# XXVI.

## RECORDS OF FIFTY EXAMPLES OF DEFECTIVE PLUMBING IN NEW YORK CITY AND VICINITY.

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At the last annual meeting of the American Public Health Association, in Brooklyn, the Rev. Dr. Storrs, after a courteous address of welcome and a graceful acknowledgment of the progress of medical science, made the following appeal to the Association:

"But we want you to find out some of the things in regard to which you have intimated something to-night.

"We want to know how it is that this dark, sly demon of diphtheria creeps into our most carefully fitted and furnished homes equipped with every possible appliance for keeping out filth, and leaves the tenement-houses and gutters and cellars untouched. We want to know why it is that this autumnal swoop of typhoid fever comes upon us every year, while we have the purest water in the world, and all the sanitary appliances that we know of in our houses and along our streets."

Without attempting to reply to the pregnant queries presented, it may not be without interest to the Association to have brought to its notice records selected from my note-books, covering the sanitary examination of fifty buildings in and about the city of New York; and, though these records are far from being as complete as desirable, they may throw a side light on a small area of the field suggested by Dr. Storrs's address, and point the moral that "our most carefully fitted and furnished homes" are rarely "equipped with every possible appliance for keeping out filth," if we include in that term the air from drain-pipes and sewers.

It is not the purpose of this paper to discuss the effect of drain air on the health of occupants of buildings, or to attempt to show a relation of cause and effect between defective plumbing and sickness in the household. The nature of the examinations has made it impracticable to obtain the sick-rate of the households with any precision worthy of careful comparison. In a few instances sickness has brought the call for test and examination, and a possible causation has been more than hinted at in the conditions found;—such cases, however, are too rare to furnish data for discussion.

My special purpose is to record the actual results of examinations covering a fair range of territory and differing considerably in character; and to emphasize the fact, that, though the principles of secure plumbing

have been known and preached for a number of years, the faults of many years ago remain our present inheritance, and are being reproduced to-day in much greater abundance than they should be.

The citation of New York houses as examples is peculiarly pertinent, in that the city has a well organized and capable board of health, with a special corps of trained plumbing inspectors appointed under civil service examination, and a strong code of plumbing regulations and unusual legal facilities for enforcing them. The city was also the first in the country to adopt plumbing regulations, and to demand the submission of plans and specifications covering new work contemplated. The board's control, however, extends practically only to new buildings and tenement-houses, unless its good offices are enlisted through solicitation or on complaint. In the year 1890, out of a total of 39,000 complaints coming to the board in this division from citizens and the Sanitary Police, about 3,000 referred to private dwellings and 9,000 to tenements; and from the total number of complaints for which there was cause, about 8,400 were put down to defective plumbing and drainage. Old plumbing may be altered, patched, repaired, or even completely torn out and remodelled, without necessary notification to the board. During the year ending December 31st, 1890, there were filed with the board in its division of Plumbing and Ventilation, 2,622 plumbing and ventilation plans, representing more than 3,300 buildings. The total number of inspections made in new houses during the year, with a force of fourteen inspectors, was 58,550—an average of something over thirteen inspections daily for each man on the force for every working day in the year. The total number of plans filed since the organization of the board in 1881, amounted last December to about 12,500. The total number of dwellings in the city in 1881, at the time the plumbing regulations were first passed, was about 76,000, so that not more than 13 per cent. of the present dwellings in the city have come under the control of the board of health.

Passing from the consideration of bad plumbing by inheritance to contemporary bad plumbing, be it remarked that 75 per cent. of all the new plans sent to the board of health for approval are returned to the architects or builders for correction or revision before they are accepted and permits issued. When we reflect that the requirements of the board are necessarily less stringent and detailed than those of sanitary engineers in private practice, we are forced to conclude that many architects are either deficient in their knowledge of correct plumbing practice and ill-informed as to what has been tried and found defective, or are indifferent to this important subject of their profession. The excellent work of a limited and competent minority perhaps only emphasizes the generalization. One of the best known members of the Guild, when confronted with defects in drains in one of his recent dwellings, remarked with surprised candor, "But I don't know anything about plumbing," and a subsequent examination of one of his beautiful houses brought convincing evidence that he had spoken the truth.

Without attempting at this time to outline the principles which should

govern in good plumbing practice, it is desirable to note that much of the cast-iron drain-pipe sold in the market is quite unfit for the use to which it is put. The grade of pipe known as "standard pipe," largely used in general work outside of the city, is too scant in metal to be secure. Tested in lengths of five feet, by filling the pipe with water, as many as thirteen sand and blow holes have been developed in the body of a single length of pipe, through which the water passed in drops or fine streams. The frequently urged argument that these holes will rust up is no excuse for the continued use of the pipe, and the city health board has long since prohibited its use. Lines of this pipe, passed by the plumber as completed and secure, have shown under water test, with but six feet head, that not one joint was sound.

"Extra heavy" pipe followed the use of "standard pipe," but tests in lengths of several thousands of feet have shown that fully 30 per cent. of this grade will develop leaks in the body of the pipe. Only "factory tested" or otherwise tested pipe of "extra heavy" grade should be used, and the quality of the plumber's workmanship should be controlled and checked by a thorough water pressure or air pressure test, extending over the entire system of drain and back ventilation-pipes after the work is completed. The board of health now require this test, and vertical columns over 185 feet high have been successfully subjected to the water pressure test without damage to the work. The importance of this final trial will be apparent when it is noted that in an ordinary dwelling there are from fifty to one hundred caulked joints which may be defective, and in large buildings the number of joints is not infrequently several hundred. In the New York *World* building twenty-six columns, measuring, with laterals, about a mile of pipe, were successfully tested at a single test.

There are two important points in the general design of plumbing work which are so frequently overlooked that special attention should be drawn to them. The first is the necessity of making vertical columns as far as possible free from offsets and bends, and providing them with a firm support at the base alone, pipe-hooks being used for alignment only. The columns are thus rendered in a measure independent of the shrinkage and settlement of the building, which not infrequently causes the opening of joints; cases are on record where hidden pipes have been pulled apart several inches by unequal settlement in walls and floors. If bends are unavoidable, care should be taken to avoid sharp elbows or turns in all pipes serving as ventilation-pipes for the drains, through which there is no flow or wash from fixtures or other sources. It may not be generally known, that the rust scale which forms in soil, waste, and ventilation-pipes, free from the wash of fixtures, drops into the pipes and accumulates in considerable quantities at bends lower down. An offset of two-inch pipe has been found completely choked for several inches with the rust which fell from ten feet of pipe above it. It was, of course, useless as a vent for the traps below, and had probably been so for several years.

Without departing further from the expressed intent of the present

paper, to offer the selected records of tests and examinations covering about fifty typical buildings in and about the city of New York, the following statement is submitted:

The values of properties given are approximate only, being in general based on the assessed valuation. It is of interest to note that their aggregate value amounts to $5,453,000.

It may be further observed that the record includes the dwellings and business places of lawyers, doctors, ministers, heads of educational institutions, merchants, bankers, and public officials,—representing in all a broad range of the intellectual classes in the community.

1. Country residence of a banker, value $60,000. A "masons' trap" drain in the cellar connected directly with the house drain, leading to a leaching cesspool. The overflow from the cistern led directly into the house drain. In times of continuous heavy rains the cellar was flooded with back flow from the cesspool. This occurred about once a year, and was thought to be due to sub-soil water.

2. City dwelling of banker, down town, just off Fifth avenue, value $36,000. Main drain of "standard pipe" newly laid, and pronounced finished by plumber; tested with light water pressure of six feet head, leaked in streams at every joint. The drain was under basement floor, and was to be buried in the ground.

3. City private hotel, up town, West Side, renovated just before test, value $60,000. Several bad joint leaks in vertical column in bath-rooms on bed-room floors. Leak at bed-room hand basin. Leak in dining-room. Two untrapped area drains. Exhaust drip from steam pump and engine directly into house drain. One or two cases of diphtheritic throats, more or less severe.

4. Country residence of retired merchant, value $40.000. Bad leak at W. C. floor joint in bath-room, adjoining bed-room, and at same point in guests' bath-room. Basin trap in first bath-room, siphons. No house traps, or vent on main drain. House drain discharges into tide water.

5. City dwelling, Lexington avenue, value $23,000. Plumbing, generally bad, taken out and entirely removed. Ventilation register in party wall of ladies' bed-room communicated—through defective vent flue—directly with ventilation register of bath-room in adjoining house.

6. City dwelling, Madison avenue, doctor's residence, value $65,000. Plumbing had been remodelled a year or more before test. An open end of a four-inch drain was found in the scullery under the dining-room. The scullery floor of flags had formerly been an open area with an area drain for rain water. An extension for the dining-room had been built over this, and the drain left without provision for supplying water to the trap, which had evaporated and left a free passage for the drain air. There was also a hole in a lead basin waste, in a dressing-room off the owner's bed-room, made by a nail driven through the lead pipe by the carpenters in putting down the floor. A child had died of diphtheria a short time before the test.

7. Mid-city dwelling, just off Fifth avenue, value $35,000. Bad leak

at floor joint in servants' closet, with free passage from this point to butler's pantry and dining-room above.

8. Mid-city dwelling, on East Side, value $18,000. Bad leak in earthen-ware drain under cellar floor; untrapped back cellar drain. Untrapped servants' closet in basement. Defective joint in soil-pipe.

9. Lexington avenue dwelling, value $20,000. Bad leak at servants' closet in basement. An untrapped rain-leader. The occupant, a doctor, had died from typhoid or malarial fever six months previous to test.

10. Mid-city dwelling, West Side, value $18,000. Leak in laundry tub waste in basement kitchen, free passage around pipe to dining-room above. Within the preceding year there had been scarlet-fever, gastritis tonsilitis, and two cases of typhoid fever, one malignant and fatal. Plumbing had been tested and renovated six months prior to test.

11. Home for children in country, value $10,000. Disused cistern under kitchen porch foul from discharge from defective drain receiving kitchen waste. An open joint in the soil-pipe, under first floor, in closet off dining-room. Cellar generally damp and wet, and flooded at times. Several cases of diphtheria among the children during preceding year.

12. Small country dwelling, value $5,000. Cellar wet and frequently flooded. Cesspool near house, with direct cistern overflow into house drain. Well twenty feet from cesspool, and thirty-five feet from yard privy. Family had suffered from malarial fever.

13. City office building, down town, two blocks from Wall street, value $80,000. Main drain through restaurant in basement. Two cement joints in drain untrapped; tin drip-pipe direct from drain to ice-box. Open two-inch joint. Restaurant flooded once or twice a year by high tides backing through floor drain to sewer. Restaurant ventilated through air shaft to roof, communicating with all floors above. Strong odors from restaurant perceptible in all floors above.

14. Mid-city dwelling, East Side, value $25,000. Old earthen-ware drain buried under cellar floor led directly under furnace, and communicated with its air-chamber. Defective joints under furnace. Smoke blown into soil-pipe at roof came out at every furnace register in the house.

15. Country dwelling, value $80,000. Defective joints in soil-pipe. One joint for about one inch had no lead whatever.

16. Suburban dwelling, value $19,000. Defective joints in drain-pipe under basement floor.

17. City dwelling of merchant up town, West Side, new district, value $40,000. Built about 1885. Defective joints in waste-pipe, back of furring between bed-rooms. Hole in lead basin waste between bed-rooms, made by nail driven into pipe by joiners in finishing. A two-inch trap ventilation-pipe between bed-rooms, left quite open by mistake of plumbers, and afterwards covered with joiner work. A waste-pipe led through air-chamber of furnace, but the joints were sound.

18. City dwelling of banker, on Murray Hill, value $40,000. The preceding year $2,000 had been spent in remodelling the plumbing.

Smoke blown into soil-pipe at roof came out at every furnace register in the house, also at soil-pipe of adjoining house. Main drain was found to connect through party wall with drain of adjoining house. Cellar party wall formed one side of air-chamber of furnace; defects in masonry of basement party wall allowed free passage of drain air from defective drain in adjoining house into air-chamber of furnace in house under test. Whenever furnace was in use, it was probably drawing part of its air-supply from the adjoining defective drain. Children were sick with diphtheritic throats.

19. Country residence of city banker, value $50,000. Defective floor joint in bath-room adjoining bed-room. Defective vent coupling in guests' bath-room. Defective joint in waste on first floor. Dead end of drain under basement floor imperfectly stopped with brick and cement. Several defective joints in drain under basement kitchen floor. Smoke blown into main soil-pipe at roof came out in basement hall, in basement kitchen, in butler's pantry, in front hall closet, guests' bath-room and bath-room adjoining owner's room. Serious case of typhoid fever in the house.

20. Mid-city dwelling, West Side, value $45,000. Smoke blown into main soil-pipe at roof came out at every hot-air register in the house. An old earthen-ware drain with defective joints led under air-chamber of furnace. A severe and tenacious case of diphtheritic throat in the house. Furnace doubtless drew part of its air-supply from the drain.

21. Mid-city dwelling just off Fifth avenue, value $30,000. Trap ventilation-pipe choked. Leak at servants' closet in basement.

22. Sixth avenue tenement and store, value $28,000. Broken drain in rear basement.

23. Down town dwelling, West Side, just off Fifth avenue, value $35,000. No trap on main drain. No traps on front and rear rain-leaders. No trap on back yard drain, within few feet of which was located cold-air supply to a furnace.

24. City church, school, and home, value $150,000. Earthen-ware drain under cellar floor. Defective joint at base of soil-pipe in cellar. Defective joint at junction of waste and earthen-ware drain in cellar. No trap on main house drain. A dry mason's trap, covered with loose flag, gave direct entrance to the cellar of very foul air from the street sewer. One or two cases of diphtheria among the children.

25. Mid-city dwelling just off Fifth avenue, value $30,000. Untrapped back yard drain and rear rain-leader.

26. Mid-city dwelling of banker, just off Fifth avenue, value $50,000. Defective joints in trap vent-pipe in fourth floor bed-room; in soil-pipe, centre of house, on third floor; in sink vent on third floor; in second floor bath-room, centre of house; at hand basin, centre of house between bed-rooms. Fresh-air inlet at street choked.

27. City dwelling, down town, West Side, value $15,000. Defective joint in soil-pipe in closet adjoining bed-room. Defective joint in bath-room. Soil-pipe trapped at base.

28. City dwelling, up town, West Side, value $20,000. Defective

joint at second floor closet. Waste from kitchen sink, buried under kitchen floor, was broken. Defective cover on main house trap. Main drain, buried under basement floor, was uncovered, and tested with water under five feet head. Drain leaked more or less at every joint. Broken hub on main drain.

29. Mid-city dwelling just off Fifth avenue, value $35,000. Defective joint in main drain in cellar. Leak in second floor bath-room. Defective joint in basin waste adjoining bed-room. Defective joint at servants' closet in basement. Untrapped back yard drain.

30. Mid-city private boarding-school, near Fifth avenue, value $53,000. Defective floor joints in bath-room in centre of house, and hole in lead waste.

31. Country dwelling, rector of parish, value $10,000. Defective joint in soil-pipe in kitchen. Leaking and open joint earthen-ware drains just outside of house wall. Masonry defective, offering free passage of air from drains into kitchen. Defective joint in soil-pipe in bath-room on second floor.

32. City dwelling, Madison avenue, value $30,000. Defective joint in fresh-air pipe in cellar vault. Untrapped back yard drain and rain-leader. Fresh-air inlet choked.

33. Mid-city dwelling, west of Fifth avenue, doctor's residence, value $38,000. Untrapped back yard drain, opening near cold-air inlet to furnace. Defective joints in drain buried under basement floor.

34. Mid-city dwelling near Fifth avenue, value $15,000. Untrapped back yard drain.

35. Large public building in city, value $150,000. Square brick sewer, 207 feet long, covered with open joint flags, in basement under corridor. Steam from radiator exhausts into drains. Numerous leaks in drains.

36. Country dwelling, value $10,000. Earthen-ware drain under cellar floor. Defective joint at base of soil-pipe in centre. Untrapped rain-leader. Butler's sink-trap siphoned by discharge of up-stairs fixture.

37. Large suburban boarding-school for boys, value $50,000. Untrapped area drain near kitchen door. Untrapped rain-leader opening near second floor windows. Open joint in basement drain. Defective joint under floor in kitchen pantry. Defective joint in disused laundry in basement. Defective joint in drain at base of an elevator shaft communicating with all floors above. Defective joint at base of column of soil-pipe. Defective joint in butler's pantry. Defective joint under floor in laundry. Defective joint in first floor bath-room. There had been serious sickness in the school the preceding term.

38. City dwelling, down town, West Side, value $20,000. Defective joint in main drain in cellar. Untrapped back yard drain. Damp cellar.

39. City dwelling, Stuyvesant square, value $25,000. Untrapped brick house drain buried under cellar floor. Air from street sewer blew back into cellar freely through defective covering.

40. City tenement, down town, on made ground, value $35,000. Defective joints in soil-pipe. Cellar flooded by high tides.

41. Mid-city dwelling, near Fifth avenue, value $30,000. Defective joints in drain in cellar. Untrapped rain-leader.

42. Mid-city dwelling, East Side, value $26,000. Untrapped rain-leader. Hole in lead waste from butler's sink. Untrapped back yard drain. Untrapped servants' closet in basement. Defective joint in main drain.

43. City dwelling, Madison avenue, up town, built within five years, value $50,000. A two-inch trap ventilation-pipe in butler's pantry had been left quite open by oversight of plumbers. Smoke from this leak followed pipe boxing to floors above, and escaped freely in nursery and adjoining bed-room on second floor. Defective joints on main drain in cellar. Defective rain-trap covers in cellar. Fresh-air inlet choked. Children in the house sick with diphtheritic throats.

44. Large public building in city, value $3,000,000. Four open ends of pipe where fixtures had been removed. Three rain-leaders used as soil-pipes. Many fixtures flushed directly from water-pipes. Defective joints in soil- and waste-pipes. It is of interest to note that there are 115 fixtures in the building, and 2,650 feet of drain-pipes, with over 800 joints. Many complaints from occupants of building.

45. Public office building in city, value $45,000. Defective joints in main drain in cellar. Untrapped overflow from house tank into soil-pipe. Untrapped back yard drain.

46. Suburban dwelling, value $18,000. Cistern overflowed directly into house drain without trap. Large unventilated grease-trap close to cold-air inlet to furnace.

47. Children's Home in country, value $6,000. Grease-trap, holding forty-one gallons, defective, and leaking into cistern.

48. City dwelling near Fifth avenue, value $30,000. Defective joint in servants' closet on basement floor. Trap ventilation-pipe choked.

49. Armory of N. Y. National Guards, value $200,000. Defective joints in soil-pipe. Basin-trap without seal.

50. Market building, value $450,000. Three lines of earthen-ware drains under basement floor. No trap on main drain. Open joint at connection of iron and earthen-ware drain. Open joints in iron drain. Cement and putty joints in iron drain. Holes in iron drains closed with wooden plugs and cement. Imperfectly connected and broken bell-trap drains. Untrapped sheet-iron drip-pipes from ice-boxes connected directly with drains. No soil- or waste-pipes ventilated to roof. Waste-pipes connected with untrapped rain-leaders with defective joints. Plumbing throughout very faulty.

In conclusion, attention may be drawn to the fact that the records given above note only the serious and flagrant defects and leaks disclosed by the test.

No mention has been made of faults in the general arrangement in the plumbing, of traps without ventilation, of fixtures in ill ventilated and

badly lighted positions, of antiquated and condemned forms of fixtures, and of other faults of greater or less importance, found in abundance.

A special effort has been made to avoid an over-critical and exacting professional standard. In fact, the proof of the defective condition of the work under test has, in general, been so apparent and convincing, that the presence of the owner during its application has been alone sufficient to cause an immediate demand for repair and correction.