circular prepared by City Engineer Ellis, and issued by authority of the Board of Health.]"

"The prevention of disease arising from sewer gas can only be accomplished by obedience to the following sanitary requirements:—

"'A trap should be placed on every main drain to disconnect the house from the sewer or cesspool."' This trap should have a seal of not less than 1½ inches, and be furnished with a hand hole for convenience in cleaning if stopped from any cause; while if the rain water down spout is connected with the sewer just above the trap, great assistance will be rendered in preventing deposits. "Every house drain should have an inlet for fresh air entering at a point inside the main trap and carried to a convenient location *out of doors*, not too near windows." For the latter reason the down spout selected must be one running to the eaves of the main building, and *not* stopping at the piazza or at any lower point. "'Every verticle soil or waste pipe should be extended at least full size through the roof"' not less than four feet and surmounted with a plain ventilating cap of such form as not to obstruct the exit of air."'

"'No trap should be placed at the foot of vertical soil pipes to impede circulation."' "'Traps should be placed under all sinks, baths, basins, wash trays, water closets and other fixtures and as near to them as possible. All traps under fixtures should be separately ventilated, in order to guard against syphonage; such vent pipes should *not* branch into a soil pipe below where any drainage enters it, but always above, and in some cases it is preferable to carry them to outer air independently. If the ventilation of traps under the kitchen or basement sinks be impracticable the discharge pipe below should be ½ inch greater diameter than the trap and pipe above."'

"The safe, waste and refrigerator pipes and tank overflow pipe should *not under any circumstances* be run into any drain or soil pipe, but discharged independently into an open sink or bowl, so that the connection with the sewer shall be completely cut off.

"'Water closets should not be supplied directly from street pressure or by pipes from which branches are taken for drinking water."'

No drain should be constructed under a dwelling house except where absolutely necessary, and then it should be of cast iron, with tight joints and ventilated at each end. All drain pipes within a house should be of metal, and soil pipes of cast iron, other pipes of lead; under no circumstances is the use of cement or earthenware permissible. The joints of cast-iron pipe should be filled with melted lead and properly calked. The union of lead with iron pipes should be made by means of a soldered brass ferrule, or cast-iron sleeve; in the latter case the lead pipe put through, turned over it, and the ferrule or sleeve inserted in the hub and leaded in the usual manner. Such joints should *not* be made with putty or cement.

A not uncommon method of ventilation is to connect the main drain with the kitchen chimney; with the cold-air inlet, this gives a circulation of fresh air in the lower drain while the chimney remains heated, otherwise it is a sort of danger, but at its best, it is no assistance to the vertical pipes, which cannot be ventilated or guarded against syphonage, except by carrying out at the roof full-size and ventilating traps as directed.

These requirements all apply with equal force to connections with cesspools; and where these are used, they should be ventilated at the cesspool in addition.

THE PRINCETON DISASTER.

(*See page* 264.)

The sudden recess of Princeton College, consequent upon an outbreak of malarial fever, by which some forty of the students have been prostrated, and which has already caused several deaths, has naturally excited much discussion in public and private. The serious consequences of the outbreak, and its important bearings on sanitary progress, induced us to visit Princeton and personally investigate the circumstances of the case, for which we were afforded every facility by the college officials, and we are thus able to lay the main facts in the matter before our readers.

The history of the outbreak dates back about a month. Before that time there had been about the usual amount of sickness in the college, but attention was then specially drawn by the simultaneous illness of seven students in a private boarding-house. Examination revealed that the well from which these students drank was polluted from an adjoining cesspool. Prof. Cornwall analyzed the water and found an excessive amount of albumenoid ammonia and free ammonia.

An analysis of the water of all the wells and springs from which the students drank was then ordered. As a result ten more wells were shown to be impure. By this time the disease had begun to assert itself in the college buildings; some forty students in all were attacked, but not all at the college. Occupants of all of the buildings were seized, the least number being in old Nassau Hall, and the most in Witherspoon Hall, supposed to be the most complete of all the college buildings.

An investigation was begun by the faculty, and it was hoped prompt remedies would relieve the prevalent alarm, when the deaths of three of the patients created a panic, and so many of the students' friends wrote requesting their return home that it was finally decided to adjourn the term for a month to allay the excitement and to permit remedial measures.

Princeton is distinctively a college town, and is made up of the college buildings, the residences of the faculty, a couple of hotels, and a moderate number of private dwellings. There is no business carried on in the place, except providing for the wants of the students. The college buildings are scattered about the grounds in picturesque confusion, and are of all styles of architecture, several being of great antiquity. There are five buildings in which students sleep—Nassau Hall, built in 1756; East College Hall, erected in 1833; West College Hall, erected in 1836; Re-union Hall, erected in 1870; and Witherspoon Hall, erected in 1877.

Up to within a few years there were no sanitary features in any of these buildings. The bedroom slops were taken out by hand and emptied into small cesspools near by, while water had to be carried up in the same toilsome and primitive way. Out-door privies were used and misused, and everything about the sanitary arrangements was decidedly offensive and unsatisfactory.

Less than four years ago water closets were introduced into all the dormitories on the ground floor only, while sinks were placed in each hallway to supply water mainly for lavatory purposes. The water came from a very pure and productive spring, which is is still the source of supply, while the waste was carried into a 12-inch sewer which ran across the college grounds and down to a large cesspool, 1,200 feet distant, beside the railroad. This cesspool was 60 feet long, 10 feet wide and 14 feet deep, with an overflow pipe at one end; the bottom was open, and it was supposed that the fluids would drain off in time. There were two man-holes, tightly covered, but no ventilation either to the sewer or cesspool, except into a brick flue in the Witherspoon building and a galvanized pipe which ran up the side of one of the dormitories, close to the windows, and which had been cracked in several places by base balls or in other ways.

The cesspool had *never been cleaned* and was full to the brim. Possibly the sewer is also choked by the deposit backing up. Yet this was the sole receptacle for the sewage of some seven hundred persons, amounting to several thousand gallons daily. The drains from all the dormitories connected with this cesspool as did those from the University hotel.

In most of the buildings there was absolutely no bar to the gases produced by decomposition in the cesspool and sewer from