Dangers to health in our own houses : a lecture delivered before the Leeds Philosophical and Literary Society, January 23rd, 1877 / by T. Pridgin Teale.

DANGERS

TO

HEALTH IN OUR OWN HOUSES.

A LECTURE

DELIVERED BEFORE THE LEEDS PHILOSOPHICAL AND LITERARY SOCIETY, JANUARY 23RD, 1877,

BY

T. PRIDGIN TEALE, M.A.,

SURGEON TO THE GENERAL INFIRMARY AT LEEDS.

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"Quam quæ sunt oculis subjecta fidelibus, et quæ
"Ipse sibi tradit spectator." *Hor. ars. Poet.*

"Things by the ear received, men's minds excite
"Much less than when submitted to the sight;
"For the spectator with his trusty eyes,
"To his own mind impressions best applies."

Translation by ANDREW WOOD, M.D.

PRICE ONE SHILLING.

LONDON:
J. & J. CHURCHILL, NEW BURLINGTON STREET.

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ENTERED AT STATIONERS' HALL.

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DANGERS TO HEALTH

IN OUR OWN HOUSES.

During the last two or three years there has been throughout the country, and not least in Leeds, a great advance towards the appreciation of the fact that a very large proportion of illness—even of fatal illness—is produced by causes which can be prevented and removed; nay, more, that the most telling sources of illness exist in our homes. "Preventive medicine" has long been proclaiming these facts, and long have we turned a deaf ear, and we of the medical profession in general are only just beginning to see the great reality of her teaching.

If any one challenges this assertion in reference to my own profession, I will reply by the inquiry—How many medical men can he tell me of who understand the sanitary condition of *their own house*, or have adequately ascertained that those conditions are, as far as our knowledge at present goes, free from dangers to health? If by any possibility it could be brought about that every medical man in the kingdom should realise the necessity for looking into the state of his own house, and act upon that conviction, I feel certain that the discovery would be made in so great a proportion of instances that they were living over pent-up pestilence that we should at once have an army of sanitarians earnest and keen to ferret out unsuspected sources of illness. I take it that not a little of the lively interest recently aroused in Leeds in sanitary work may be traced to the fact that many of the medical men of this town have recently gone into the question of the sanitation of their houses, and have thereby become more keenly alive to possible sources of illness among their patients.

My aim in giving this lecture to a non-medical audience is this —to endeavour, as best I may, to convince my hearers, and through them to spread the conviction still further—Firstly, *that it is the duty of every householder to ascertain for himself whether his own house be free or not from well-known dangers to health;* secondly, that such dangers are real, are at our own doors, and are extensively prevalent.

At present the state of affairs is generally this :—A house is taken, or has long been inhabited, and the state of the drains, traps, and overflow pipes is taken for granted, or never questioned, until at last illness breaks out and the medical attendant reads in the illness the influence of defective drains and sewer gas. Then *and not till then*, an investigation is made, gross flaws are discovered, and the defects are made good. In other words, the health of the family is accepted and relied upon as the test of drain soundness, illness and death are made the drain detectives, ministers, indeed, most wasteful, most extravagant, often most lamentable.

I have no hesitation in expressing my conviction, a conviction based upon observation during the last year and a half, that there is hardly a house the sanitary arrangements of which have not been reviewed within the last four or five years by persons acquainted with recent advances in sanitary knowledge which can be relied upon for safety.

There are still, no doubt, architects, builders, town councillors, aye, even medical men, who look upon those who urge such sanitary revision of houses as hobby-riders and enthusiasts. I trust, however, that, after hearing the facts which have come to my own personal knowledge or have been communicated to me by persons immediately concerned, you will think over and study these matters for yourselves, and will aid in forming such a body of intelligent public opinion, that, in a future not far distant, the Government may bring forward, and the country may support sanitary legislation equal to the great work with which it will have to cope.

It may be taken for granted, that sanitary science has established two things—*Firstly*, that when drinking-water is contaminated by sewage, those who drink the water are in danger of suffering from typhoid fever, diphtheria, and other febrile ailments classed together under the term "zymotic;" *secondly*, that when gas from sewers, or from leaking drains, make its way into a house, the inmates are in imminent danger of an outbreak of such zymotic diseases, not to speak of minor illness, the connection of which with sewer gas is now more than suspected. Nay more: how often has the medical attendant been blamed for the fatal result of a slight operation, or a puerperal illness, where the true cause of the calamity has been an atmosphere charged with sewer gas.

The dangers of contamination of drinking-water by sewage, and the communication of typhoid fever thereby, have been so often proved and worked out, and have been so well ventilated by the press, that the public is fairly informed and convinced of these dangers. But the insidious dangers from sewer gas, *especially in well-sewered towns*, have only recently arrested public attention in a manner which is likely to bring about a just appreciation of the importance of this subject.

The following is the plan I have proposed to myself to follow in this lecture:—

Firstly, to shew you a series of diagrams drawn, not as pictures, but as forcible expressions of the facts they are intended to set forth.

Secondly, to relate a series of sanitary defects which have been discovered in property with which I am more or less directly concerned within the short period of a year or two during which I have become sensible of my responsibility in these matters.

Thirdly, to relate a series of instances in which illness and sanitary defects have co-existed.

Fourthly, to relate other sanitary defects and bad work described to me by persons immediately concerned with the property in which they were found.

Fifthly, to give extracts from the press which shew how rapidly public appreciation of the subject is spreading, and which express what I feel on these subjects in more forcible language than I can command.

THE DIAGRAMS.

Many of my hearers, no doubt, have read over and over again in the public journals of illness and bad drainage, have heard about it and read about it, yet, if asked whether their own drains were right, would say, "I believe so," "my landlord declared they were so,' and "besides I don't know how to set about finding out for myself."

To such, I say, follow me as I explain this diagram (No. I.), which is intended to shew, in one house, most of the common defects in the arrangements of water pipes and soil pipes, whereby sewer-gas gains entrance into our houses. In the next diagram (No. II.) the same house conveniences are shewn with these defects *avoided*. And here let me guard myself against misconception. Being neither an architect, a sanitary engineer, nor an officer of health, I do not profess to say what are the *best* ways in which these evils may be avoided, but I wish, as a *house-holder* and *house-owner* to put before you facts upon which every *tenant* and every *landlord* ought to *inform himself*, and, as a *medical man*, to declare to you how frequently within the experience of myself and my immediate medical friends, *illness and death have been found associated with gross sanitary faults.*

DEFECTS IN PROPERTY FOR WHICH I AM RESPONSIBLE AS OWNER OR TRUSTEE.

I.

Water-closet in the middle of the house (Plate I., A) with a leaden soil pipe, jointed and seamed and patched up, with the

wall of the kitchen stained by numerous leakages. The waste pipe from the bath passed untrapped into the soil pipe (Plate I.,C).

II.

A sink pipe in the cellar kitchen passing untrapped into the drain; the bell trap having been lost two or three years. This state of the sink was in existence two years ago when the tenant lost two children from scarlet fever.

The closet to this house was out of order. The drain connecting the soil pipe with the main drain being blocked up for several feet, in consequence of the scamping of the drain work. A six-inch pipe being inserted between two four-inch pipes (Plate III., a).

III.

Sink untrapped.

Fall pipe from the front of the house carried through the basement of the house to an untrapped drain at the back, the said fall pipe leaking at every joint, so that in wet weather cans had to be placed to catch the water as it escaped from the open joints. The waste-pipe from a bath near the bedrooms passed untrapped into this fall pipe.

A lady visiting this house suffered from erysipelas of the face. This illness at once suggested to me defective drains, and led to the discovery of these faults.

IV.

First Partial Investigation.

a. Sink pipe in butler's pantry untrapped (Plate I., C).

b. Lead sink in bath-room untrapped.

Second Investigation.

c. Scullery sink and waste-pipe (Plate I., C) passing untrapped direct into the drain.

d. Dish stone in the scullery opening directly into a rain water tank, which had an untrapped overflow into the drain (Plate VI., GA).

e. Kitchen sink pipe passing untrapped into the soil pipe of a water-closet, thus acting as a ventilator (Plate I., C).

f. At the opposite end of the house a second w.c., rarely used, and, therefore, at times, untrapped from evaporation of the water. The soil pipe of this w.c. passed down the inner wall of the next house, to reach the drain which ran under the kitchen floor of the said house (Plate I., A). The soil pipe, an old leaden one, was rotten, breaking down like short cake. This pipe leaked into the kitchen wall, which was black with moisture. The floor also was "black wet" with escape of sewage matter, which rendered the kitchen offensive.

V.

a. Defective connection of gully with a drain (Plate III., b, E).

b. Drain from w.c. passing under kitchen floor, receiving pipe from kitchen sink. Where this pipe joined the drain their was a hole in the cement large enough to admit the hand (Plate V., B).

c. A dish stone in the scullery passing direct into the drain (Plate VI., G).

d. An open pipe in the kitchen untrapped, by which the hot water cistern might be emptied into the drain.

VI.

a. When a scullery was turned into an office, the stone floor was replaced by a wooden floor, and the sink was removed. The sink pipe was cut off and left open to the drain, and concealed beneath the wooden floor. A constant drain smell being complained of by the tenant, investigations were made and the fault was detected and remedied (Plate IV., B).

b. An old well, 18 feet deep, partly under the house, had become offensive. It was discovered that within 3 feet of its surface, the drain pipe from a water closet was broken at the flange, and allowed liquid to flow out and soak into the well.

INSTANCES IN WHICH ILLNESS AND SANITARY DEFECTS CO-EXISTED.

Case I.

Four children were taken ill on the same night—three recovered in a short time—a fourth was dangerously ill in diphtheria, and had a tedious recovery. At the end of a fortnight a fifth child began in diphtheria, and died.

Previously to this outbreak the owner of the house had discovered serious defects in the drainage, and had made his plans for setting them right.

The following defects existed:

a. Main drain, brick with flag covers, open in many places, running under the kitchens (Plate VI., K).

b. Inlets into drain, covered by a loose flag, intended for connecting branches but not used, consequently never made good (VI., B).

c. The soil furrowed by *rats*, from the drain to the under surface of the kitchen floor, allowing free escape of gases from the drain to the floor. (Plate V.)

d. Only one *ventilating shaft* (recently inserted) of $1\frac{1}{2}$-inch diameter, to relieve the sewer gas pressure of a block of 8 houses, each with two water closets.

e. A soft-water tank under the kitchen floor in a foul state, with overflow pipe connected to main drain without any trap, thus allowing gas to escape under the floor. (VI., A.)

f. A fall pipe direct into drain, opening below the level of the bedroom window (VI., F).

Case II.

In this house about four years ago, a gentleman was seized with typhoid fever and died.

The faults now discovered were—

a. Under the kitchen floor, which on account of dampness was examined, it was found that the entire ground was saturated with

sewage from an adjoining privy—into which also the slops of the house were poured—to the depth of 2 feet (Plate VI., D.)

b. One *water-closet*, with the trap too shallow, and therefore in reality not trapped at all (VI., C).

c. A second *water-closet* with a 1-inch pipe soldered into the trap and not connected, but left as a direct communication with the soil pipe (VI., M).

Case III.

This case was related to me by a medical friend, as an illustration of the obstinate refusal of a landlord to see to his own drains, even where his own safety was involved.

My friend writes, after stating that this gentleman died of typhoid fever: "Typhoid fever was suspected from the first, as the "patient, the owner of the house, had frequently been cautioned by "myself about the condition of his drains, and advised to have "them examined. I had very frequently in my visits to the house "noticed an odour of sewage gas in the hall; but in spite of my "repeated solicitations I could not induce him to do what was "necessary."

After this gentleman's death the drains were examined, and the following conditions were revealed:

a. Water-closet drain, passing under the kitchen floor about 1 foot from the surface, constructed of unluted pipes leaking at every joint, so that the soil was saturated with sewage (Plate I., B).

b. Soil pipes unventilated (I., H).

c. Drains unventilated.

d. Drains untrapped.

He concludes his letter: "The drainage is now perfect. The "sewage odour in the hall has entirely disappeared, with great "benefit to the occupiers of the house as far as health is concerned, "and much to my satisfaction. This gentleman used to sit in his "kitchen smoking from 10 till 12 or 1 every night."

Case IV.

A little girl was attacked by diphtheria and died. Several other children fell ill one by one, and recovered. The mother was twice attacked, and recovered only a few days before her confinement. The diphtheria was confined to this house, and there was none in the neighbourhood.

The following conditions explained the outbreak :

a. About ten days before the outbreak, the kitchen sink became stopped up, and men were employed to open the drain in the yard, and to remove a mass of decomposing filth, most offensive. The elder children *stood about the drain watching the process.*

b. The whole family had lived and slept for months in a *tainted atmosphere*, as a bath and lavatory, with waste pipes passing untrapped into the drain, were placed in a closet without any opening whatever to the outer air (Plate I., C).

Case V.

TYPHOID FEVER IN NEW HOUSES.

A family of six occupy No. 46 as soon as finished, and shortly find that, after rain, clear water rises through the cellar floor. This had no offensive odour at first; but as it dried produced a sickening smell. At the end of a few weeks the mother and two children were ill in typhoid fever, and shortly afterwards the husband was seized also.

The tenants of No. 50, a family of seven, entered the house about the time of the illness in No. 46, and almost immediately two were seized with typhoid fever and one died.

The tenants of No. 48 escaped.

The following conditions were discovered:—the drain from 50 and 48 (Plate IX., A) emptied into the drain from 46, and this terminated 18 inches from the house forming a cesspool in the soil

(C). This collection was discovered when the sewer (B) was made in the main street, and the branch drain was made to catch the drain from the houses. The main drain of ——— Street *was not made until after the building of these houses*, so that they could not have been connected with the town sewer at first.

Case VI.

This instance of illness in a new house is described in the following letter published in the *Lancet* of August 12th, 1876:—

"HOUSE DRAINS AND ILL-HEALTH."

Sir,—In an article on house-drains in your journal of July 29th you call attention to a hiatus in sanitary legislation which renders a very large portion of the sanitary work of an urban health authority mere waste paper, and the implied security a delusion and a snare.

You suggest "that, in addition to the proposal (of the Society of Arts) to submit the plans of house-drains and connexions to the local authority, power should be given to the authorities to appoint an inspector to see that all such sanitary work was properly carried out."

In confirmation of the opinion expressed, and in illustration of the pressing want you have pointed out, may I relate a sanitary exposure which has recently come before my notice?

A lady took on lease a newly-built semi-detached house in Leeds, rent £80. The house had been inspected by a land surveyor, had been found to be dry, and had been passed as satisfactory. In a few weeks the cellar and kitchen walls became wet, and the house was pervaded by a smell of drains, and in four months seven out of a family of nine were ill with febrile attacks, high temperature, sore throat, swollen cervical glands, and enlarged tonsils. The two maid servants were each laid up twice in a short period.

The illness suggested defective drains, and, under the pressure of the medical attendant, the following defects were discovered, much to the annoyance of the landlord:—

Defect No. 1.—The main drain, nine-inch tubes, was laid immediately against the outer wall of the house, and 12 inches above the level of the kitchen floor (Plate VII., B).

Defect No. 2.—These drain pipes had no fall, the joints were not made good, and the sewage freely escaped into the ground, saturating the kitchen wall and the soil under the kitchen floor, and filling an old drain (Plate VII., C).

Defect No. 3.—The branch drains for sinks and water-closets were built into the wall, and the lead delivery-pipes were simply turned into these drain-pipes, without any attempt whatever at connexion having been made (Plate V., B). In two instances an inch-and-a-half pipe was turned into a six-inch pipe, thereby allowing ample space for the untrapped sewer gas to escape into the house.

Defect No. 4.—The overflow pipe from a cistern, and the waste-pipe from a lavatory, were connected to an untrapped, unventilated soil-pipe, and through these untrapped pipes the sewer gas was literally blowing into the house (Plate I., CD).

Every one of these sanitary defects is in direct violation of the building bye-laws of Leeds. The plans of every new building or of any alteration of an old building have to comply with the bye-laws, and are passed, after careful inspection, by the surveying authority. And what next? Dishonest speculators, dishonest builders, dishonest contractors may scamp every sanitary requirement, as no effective machinery is provided to secure that these requirements ever reach any stage beyond the paper on which they were drawn. Houses are built, and let, and sold, for what the speculators can get out of them, and in nine cases out of ten the sanitary flaws are not discovered until they have worked their natural results in the illness, or perhaps the death, of the unfortunate tenants.

Scamped drain-work is one of the most dangerous, one of the most common, and one of the most difficult to detect of the sanitary flaws of new buildings, and is rarely found out except by the illness it produces.

We must not rest content until it shall be compulsory on every sanitary authority to provide that the laying of every drain shall be watched from beginning to end by a competent inspector, who has the independence, the courage, and the honesty to compel, in every case, sound, reliable workmanship.

I am, Sir, yours faithfully,

T. Pridgin Teale.

Leeds, August 3rd, 1876.

Case VII.

Death from erysipelas after a slight operation—case of typhoid fever in the house within a year—unhealthy farm surroundings of the house.

Case VIII.

A lady living in a large country house remained ill, and feverish for many weeks, and seemed unable to reach convalescence.

Her protracted illness led to a review of the drains of the house, and to the discovery of the following defects:

a. A cistern in the roof with a 6-inch overflow pipe passing direct into the drain untrapped. (I., D.)

b. Unventilated water closets.

c. Soft water tanks, all with overflow passing untrapped into the drains.

d. Cistern for soft water used for culinary purposes, through the centre of which a seamed soil pipe from a water closet passed.

e. Main drain partly under the house, and with no trap to cut off the gas from half-a-mile of outside drain.

Case IX.

A family in a new house "never had the doctor out of the house." At last the drainage was examined, and it was found that all the sewage passed under the house, the delivery pipe not joining the drain pipe. (VIII., B.)

Case X.

The wife of a medical man nearly died of puerperal fever after a confinement four years ago. A similar event being again in prospect her husband very wisely had the sanitary condition of the house enquired into which led to the discovery of the following sources of danger:

a. *Lavatory* in the dressing room next to his bedroom with a waste pipe passing *untrapped* direct into the drain. (I., C.)

b. A *fall pipe* also passing into a drain opening directly under his bedroom window. (VI., F.)

c. In a passage leading from the kitchen a *dish stone untrapped* passing to the drain. (VI., G.)

d. *Sinks untrapped.* (I., C.)

e. Within 15 feet of the kitchen and *in the house*, a privy, with a midden which received slops and everything, and was emptied once in 6 weeks.

All was immediately set right and the lady recovered without a drawback.

Case XI.

A gentleman entered upon the occupation of one of our Yorkshire country houses in succession to a gentleman whose wife had died at the house of scarlet fever.

As the new tenant's family were always ailing with sore throats, &c., he consulted an architect who discovered the following faults:

a. A cesspool within 3 or 4 yards of the well supplying the drinking-water the drains passing to and carrying the overflow

from the cesspool, being merely sides of brick laid upon the soil, with no foundation.

b. Not a single waste pipe trapped in the house.

Case XII.

A gentleman consulted me about an inflamed finger which was threatening to spread up the arm as erysipelas.

I immediately requested an enquiry into the sanitary condition of the house, and these defects were found :

a. Near his bedroom was a bathroom with a drip pan passing untrapped into the drain. (I., C.)

b. Near his bedroom an unventilated water-closet. (I., A.)

c. In the wash-house, under his bedroom, an untrapped sink, and a rain-water cistern with a 4-inch overflow pipe untrapped. (I., D.)

Case XIII.

A gentleman requested a medical man to see his son just returned from school. For three or four days it was doubted whether the case would prove to be typhoid. On hearing that two other boys from the same school were ill, the father wrote to the school to make enquiries. The reply was that two-thirds of the boys were ill at home, that the two ladies who kept the school were ill in Switzerland, and that two servants were dangerously ill in typhoid fever. One of these, who was nursed for some time in the same house and atmosphere, died.

On examination, a disused drain which communicated with the external drainage was found under the play-room, and was supposed to be the cause of the illness.

Case XIV.

Mr. A. tells me that his house, situated 450 yards from the high road, was originally drained by nine-inch pipes into a pond a little

beyond the high road. Early in 1876 the district was sewered, and the drain was cut off from the pond and connected with the main sewer. In July, 1876, a maid and servant lad were seized with typhoid; the maid died and the lad recovered.

After the death the drains were examined and it was found (*a*) that waste pipes from the kitchen, washhouse, pantry, and a lavatory, passed untrapped into the drains, with the scanty protection of a bell trap. (*b*) That the connexion of the drain with the new sewer was so defective that the drain was blocked up at the junction, a nine-inch pipe having been inserted into an 18-inch pipe without any proper junction.

Case XV.

SANITARY DEFECTS AND BAD WORK IN THE LEEDS GENERAL INFIRMARY.

In the Spring of 1876, in consequence of the great prevalence of *febrile attacks accompanied by sore throat* amongst the domestics and nurses, a sanitary inspection of the Hospital was made, when the following defects, *amongst many others*, were discovered.

a. In the medical officers' water-closets, which are placed in a corridor near to the bedrooms, a defective joint was found under the floor, allowing the liquid soil to flow out and saturate the soil. An overflow pipe of cistern passing untrapped into the drain.

b. Close to a small accident ward a fall pipe, missing the soil pipe of a water-closet, pours the water into the foundations, the open soil pipe allowing the escape of sewer gas into the w.c. Overflow of cistern direct into the drain.

c. Kitchen Sinks. Waste pipes carried into a large receiver under the four large coppers, where the refuse was kept in a continual ferment by the heat of the coppers. When this was emptied, probably for the first time for 18 months, the stench was intolerable.

d. Water grates in raw meat larder, cold meat larder, and dairy, were all imperfectly trapped, or not trapped at all.

The prevailing illness in the hospital did not affect the patients in the wards; the construction of the wards rendering them comparatively untainted by the defective drain work.

CONCLUSION.

Let me now venture to make a few suggestions for the consideration of those who may for the first time be directing their thoughts to this subject.

1.—Be not content until you have *seen* that every waste pipe and overflow pipe is cut off from the access of sewer gas, that the soil pipe of your water-closet is sound and adequately ventilated, and that there is no leakage at its junction with the drain.

2.—If there is a smell of drains in your house, or a damp place in a wall near which a waste pipe or a soil pipe runs, or a damp place in the cellar or kitchen floor near a drain or a tank let no time be lost in laying bare the pipes or drains until the fault be detected.

3.—If you are tenants, and your landlord refuses to remedy the evil, *do it at your own cost rather than allow your family to be ill.*

4.—If you are about to buy or to rent a house, be it new, or be it old, take care *before you complete your bargain* to ascertain the soundness of its sanitary arrangements with no less care and anxiety than you would exercise in testing the soundness of a horse before you purchase it.

5.—If you are building a house, or if you can achieve it in an old one, let *no drain be under* any part of your house, *disconnect* all waste pipes and overflow pipes from the drains, and place the soil pipe of the w.c. *outside* the house, and ventilate it.

6.—If, having bought a house with bad drainage, it costs you £100 more than you expected to put it right, so much the worse for your bargain.

7.—If you are a tenant, and your investigation compels the landlord to spend a large sum in rendering the house free from sanitary

dangers, you may fairly pay a higher rent for the greater safety, and for the greater immunity from illness and all the expenses it entails.

8.—A landlord may reasonably look for interest on money which he spends for the benefit of his tenant; but he is committing little short of manslaughter if, by refusing to rectify sanitary defects in his property, *he saves his own pocket at the expense of the health and lives of his tenants.*

9.—Many a man who would be aghast at the idea of putting small quantities of arsenic into every sack of flour, and so by degrees killing himself and family, does not hesitate to allow sewer gas to poison the inmates of his house, even in the face of the strongest remonstrances of his medical adviser.

10.—If a rat appears through the floor of your kitchen or cellar, feel sure that something is wrong with the drain.

11.—When you leave a house because of its unhealthiness, don't let others go into it unwarned, or at any rate let the landlord know the reason of your leaving, and throw upon him the responsibility of the health of the future tenant.

12.—If you be a landlord, don't intimidate your tenants or threaten to give them notice to quit if they complain of defective drainage or sewer gas in the house. I just touch on this point and say no more, but it is a caution which, I believe, is needed.

13.—If any one should be spurred up to the investigation of the sanitary condition of his own house, let me urge him to go round with the person whom he consults and see for himself every pipe and trap, and if possible every drain investigated, and let him not shrink from the man-hole in the roof. It will be a valuable lesson, and may help him to detect faults on a future occasion, or perhaps in a friend's house.

14.—When illness of a zymotic type breaks out in a house from poison within the house, what ought to be done? Theoretically, no doubt, the patient ought to be removed, so as to secure an untainted atmosphere. Practically this is often out of the question. What is the next best thing to do? To make the atmosphere of the room independent of the atmosphere of the house, acting on

the principles so ably advocated and forced upon the attention of the country by Mr. Tobin. This may readily be done as a temporary measure, by opening the bottom sash of the window just to the extent which allows the flame of a candle held at the key-hole to burn steadily. In other words, admit through the window just the amount of air that will feed the chimney without drawing upon the air of the house. The next step is to convert this horizontal current into a vertical one, by fixing a board six or eight inches in height against the lower part of the window, and one and a half or two inches distant from it. Then the current will set upwards towards the ceiling, and slowly diffuse itself without producing a draught.

The same idea was suggested in the year 1862, by Mr. F. Hinkes Bird, F.R.C.S., in a paper in the *Builder*, on "Costless Ventilation," which contains most valuable hints.

The more thoroughly that householders will study and look into the sanitary arrangements of their own houses, the greater obligation will be laid upon architects, for their own credit, to see that honest sanitary work is done in the houses they design and supervise, and to cast as critical an eye on the laying of a drain pipe as they would on the fixing of the keystone of an arch; the greater inducement will there be for honest builders to devote their best work and *best workmen* to the construction of the drains; the more easy will it be for our Sanitary Committee and Medical Officer of Health to enforce wholesome regulations which have often been treated hitherto as a dead letter; the more difficult will it become for defective, scamped, disgraceful workmanship to escape detection; for speculating builders to do, as I am told is now being done in Leeds, viz., to build houses on reeking foundations, the accumulation of recently-emptied ashpits, to make their mortar of road scrapings, with all their animal refuse—to use for lining of houses bricks recovered from cottages and courts which have been pulled down on account of their unfitness for human habitation; to set at defiance every rule of the sanitary authority of our town.

POSTSCRIPT ADDRESSED TO THE WORKING MEN AT A MEETING IN THE PEOPLE'S HALL, HOLBECK.

When, at the conclusion of my Lecture at the Leeds Philosophical and Literary Society, a request was made to me to repeat the Lecture to a meeting of working men, I not only consented, but gladly availed myself of the opportunity, feeling that I should address you in a double capacity,—*firstly*, as house occupiers whom I am anxious to rouse to a higher sense of their duty as to the health of *their own family*, as far as it depends upon a healthy condition of the house they occupy,—*secondly*, as men, some of whom are employed to execute this work on which our very health and lives depend. I wish to make you feel that when "preventable disease" arises in your houses, (typhoid fever, diphtheria, scarlet fever, &c.,) *somebody is to blame for it*, and to inspire you with a determination to fix the blame on the proper person. That person may be yourself, who never looked into the sanitary arrangements of your house, may be your landlord who refused when warned to set wrong things right, may be the contractor who scamped the work, may be the workman who idly, carelessly, laid the work, may be our town authorities who allowed the house to be occupied with the faults undetected. When disease arises which we call "preventable," depend upon it some one ought to have prevented it.

I have shown you work defective from *ignorance*, and work defective from *dishonesty*. Probably no work done throughout the kingdom is so badly done as work in houses and drains, and pipes which is out of sight. Probably no work is better done in the kingdom than the locomotives turned out for our railways, or the machinery which we send to all parts of the world. Are the working men less honest in the one case than in the other? I trow not. The difference is this: Necessity in the one case compels good work; indifference and ignorance in the other case allows bad work to pass unchallenged. If the

platelayer were so to fix his rails that they would not correspond, and the next engine were thrown off the line, and death were the result, an inquest would be held, and that platelayer would be committed for manslaughter. Is there any great difference in the case where one drain pipe, by missing another, ends in nothing, and in a few weeks, is the cause of death from typhoid fever? The excuse at present is that the drain layer does not know how certainly he is laying the foundation of illness and death. Disperse that ignorance, and the excuse will be gone. If the tire of the locomotive breaks, and throws a train off the line, the railway company goes to the maker of the engine, the maker of the engine to the maker of the tire, the maker of the tire to his books, and there learns the name of each foreman, and, I believe, of each workman, through whose hand the tire has passed. Why can we not achieve the same connected responsibility about our drains?

APPENDIX.

HEALTH AND SEWAGE OF TOWNS.

TO THE EDITOR OF *THE TIMES*.

Sir,—In the general interests of public health the Council of the Society of Arts appeal to the inhabitants of the metropolitan districts and to the public generally to send to the Society evidence of cases showing the various evils which have occurred from the present imperfect system of the drainage of houses. At the Conference on the Health and Sewage of Towns lately held by the Society, and attended by numerous representatives from various towns and localities in the kingdom, the importance of greater attention to the house drainage as distinct from the sewerage was especially brought before the notice of the Society.

It was pointed out that, however good the general sewerage might be, unless the drainage proper of the house and its connexions with the sewers were carefully planned, executed under due supervision, and maintained in proper order, there was imminent danger of typhoid and other diseases from the imperfect exclusion of sewer gas.

* * * * * * *

Under these circumstances the Council invite communications both as to cases of evil arising under the present state of things in the metropolis and in the country generally, as well as any suggestions for remedy, and they will be glad to receive such communications before the 20th of October next.

I am, &c.,

P. LE NEVE FOSTER, Secretary

Society of Arts, Adelphi, Sept, 20th.

FROM *THE TIMES*, SEPT. 22nd, 1876.

A letter we published yesterday, from the Secretary to the Society of Arts, calls attention to a very important, though comparitively neglected question in relation to public health. We have expended enormous sums of money of late years on the efficient drainage of towns, and the proper construction of public sewers, and, no doubt, our efforts have resulted in incalculable benefit to the community at large. But while we have been directing all our energies to the task of carrying off the refuse matter which reaches our sewers, and disposing of it in a harmless, if not in a profitable, manner, we have as yet taken little thought of the means whereby the matters we want to get rid of are to be conveyed innocuously from our houses to the sewers. It is much easier to reform town drains than house drains; the former are made to be got at easily, and at the worst can always be reached at the cost of a temporary suspension of traffic. But house drains, especially in old houses, are to be found no one knows where, and even in new houses the perversity or ignorance of builders often places them where they are practically inaccessible. Out of sight, out of mind, is too often the easy-going maxim of builder and tenant alike, and it is frequently not till another sense is forcibly called to take cognizance of what the sight has neglected that the householder finds, to his cost, that the drains are out of order. Few builders can be trusted to make the connexions between the house drains and the public sewers satisfactorily, and, unfortunately, it is a matter which most architects seem to think beneath their notice. But even if that particular matter has been thoroughly attended to, the danger is by no means at an end. All house drains need to be ventilated, and, wherever it is possible, their connexion with the external sewer should be broken by a simple expedient, known to all builders, but, unhappily, adopted until quite recently by few or none. Thus in too many cases the improvement in public sewers has as yet been a bane as well as a benefit, because it has not been accompanied by corresponding attention to sanitary precautions within the house.

It cannot be too strongly insisted on that the universal extension of a general and public system of drainage in large towns calls more imperatively than ever for vigilant attention to domestic sanitary arrangements.

Formerly, when every house more or less disposed of its own drainage, though matters were bad enough, yet the extent of the mischief could generally be measured. Now, however, each house, unless specially protected, is exposed to the attacks of the sewage of the whole town, and yet, as a rule, no greater precautions are taken than heretofore to keep the enemy at bay. The evils to which the unwary householder is exposed are neither few nor easy to guard against. If his house is an old one, drains are hidden away in a manner which conclusively proves that malice is no match in ingenuity for ignorance. Some of them are sure to be found with all connexions closed save that which furnishes them with a constant supply of noisome and fetid matter. Sometimes the outlet of the old cesspool is closed when the house is connected with the public sewers, but the builder has carelessly left open to the house all the old drains which formerly fed the cesspool; or the new drain is laid with a broken pipe or a defective joint, and fills the house with stench and poison. Indeed, where a house has exchanged the old system of drainage for the new, it needs an almost superhuman vigilance to guard against the various and subtle sources of future mischief; yet the task is generally left to a careless builder and to blundering workmen. In a new house the dangers are not, perhaps, so numerous nor so difficult of detection, but they are real and serious enough. The great object of builders seems to be to get the drainage out of the house in as closely-sealed channels as possible. This is a good thing with proper precautions, but they forget or refuse to acknowledge that where water can pass gas can pass too, and that while the natural flow of water is downwards, that of this particular gas is upwards. Consequently, the drains, unless ventilated as well as trapped, are so many channels whereby sewer gas is laid on to the interior of the house. Now, sewer gas has a very bad character, and for all we know its character may be worse than it deserves; that, however, is not a question for us, and the connexion of sewer gas with specific disease we are content to leave to professional experts. At any rate, all will admit that sewer gas is a very unpleasant companion in a house, more especially when a good deal of money has been paid to keep it out. Yet, with all our efforts at sanitary improvements, there are still very few houses in towns where it is not at least an occasional visitor. Builders will insist on the efficacy of water traps and cemented pipes,

and, no doubt, such expedients are good so far as they go. But, of course, gas will pass through water under sufficient pressure, and, not to speak of the pressure which the unaided gas often exerts on the outside of the trap, it is often powerfully aided from within by the difference of temperature which exists between the house and the external drains. In fact, we not only lay on the gas from the large reservoirs we have constructed in every street, but we often turn our houses into ingenious pumps to suck it in. The remedy for this is not only to trap all drains, but to ventilate them as well. If from below the trap a pipe rises to a convenient distance in the open air, the gas is forced through it whenever the pressure becomes excessive, and the trap, relieved from this pressure, becomes a protection, and not a snare. This remedy is as simple as it is effective; yet it would be interesting to know the percentage of houses in any large town whose most noxious drain pipes are ventilated as well as trapped. Another frequent source of mischief is to be found in the arrangement of cisterns. Frequently the drinking supply of the house is furnished from the cistern which also supplies the water-closet, and, what is still worse, the waste pipe of the cistern is often conducted entirely without trapping into the nearest drain. We need not dwell on the consequences; they are unsavoury enough, even if they are not, as most sanitary authorities are agreed that they are, positively dangerous.

These are a few of the defects of domestic sanitary arrangements. We do not mean to say that they are universal, but they are at least so frequent that few householders find themselves free of them without much personal effort and worry. They spring from the fact that in old houses we have a system on hand which is obsolete, but extremely difficult to get rid of; while as to new houses, few architects or builders will give themselves the trouble to understand the subject, or intelligently to carry out the really very simple measures that are necessary to avert the evil. We wish Mr. Le Neve Foster and the Society of Arts all success in their benevolent endeavours to remedy a state of things of which all must acknowledge the evil and many feel the inconvenience. It is obvious, however, as Mr. Foster seems to acknowledge, that the matter is one rather for private effort than for public legislation. Even the submission of plans for the drainage of new houses to competent inspection, though it might remedy some of the more obvious defects

and put a stop to a few mischievous arrangements, would have little positive result where so much depends less on skilful planning than on effective execution. What is wanted is what it is very difficult to accomplish—namely, to engage the personal attention of every householder to the sanitary arrangements of his own house. The matter is really not very difficult to understand, nor are the more immediate and necessary precautions difficult or expensive to take. We are all the victims of architects, and builders, and workmen, and we suppose we must remain so until we can all dwell in "Hygeiopolis." But if professional men will not help us we can do a great deal to help ourselves, and it is astonishing how much can be done with a few yards of piping and the aid of a common plumber to render a house sweet and healthy. Mr. FOSTER is, no doubt, quite right in saying that good public sewers lose a great deal of their practical benefit without an efficient system of house drainage; indeed, he might have gone further, and said that they are in some respects, as we have endeavoured to point out, a positive evil. But the evil may be speedily and effectively checked by a little common sanitary knowledge, and a little determined effort, which, though a public benefit, is not disinterested, for it brings its immediate reward in increased comfort and security. The Society of Arts would do a great public service, if, in addition to inviting public discussion of the evil and its remedy, it would lend its powerful aid in diffusing the necessary sanitary knowledge in a popular and accessible form. The great drainage question is one which is as yet far from being settled, and this particular aspect of it is one in which every householder has a direct and personal interest. Even if all new houses could be effectively drained, the danger would still beset us in our present habitations. We cordially sympathize, therefore, with the efforts of the Society of Arts, for nothing but benefit can come from a public discussion of the question, from the interest it will arouse, and from the knowledge it will diffuse. We do not, however, think that the matter as yet calls for further legislative interferance, and such, we gather, is also the opinion of Mr. FOSTER and the Society of Arts. "Every Englishman's house is his castle," as we know, and the principle is doubtless in most respects a good one; but if the Englishman would keep the Sanitary Inspector from his door, he must take his own measures, and that speedily, to drive away from his dwelling disease that can be prevented.

MR. DE LA RUE'S LETTER TO *THE TIMES*, OCT. 19TH, 1876.

HEALTHY HOUSES.

To the Editor of THE TIMES.

SIR,—Your having lately published some correspondence upon a kindred subject encourages me to hope that you may be willing to accord space in your columns for the following remarks.

My attention has recently been specially directed to the subject of domestic sanitary arrangements, through my having been engaged in preparing a house for my own occupation, and the fact that this house when I acquired it appeared to be not only in substantial, but in what is termed decorative, repair, whereas upon investigation it proved to be in a condition far from healthy, has so much impressed me with the danger which is too often incurred, even in well-ordered households, for want of proper vigilance in respect to the drains, that I am led to hope that a few words of caution and advice may be of service to others.

My venturing to encroach upon your valuable space is stimulated by the approach of winter; for, paradoxical as it may at first sight appear it is in the winter season that any defects in the sanitary arrangements of a house assert themselves with the greatest persistency, since the fires are the chief agents in inducing sewer gas to leave its solitudes and poison our homes. Thus, the houses on either side of a street form huge upcast shafts which seek a supply of air from the readiest source, and it too often happens, especially at night, when the doors and windows are closed, that the sewers contribute thereto. Even in summer time the kitchen fire is usually maintained, and lends most active assistance in bringing about an interchange of air in the house, because provision has to be made for the column of air continually ascending the chimney. Should there be, therefore, any free communication, no matter how small, between the sewer and the house, the consequence would be a flow of sewer gas from the former to the latter. How much more would this action be going on in winter, when the doors and windows are kept closed, and when instead of one fire there are many! It is, then, to

what is technically termed the "suck of the house" that the intrusion of sewer gas is principally due, and that the barometrical pressure in the sewers is generally reduced below that of the atmosphere.

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W. W. DE LA RUE.

LEADING ARTICLE IN *THE TIMES* ON MR. DE LA RUE'S LETTER, OCTOBER 19TH, 1876.

It has been well said that the greatest reforms effected in any community are commonly those which each person may effect for himself.

We published to-day a letter from Mr. WARREN LE DA RUE, in which some of the most important of the questions bearing upon public health are regarded in this aspect; and we commend its details to the careful consideration of our readers.

It is a prevalent superstition that the occupier of a house may take its wholesomeness upon trust from his tradespeople, and that he may look for sound and effective drains as a natural outcome and result of the money which he pays to his builder and his plumber. Those who would not commit to any other judgment than their own, a single detail with regard to the colour of a decoration or the position of a piece of furniture, are yet willing to commit unreservedly the supervision of arrangements upon which the happiness, or even the lives, of all who are most dear to them may be dependant. There is nothing in science more certain than that sewer gas, next, perhaps, to a polluted water supply, is one of the most common of the vehicles by which typhoid fever finds its way into our houses; and while a polluted water supply, save in some exceptional cases, exerts its direct influence almost exclusively upon the dwellers in cottages, the entrance of sewer gas is one of the special dangers which beset the habitations of the comparatively wealthy. The more completely any house is furnished with closets, with bath-rooms, with fixed washing basins, with sinks, so much the more numerous are the channels through which an often times deadly poison

may find access to the inmates ; and so much the greater should be the care with which the construction and the state of these channels should be examined by the responsible occupant.

It has often been found, moreover, that arrangements which were intended to be protective have been so ignorantly designed, as themselves to become sources of danger ; and it is constantly forgotten that no constructions, however excellent originally, can be relied upon to be permanently self-acting, or can be expected to retain their efficiency unimpaired, unless they are subjected to regular periodical inspection. A year or two ago, for example, public attention was much directed to the state of a great school, the architect of which had supplied it with an elaborate system of filters, so that the water derived from public sources might receive on additional purification. The intention was admirable, but the filters were "nobody's business," and had not been cleaned since the day when they were first erected. In the course of time they became charged with decomposing refuse, and for several months they were the unsuspected sources of a water-pollution which caused the loss of many valuable lives. Similar results are not uncommonly produced on a smaller scale in private houses, where the construction that was originally satisfactory is expected to work without impairment for ever.

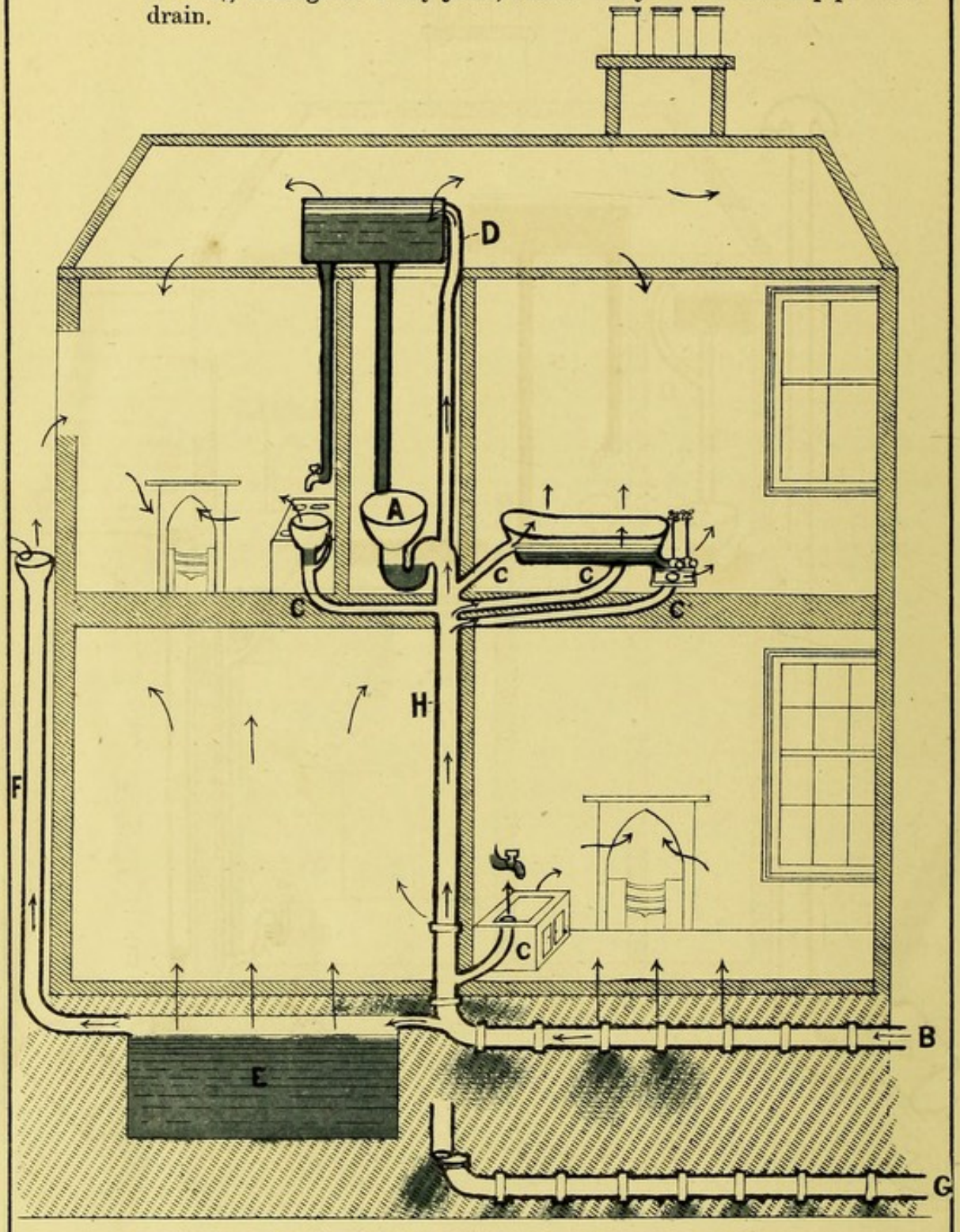
The occupant of the present day, as regards the health of his family, is in almost equal danger whether the house in which he lives be old or new. In old houses, built when sanitary requirements were little regarded, even by the most enlightened, the drainage is often as faulty in material as in design ; and the drains are not only themselves pervious to soakage through their walls, but they are so placed as to be almost inaccessible for the purposes of inspection and repair. In new houses, and more especially in those which spring up like mushrooms in the suburbs of great cities, the safety of the inmates is often recklessly sacrificed to cheapness of construction. The square or the terrace is the work of some speculative builder, whose profit is contingent upon his success in paring away certain small margins, and who has no acquaintance either with the causes of disease or with the elements of physical science. He makes everything which will be out of sight upon the cheapest model of which he has any knowledge, and he trusts that

his arrangements will at least last until the premises are transferred to a tenant. There are thousands of handsome-looking houses around London in which an educated nose at once detecis the smell of sewer gas, in which the ladies of the family, who are more at home than the gentlemen, are always more or less ailing, and say that the place does not agree with them, and in which no prudent surgeon would attempt to perform an operation. In such houses, not infrequently, there are faults due to the shortcomings of the local authorities; but there are always faults due to the bad construction of the houses themselves and capable of being removed by such means as Mr. De La Rue has pointed out. The first step towards their removal must be the recognition that they require the aid of knowledge and experience in order that they may be dealt with in a satisfactory manner—of such knowledge and experience as very few of the artificers, or even of the masters, in any of the trades subsidiary to building have ever had any opportunity of acquiring. In this respect the builders are no worse than the majority of their employers, and do but exhibit an indifference which is common to nearly all of those who deal with them. The latter, in their turn, when they suffer from some of the evils which they ought to have prevented, instead of admitting their own responsibility and their own error, are too apt to blame the local authorities, or to resort to one of the forms in which the invocation of Hercules may be used as a substitute for personal exertion.

There can be little doubt that the root of the mischief in the matter now under consideration, as well as in those large sanitary questions which fall properly within the province of official persons or Boards, is to be found in a very generally prevailing ignorance about the ascertained causes of disease. There is, perhaps, not much ignorance with regard to what has been said, but there is ignorance of the densest kind with regard to any intelligent conviction about what is true. People do not realize, even if they have read or have been told, that the laws which bring sewer gas into their houses when certain physical conditions are fulfilled are of the same order and equally invariable as those which regulate the movements of the heavenly bodies, or the flux and efflux of the tides. They do not realize, even if they have read or have been told, that the presence of sewer gas in the air they breathe,

and especially in the air they breathe during sleep, when the power of the body to resist noxious influences is reduced to its lowest point, is an unfailing source of depression and debility, and is also an almost certain source of typhoid fever, as soon as that malady is in any way brought into the district, so that its peculiar poison becomes added to the gas which previously was only noxious in a general way. When people do realize these things, they will for the first time begin to understand the earnestness of sanitary reformers, and their readiness to preach, *in season and out of season*, to a world which has hitherto shown but scanty disposition to listen to them patiently, or to modify its conduct in accordance with their teaching. It is a subject of no small congratulation that a distinguished astronomer, of world-wide reputation in the science which of all others is the most exact, should come forward to volunteer his testimony, in language of characteristic simplicity and modesty, in favour of the truths of preventive medicine, and to point out the means by which these truths may be applied and rendered useful. In the present state of European questions and of political parties there is no hope that any impulse to sound sanitary legislation will be given from above, from Statesmen or Ministers; and there is no prospect of any substantial measure for the protection of health and for the extinction of preventable disease until such a measure is demanded irresistibly by the public. For the creation of the demand the diffusion of knowledge is the one thing needful. As soon as the average householder comes to see the truth of what Mr. De La Rue has written, to understand that a healthy family is more important and is better worth having than domestic decoration or adornment, and that it may even be more desirable to spend money in drainage than in carriages or other forms of luxury, he will not fail to put his newly acquired information into practice. When he has done so, and has obtained all the security which his own efforts can insure, his next requirement will be to be protected by the law against the neglect of his neighbour. In such matters the boundary lines between that which can be accomplished by personal effort and that which can only be accomplished by legislation are very clear and well-defined. Mr. De La Rue has done good service by directing attention to the former, and his advice, if ever it should be generally followed, will inevitably lead to the latter.—*Times*, October 19th, 1876.

G. Drain under floor with joints unluted, and pipes laid without a fall; shewing leakage at every joint, and at the junction of soil pipe with drain.



HOUSE WITH EVERY SANITARY ARRANGEMENT FAULTY.

A. Water-closet with soil pipe in middle of house.

B. House drain under floor of room.

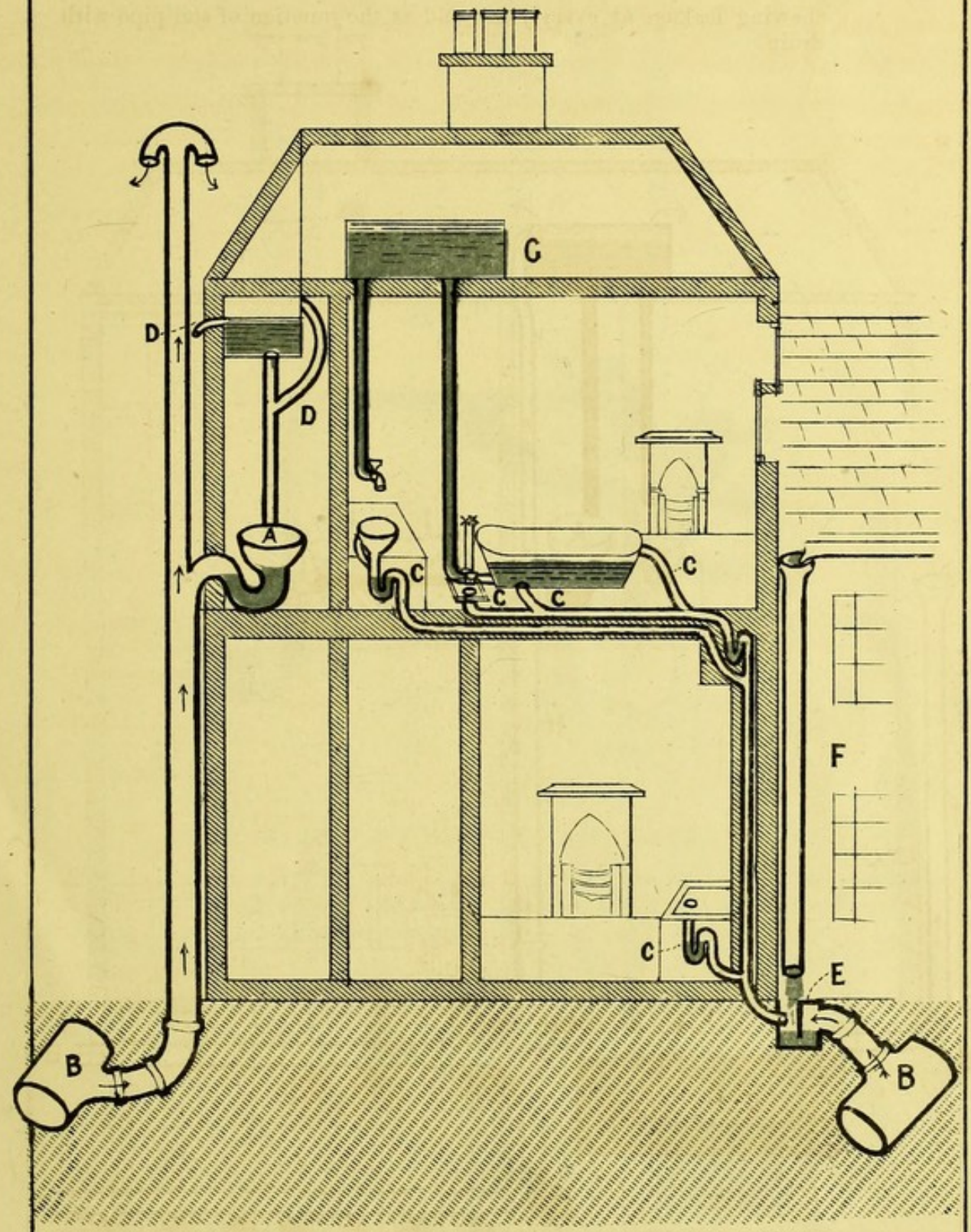
C. C. C. C. Waste pipes untrapped, communicating directly with drain.

D. Overflow pipe of cistern turned into soil pipe, and acting as ventilation of drain.

E. Rainwater tank under floor, with overflow untrapped into drain.

F. Fall pipe communicating with drain opening under bed room window.

II.



HOUSE WITH FAULTY SANITARY ARRANGEMENTS AVOIDED.

A. Water-closet with soil pipe outside the house, and ventilated by a large pipe carried up and away from all windows or chimneys.

B. House drains outside house.

C. C. C. C. Waste pipes trapped, and disconnected from drains by a gulley E.

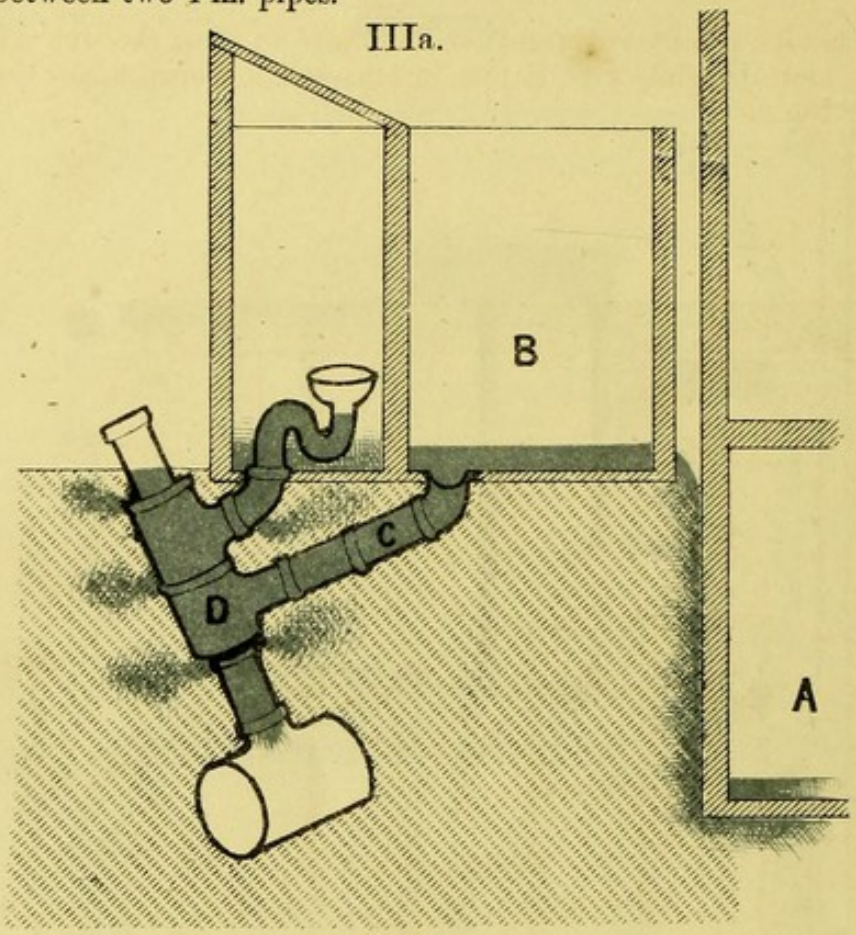
D. Overflow of cistern into open air, or supply pipe.

F. Fall pipe near bed-room window discharging into a gully, not into the drain.

G. Domestic cistern separate from water-closet cistern.

Cellar A flooded from overflow from ashpit B, the drain of which (C) did not act, as it drained into the drain D of next house, which was blocked up for several feet, because two 6-in. pipes had been let in between two 4-in. pipes.

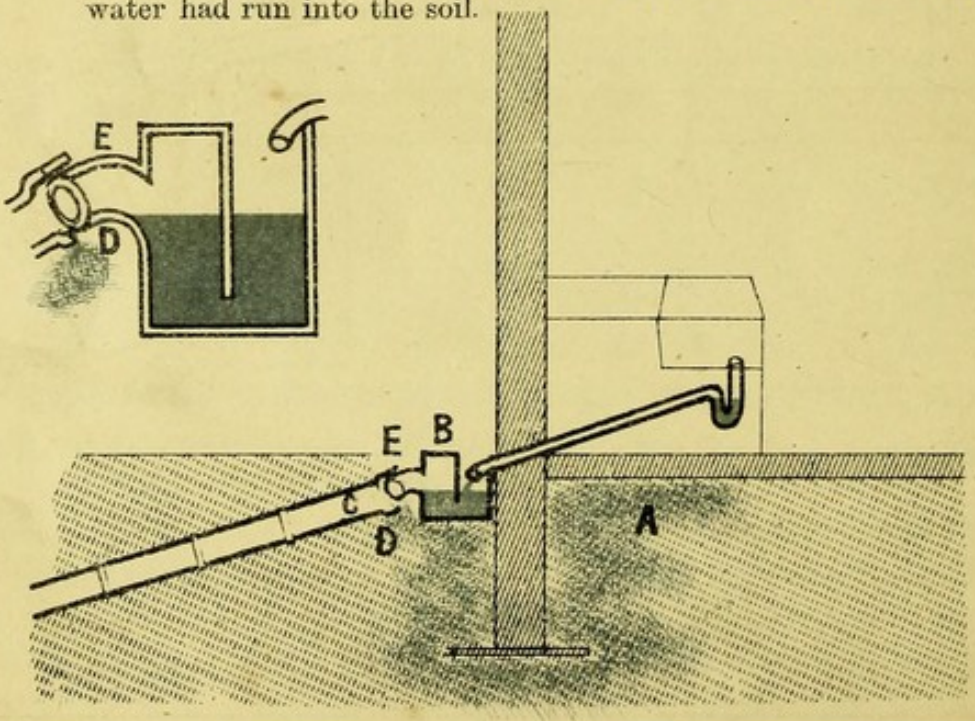
IIIa.



IIIb.

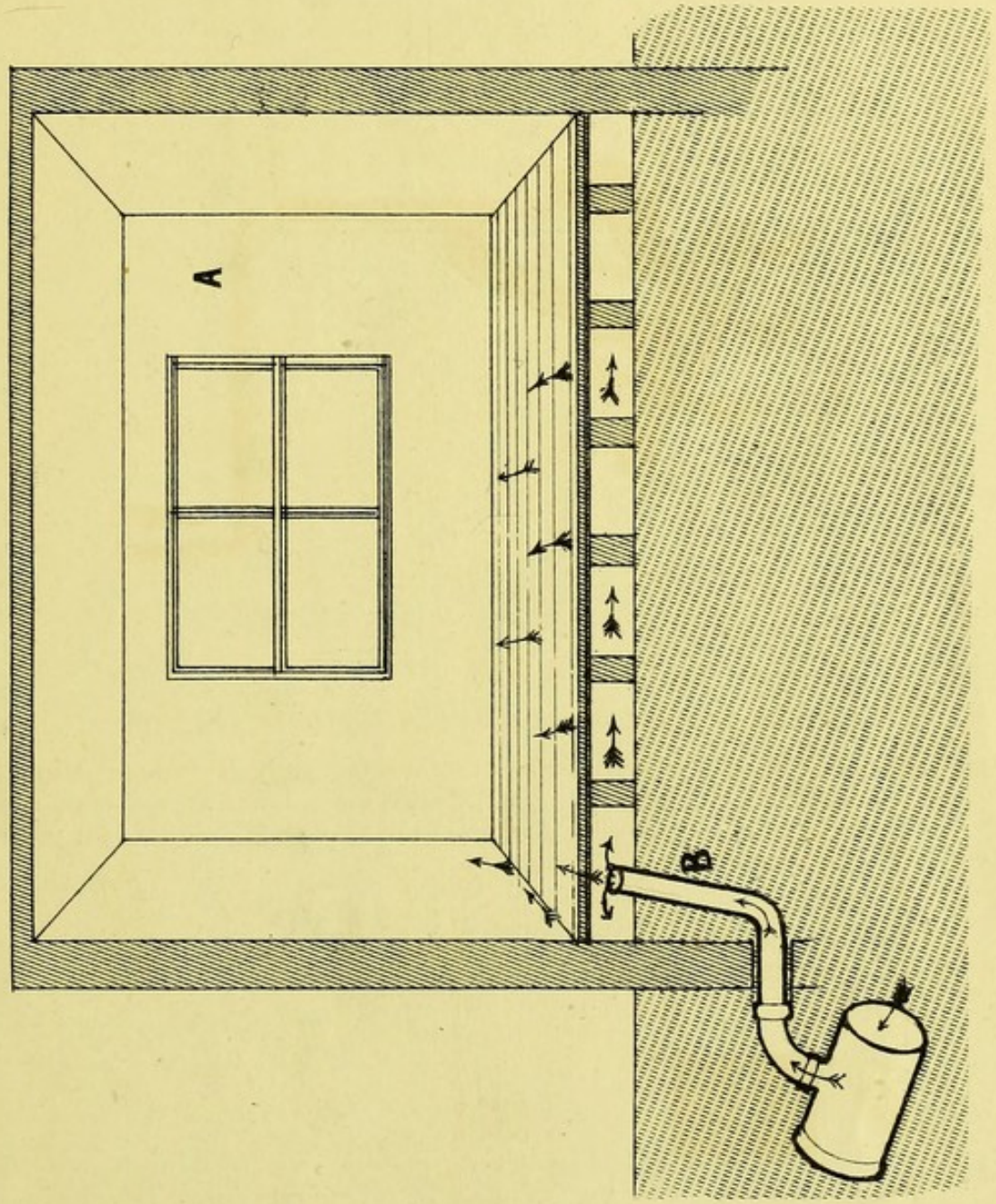
FAULTY CONNECTION OF GULLY WITH DRAIN PIPE.

Dampness of floor of pantry A caused by fault at gully B; where gulley B joins drain pipe C the joint had opened out below at D, in consequence of the fracture of the lip of the sanitary pipe at E, and thus all pantry water had run into the soil.



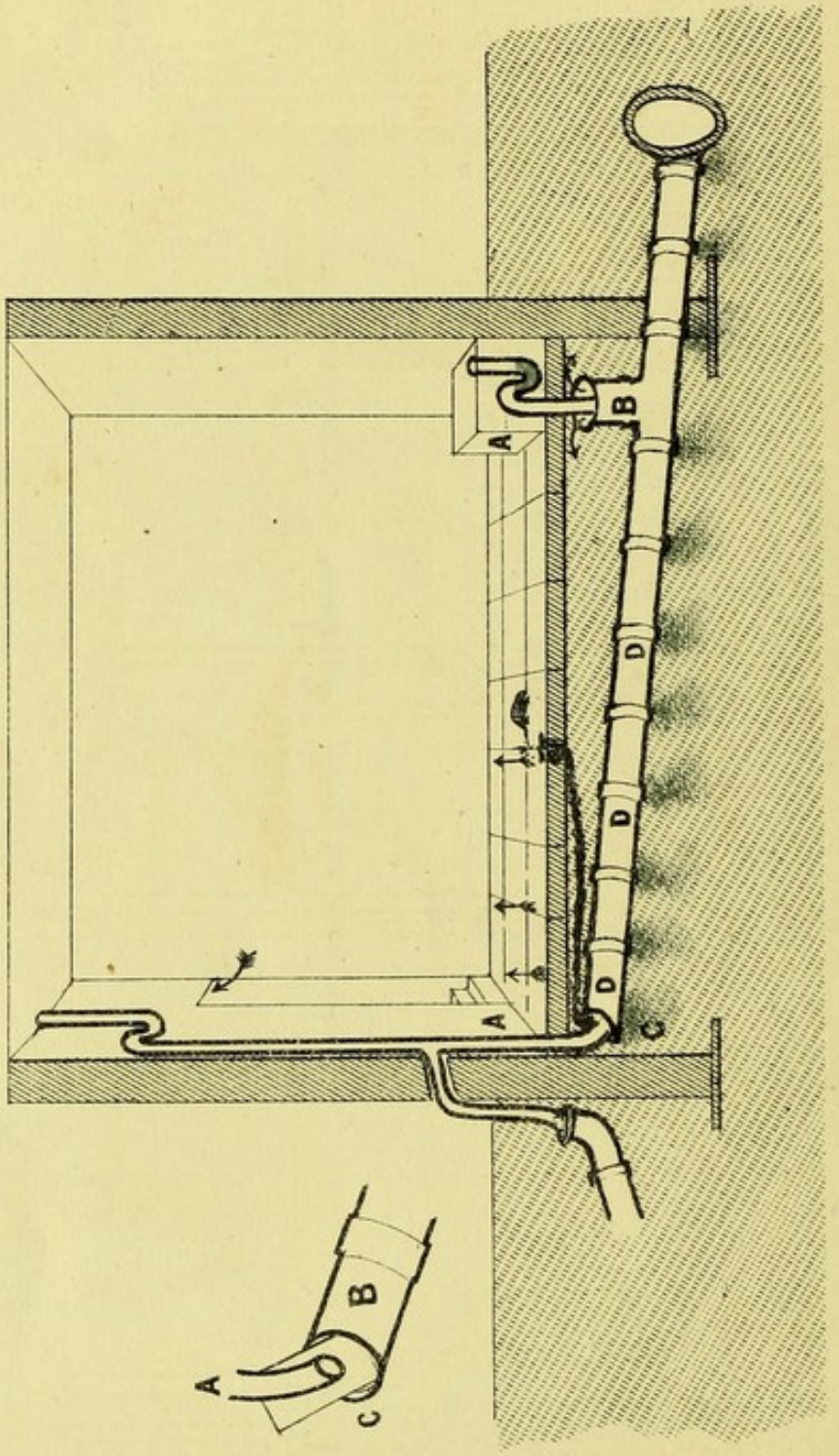
IV.

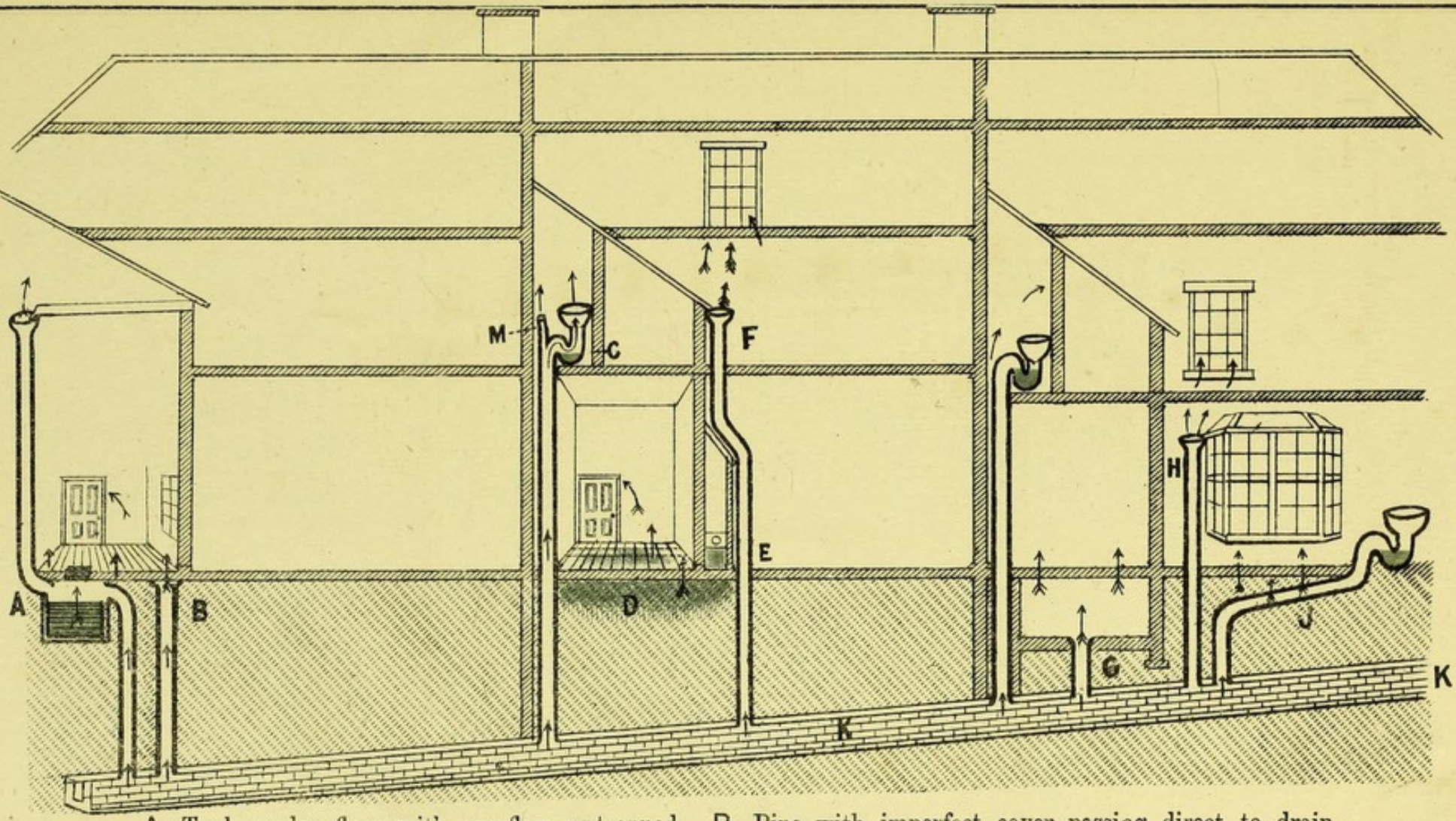
When room A was converted from a scullery into an office, the sink was removed, and the sink pipe B just cut off and left open under the boards of the floor.



V.

Waste pipes A A turned into larger drain pipe B B without any luting or cement, allowing sewer gas to escape, and also at C pouring the liquid into the soil instead of the drain D, unluted joints leaking under the floor.



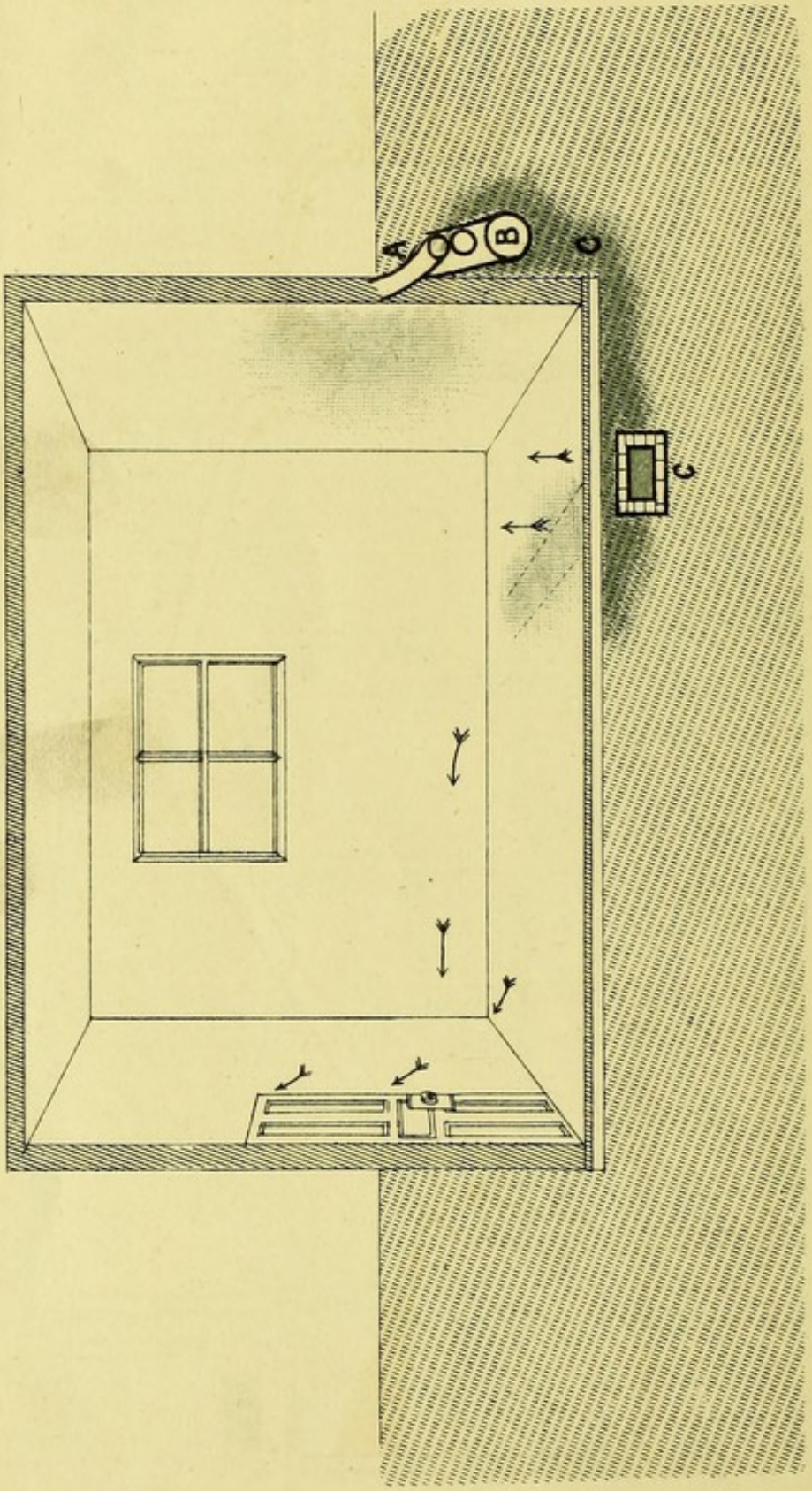


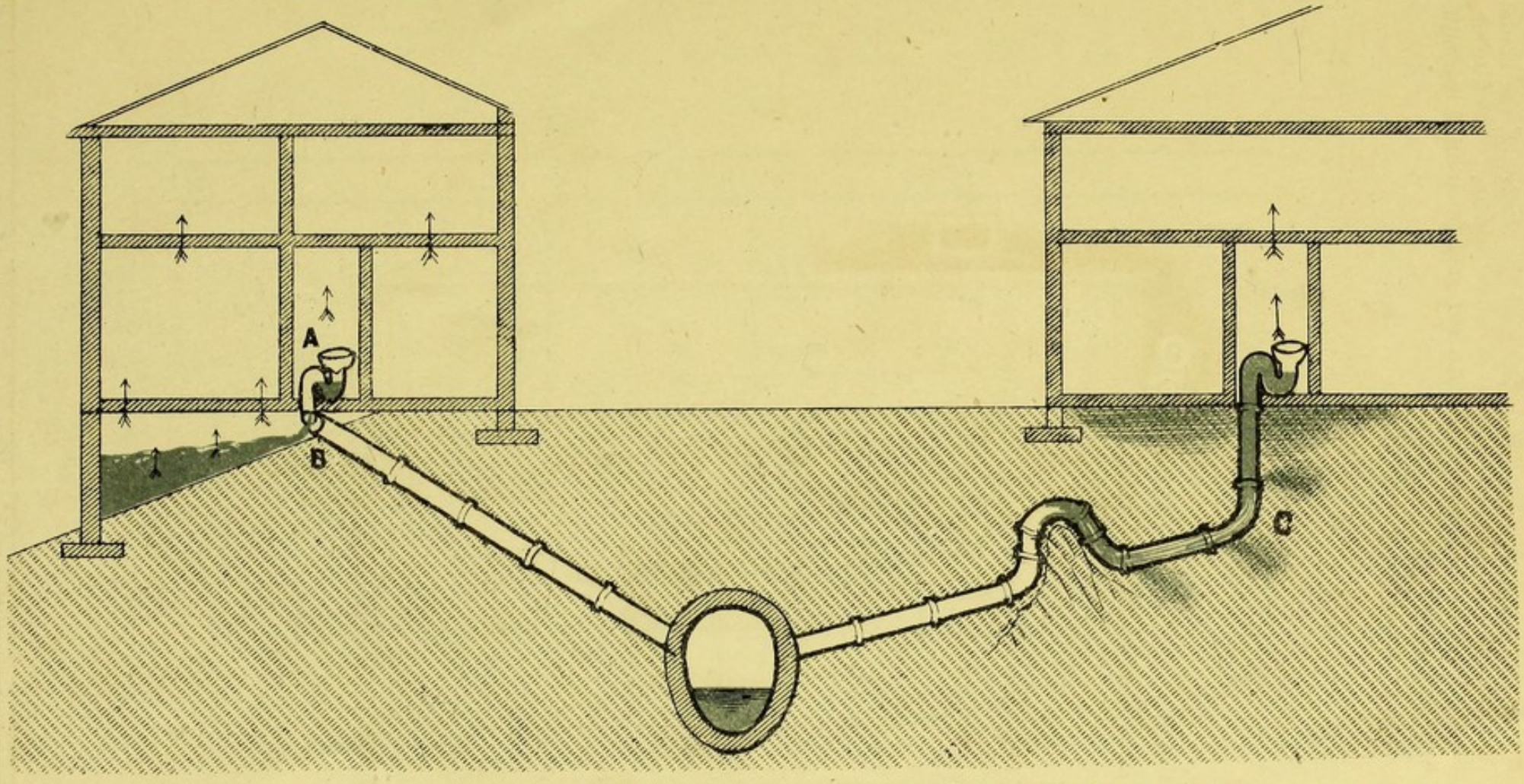
A. Tank under floor with overflow untrapped. B. Pipe with imperfect cover passing direct to drain. C. Water-closet with imperfect trap. D. Soil under kitchen saturated with overflow of Privy E. F. Fall pipe opening under bedroom window. G. Dish stone passing untrapped to drain. H. Fall pipe of bay window passing direct into drain. J. Water closet drain with open joints under floor.

VI.

VII.

Soil pipe A imperfectly joined to pipe B, pouring all the sewage of the house into the soil. Pipe B close to wall of house, and above the kitchen floor. Wall and floor damp. C. An old surface drain filled with leakage from sewers.





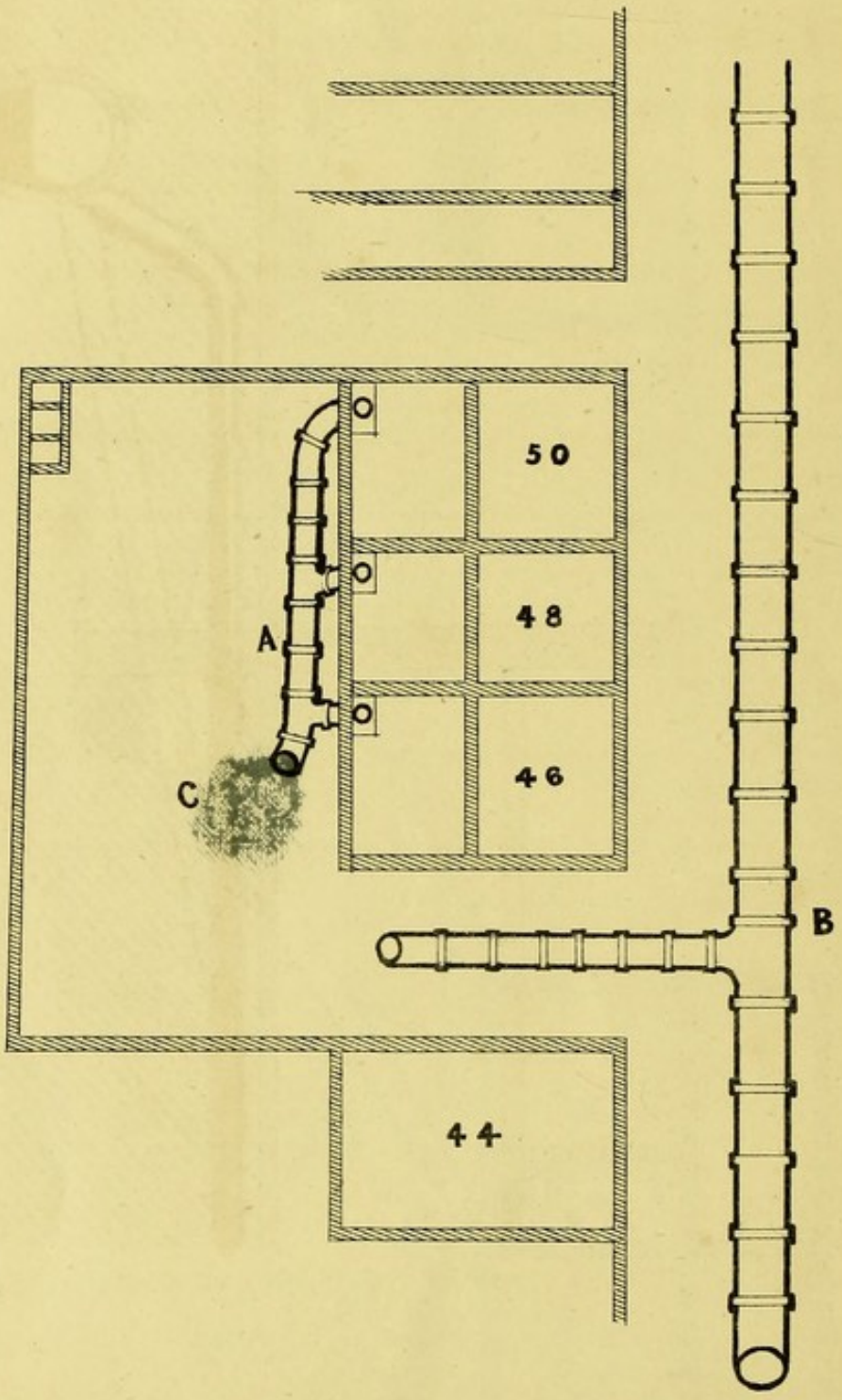
Soil pipe A missing drain B and pouring all the sewage into a triangular space below the ground floor of the house.

Soil pipe C blocked as far as a rise in a drain which, to avoid cutting through the rock, was carried by curved tube over the rock.

IX.

A. Drain from houses, 46, 48, 50, ending in the soil. Several cases of typhoid fever in 46 and 50, one fatal.

B. Main drain of street laid after occurrence of the typhoid fever.



X.

Badly made drain, economy in excavation at the expense of the fall of the drain.