

tary arts and sciences, together with their first-born children—the plumbers—got lost, so long and badly as to leave no records behind them.

After the fall of the Roman Empire, man drifted into darkness of superstition and ignorance; science was forgotten and the arts abandoned; whole communities neglected the simplest laws of cleanliness and hygiene; pestilence and death stalked hand-in-hand over the earth, sweeping away its millions of appalled and helpless victims with relentless fury and persistence.

As imperfect as our modern sanitation of cities may be, we can scarcely imagine in a civilized city of the first class, a plague like that of Egypt in 1792 or Barbary in 1799, with a death rate of 3,000 a day, or Bassona, in Persia—and all from causes now considered within the easy remedial reach of sanitary science. The great pestilences that nearly depopulated Europe during the sixteenth and seventeenth centuries became the cause of a revival, rather, the creation, of a sanitary science; for when investigation had brought to light the terrible sanitary conditions by which the evils had been produced, and men began to realize the accursed horrors of the situation and the imperative necessity of a remedy, the next step was to formulate the results of experience into science, which was done; and so well was it done that the average health of cities has been vastly improved and the duration of human life prolonged—and we have done it all ourselves, without the aid of the ancients. It is a source of some pride that sanitary science, with its long train of useful arts to ameliorate human conditions, is exclusively of our own invention. It is true, we were forced into it by a necessity which knows no law, excepting the laws of nature, of which self-preservation happens to be the first; but still we have accomplished our duty as well, perhaps, as any other department of science having for its object the advancement of man's physical welfare. By we, I mean the plumber, in contradistinction to the architect.

With a proper regard for the proverbial modesty of a worker in lead, and due deference to the grandeur and dignity of architectural achievements, we humbly submit that the modern improvements in the art of sanitation are due to the labor and experience of the long-suffering plumber rather than the intellectual efforts of the artistic and skilled architect. The inference is, therefore, clear that in the onward march of sanitary science the time has arrived when the plumber should take his place in the procession to which he is by right entitled as minister-in-chief. In the necessary and logical order of things, custom has long since entrusted the sanitary welfare of the community, and held alone responsible for the shortcomings, of the man who does the work. The architect, however learned and skillful, may design palaces, and princes may have them erected, which, but for the aid of the sanitary plumber, would become reeking hot-beds of disease and pestilence. It is to the plumber that all questions arising from defective drainage, sewerage, etc., are referred, and, whether justly or unjustly, he is alone held responsible for the evils of bad plumbing, and too frequently made to bear the sins of others. Now, the grand object of the organized agitation of our Guild is, so far as possible, to remedy the evils and elevate the sanitary art in behalf of the public as well as ourselves. Our desire is to render the plumber competent to meet the varied duties and responsibilities not only supposed, but made necessary by the practice of his art—in brief, to make himself a worthy executor of an honest art and dignified science, and even to invoke the aid of legislation if necessary in order to more effectually insure results. In order to achieve this it is necessary that the working army of reform be properly disciplined and officered, and the duties fairly and wisely assigned. Our relations with the architect, builder and doctor, should be clearly defined, and each class be made to bear their respective burdens. Our present affair is with the architects, and our duty is to examine dispassionately the relations we occupy with them, and decide what changes are necessary, if any. Presupposing that the educated plumber is his own sanitary engineer, it is evident that to him will be referred all questions of drainage, sewerage, light and ventilation, and especially the practical methods whereby the best results are to be attained, all of which are but incidental in the studies of the architect while they constitute the life and business of the plumber.

Let us look into the facts a little. The investigations of science into the causes of pestilence and the search for remedies, from which investigations sprang sanitary science, revealed facts no less curious than important. We recognize the great central fact that all matter is but the different arrangement of a few simple elements into the absolutely innumerable forms of use and beauty, and that from the lowest to the highest form of organized matter. Each is but a laboratory, which changes the material arrangement and hands it on to the organisms above it, each returning the waste to the earth and air to recommence the work in never ending cycles—not that this knowledge was necessary to enable the plumber to fit up a water closet, but to give birth to a new science, whereby the plumber's art is hereafter to be directed and developed. When Moses by Divine command instructed the children of Israel to make the first earth closets on record by covering their excreta with earth by means of a paddle which each was ordered to carry for the purpose when on the march. But when they came to be gathered into cities Moses was confronted with a series of sanitary problems that became more and more difficult of solution as the population increased, and they were precisely the same problems that bring the plumbers to the front to-day. The removal of excreta and waste of cities is not left to the leisure or discretion of anybody, but is absolutely compulsory, and proper supplies of water and air equally so, for reasons too obvious to require mention. The question that we are called upon to answer, therefore, refers to the methods best adapted to promote the public health on the one hand and to counteract the evil results of a false economy on the part of

ignorant plumbers, shoddy-builders and mercenary owners on the other.

Our duty and business interests both demand that we face the situation openly and boldly, neither underrating the difficulties before us nor deferring to vicious customs or traditional authority. It is no secret that one of the disabilities by which the practical sanitary artisan is often hindered is his false relations with the architect, relations which the sanitary experience of modern cities demonstrates should be at least modified if not reversed.

An architect is not necessarily a plumber, and is seldom practically familiar with the laws of sanitary science, and still less with plumbers' devices, methods and materials. It cannot, however, be denied but that many of the architects have given the question of sanitary plumbing a good deal of thought and consideration, some of whom (in our own city) have done more to advance the cause of good plumbing than many of the plumbers themselves. Architects are always careful whom they select to carry out their plans, in order to secure the best possible results. Yet the architect's plans and specifications are generally prepared without consultation with the plumber, who is expected to do the work, and who alone is held responsible for its efficiency, not only by the owner, but by the public.

Let us not be misunderstood here. With the architectural beauty of a building or of the building materials, the plumber has nothing to do, but with its water and air supplies, its many and varied fixtures, its piping and drainage and sewerage, he should have everything to do. In some cities, and forsooth in many of our government buildings it is customary for a builder to undertake a whole or lump contract. The builder sub-lets the plumbing, not to the best, but to the lowest bidder, who, in order to save himself, puts his whole mind on the arts of substitution, and how not to do things and still keep within the letter of the specification. The chief sufferer in the affair is the confiding owner, who, perhaps, finds his costly and magnificent dwelling little better than a whited sepulchre. This is no fancy sketch—it is history enacted in large cities every day, and tends to bring about results which are humiliating to the plumber, and by no means creditable to sanitary savants. That the plumber has too long permitted himself to occupy the position of the humble mechanic, asking leave to carry out the designs of his superiors as cheaply and showily as possible, and is expected submissively to grin and bear the popular abuse heaped upon him and his art by those who feel outraged by somebody, and make the plumber the scape-goat, cannot be denied.

There is no conflict of interest whatever between the architect and plumber, but they both need to be educated to a realizing sense of the situation. The plumber of the future will be required to conjoin his art to science and elevate them both to the dignity of a profession which will command the respect of the architect. Apparently it is too subversive of the long established relations between the intellectual designers of palaces and the heretofore dirty plumbers who have been trained to perform the double duty of drudge and scape-goat. And we do not expect the enmity of cheap people whose evil methods we hope to reform, will be conciliated at once or easily; innovations upon any established customs are always opposed by those whose trade or occupation is hindered by the improvement. This is also history. But the difficulties before us should stimulate more determined effort and encourage us to the inauguration of a more harmonious co-operation between architects and plumbers. By this means public interest in the progress of sanitary science will be inspired, and the confidence of the people gained; it will be easy to secure a wise system of legislation, in order to perpetuate and multiply the sanitary advantages we shall have inaugurated. Fortunately—if I may use the word in a case where the accumulated misfortunes arising from the evil sanitation of cities have been our school-masters—we are in some degree prepared for improvement. For nothing is more certain than the facts we have mentioned concerning the origin of sanitary science. Not only the public generally, but architects, doctors and plumbers have acquired, through misfortune, the rudiments of a sanitary education, whereby our contemplated revolution will be rendered easier. It is also most probable that the real or fancied interests of the trade will interpose vexatious obstacles in the way of any change. But neither architects, doctors or plumbers, or the shrinking public disagree as to the existence of great sanitary abuses that cry aloud for reformation, and none dispute the fact that the proper education of all concerned is the rational course to be pursued. Educate the plumber by force of law if necessary, if it cannot be accomplished otherwise, so as to enable him to execute a wise system of sanitary legislation, and all the rest will follow. To the master plumbers will then be entrusted all matters pertaining to sanitary art, and the plumbing of buildings will not be planned without his counsel. One more point it is well to suggest. As the plumbers' work is subject to especial criticism on all hands, therefore justice and common sense, under the coming dispensation, will demand that no Board of Health, either provincial or municipal, shall be complete without at least one master plumber. We have everything to hope for and nothing to fear; if we are sincere in our intentions and earnest efforts we shall succeed. Let us secure an efficient system of legislation, and the foundation will be laid for our sanitary superstructure. The architects will give us the plans; we will see to it that proper drainage shall carry away all noxious elements, and our friends, the doctors, may stand by and approve.

Glass bricks are made extensively in Germany. They are blown with a hollow center, containing rarified air, and are said to be as strong and durable as clay bricks. They freely admit light. So far the glass bricks has only been used in the construction of conservatories.