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CONTENTS.

THE scheme of Dr. R. P. Dyrenfurth for a National Polytechnic School, as recommended in the speech of the Hon. Henry Blair, of New Hampshire, in the House of Representatives, on the 13th of June, contemplates the establishment of a great central institution of instruction in science and the useful arts, supported by the surplus income of the Patent Office, which amounts to $100,000 annually. The accumulation of this unappropriated balance during many years now amounts, we are informed, to a fund of $1,200,000. It seems proper that this considerable fund and income should be applied in some way to benefit the national spirit of useful invention, whether by promoting scientific investigation or by feeding and enriching the sources of the industrial arts through processes of education. The plan in question was submitted in the last days of the session without any expectation of immediate action, but with the intention of awakening profitable discussion of the subject. It provides for schools of mathematics, of civil and mining engineering, of machinery, architecture, chemistry, agriculture, and forestry, with a Board of Regents, composed of the Vice-President of the United States, who is to be the chief executive officer, of the Secretary of the Interior, who is to be *ex-officio* Director, of the Commissioner of Patents, and of six members each of the Senate and House of Representatives. It is proposed that each of the eight schools shall have a principal, that the students shall be appointed in the same manner as are those of the Military and Naval Academies, that they shall pay $250 per annum for tuition, board, and lodging, with certain fees for practice in the laboratory, etc., shall wear a uniform and be subject to such discipline as shall most effectually increase the efficiency and maintain the authority of the school.

IN behalf of this scheme it is claimed that it contemplates no expense to the national treasury; that it will be free from political influences; that, by the equal territorial distribution of polytechnic graduates, it will fairly diffuse the benefits of scientific education; that these graduates will stimulate healthy enterprise and useful invention, and afford a sound basis for the advancement of all the practical arts of civilization; that the proposed school will enjoy the advantage of proximity to examples of the best mechanical inventions in the model rooms of the Patent Office; that, by the method of appointing its pupils, it will not interfere with existing institutions; and that, by the nominal cost of their instruction, it will open the benefits of scientific training to many who are now practically excluded from them.

As yet this proposition has attracted but little public attention, but it deserves to be fully discussed. Its merits are obvious enough; the greatest of them, perhaps, is, that it points out the fact of the existence of a great available fund eminently fit for the endowment of technical education. As for the especial contrivances of Dr. Dyrenfurth, by which he would divert this newly-discovered treasure to its natural uses, we commend them to the careful consideration of our readers. As at present advised, we are not of those who consider the establishment of centralized institutions of instruction best adapted to our needs. Naturally the same arguments brought against a national university must apply to a national school of science. The Naval Academy at Annapolis, and the Military Academy at West Point are maintained for the education of officers in the public service. They occupy a place which no private or local institutions could possibly fill, and are necessarily based upon arbitrary standards of discipline, so that their graduates may conform to a type and become parts of an elaborate machine, the efficiency of which largely depends upon the subordination of the individual to the system. The object of a polytechnic school, or a school of technology, on the other hand, is to develop individual and independent minds for the various uses of civil life; the primary aim is through the individual to improve the arts of civilization. To this end numerous technical schools have been provided in various parts of the country, each of them requiring, for the perfection of its use, more complete apparatus of every kind, a larger and better paid body of instructors, larger loan funds, more numerous scholarships, and, in short, a more ample endowment than any of them at present enjoy. These institutions are distributed according to the enterprise and needs of the commonwealths, and to meet natural demands. It would seem, therefore, that the large surplus funds of such an institution as the Patent Office would be more usefully and economically applied by distribution, under proper restrictions, among these various naturally established nuclei, than by adding yet another nucleus, and one which, from the nature of the case, must be subjected, like the present national schools of the military arts, to the annual chances of imperfect and meddlesome legislation. Let us, however, thank Dr. Dyrenfurth for drawing our attention to these unexpected national resources, and let us hope that his ingenious scheme may in the end result, by whatever means, in giving to technical education in this country the most effective and the most judicious assistance.

WE desire to give our readers the benefit of an invention in architectural practice which, while it may possibly suggest to the more energetic members of the profession the existence of new and untried fields of remunerative if not honorable employment, may also admonish them that such fields, however promising, are sometimes fertile only in brambles. The erection of a new county jail has for some time been contemplated by the Board of Supervisors of the city of Brooklyn. Most of the profession, even in these hard times, would content themselves with awaiting at the Board-room doors until the assembled wisdom within should have finally determined to build the jail, when the usual professional swoop and scramble for the spoils would have been witnessed; but Mr. Wm. A. Mundell with superior enterprise, volunteered to assist the Board by laying before them a full set of plans for the building in question, which plans of course were not to be paid for if the scheme of building came to naught. The Board, being human, could not but assent to a proposition so easy as this and accompanied with such a saving clause, and the plans in due time were unrolled upon the table before them. The real building, however, is apparently not foreshadowed by these drawings and a full fledged claim forthwith comes into existence, which on the 1st instant was laid before the Board in a motion to pay said Mundell the sum of $4,500 "out of the unexpended balance of the out-door relief account," for his plans and specifications for the new jail, as payment in full for his services, he to deliver all such plans and specifications to the clerk of the Board and to agree, if at any time it should be desired to begin the erection of a new jail, that he should superintend the work for the sum of two and one half per cent on the cost thereof. It is to be supposed that Mr. Mundell, for the sake of the public interests involved, was willing to sacrifice himself in this manner, for the motion was adopted by the Board and the architect departed with a feeling that he had by his clever professional management benefited himself, if not the county. But the next day the Taxpayers' Association obtained from the city court an injunction forbidding the payment or the receiving of the check for $4,500 for the services in question, and now Mr. Mundell has only his plans and the sympathy of his friends in the majority of the Board with which to console himself.

ALTHOUGH, apparently, the testimony before the Potter committee has so far failed to meet the expectations of its friends, it certainly has succeeded in opening to public view some of the

curious hidden machinery of politics, in showing how widely extended are its wires and in what odd places the party-puppets jump. The latest exhibition of this kind occurred in the Department of Architecture, where it might be supposed those only who could manage a T-square or superintend a piece of mechanical work would find place. One Mr. Dennis was lately compelled to narrate before the committee his adventures in search of an office in reward for certain alleged political services in Florida. It appears that he aspired first to be an auditor in the Treasury Department, then to be a special agent, and then to be custodian of plates and dies, but, failing in these efforts, he finally applied for and obtained a place in the Department of Architecture, where, although, as he confessed, he knew nothing of architecture and of course had passed no examination, he discovered a congenial function for drawing pay without any equivalent of service; so that when he asked for a leave of absence of three or four months to go to Massachusetts, he was enabled to say to the Assistant Secretary of the Treasury that he "was put on there to draw pay," and would not lose his "capacity to do so" if he went away. We regret to say, for the credit of the Administration and notwithstanding its pledges of civil service reform, that, according to his testimony, he got his leave and drew his pay regularly at the rate of six or seven dollars a day. We are much exercised to know with what show of occupation the Supervising Architect supplies those who hold these decorative positions in his Department. Architecture is said to be the reconciliation of the useful with the beautiful. Is this reconciliation exemplified in the government office, and do the working draughtsmen there manage to maintain a symmetrical and entirely operative union with their purely ornamental comrades? An explanation in his next annual report how in architecture "they also serve who only stand and wait," may afford some useful hints to the profession and would be thankfully received.

A commission, appointed by the crown in England, to investigate the copyright laws, and to suggest new enactments by which the rights of the public and of authors, publishers, painters, sculptors, architects, and of all intellectual producers, should be more distinctly defined and more properly adjusted, has just made its report. After an elaborate investigation, the commission concludes, as regards painters, that, in the absence of a written agreement to the contrary, the copyright in a picture should belong to the purchaser, or the person for whom it is painted, and should follow the ownership of a picture, without, however, prejudicing the right of the artist to make such use of his preliminary studies and sketches for such picture as shall result in works which are not direct imitations or *replicas* of it. Mr. Charles Barry, on behalf of the Royal Institute of British Architects, appeared before the commission, and claimed that architects were subjected to great injustice and injury by the absence of a copyright which should protect their designs and prevent their use by other persons than the authors for building purposes. He suggested that the right to reproduce a building, whether in whole or in part, or on a different scale, or for other persons than the original client, should be reserved to the architect for twenty years from the date of erection, or from the sale of the design. The commission, however, considered it impracticable to reserve this right to the architects to reproduce buildings, but recommended that property in architectural designs should be protected as drawings, "so that they may not be copied on paper."

It follows from this apparently that, in the judgment of the commissioners, among whom, by the by, there was neither a painter nor an architect, the execution of a design in a building is practically, on the part of the architect, a surrender of all right to it in the future to the public; it becomes common property as a work of art, and may be imitated to any extent by any builder, just, indeed, as he himself consciously or unconsciously, in whole or in part, has imitated, or, at least, has been influenced by the works of his predecessors or contemporaries. This is certainly a reasonable condition. If it were practicable to reserve to the architect for twenty years the exclusive right to reproduce his buildings, in whole or in part, as proposed by the representative of the British Institute, the law, as it seems to us, would operate directly to check the natural advancement of the art, and the free development of style, and introduce into design a deleterious element of agressive personality, a sort of patent system, entirely inconsistent with healthy artistic work. It would be the business of every architect to strive mainly for individuality or originality of expression in his work, and studiously to avoid, so far as he could, any appearance of copying, or of being influenced by the works of his brethren, — certainly the lowest motive which can actuate the artist in the process of designing, and one which would make modern architecture even more self-conscious and affected than it is. To place any such arbitrary check upon the laudable tendency to imitate a good work of architecture or to copy the good points thereof, as is proposed by the Institute, would be a direct interference with a natural law of progress. Architecture can live and grow only in a generous atmosphere. The enforcement of such patent rights, if enforcement were possible, would stifle the art and style would disappear in a generation.

PREMIUMS IN COMPETITIONS.

The invitation issued by the Government for a competition for the restoration of the Patent Office calls to mind a usage of competitions, which is at the same time one of the most universal and one of the least reasonable of them all, — we mean the habit of offering graduated premiums for competitive designs. It is, perhaps, not one of the vital points in the management of competitions, yet it seems as if building committees or even architects scarce ever imagined a competition without attaching to it this perverse notion, — for such it appears to us, yet it has nothing better than habit to recommend it, and many things to discredit it. It is probably a survival of the custom of giving a first, second, and third prize and so on, in public games, or school examinations, natural enough, but is transferred to a rivalry in which any gradation among the unsuccessful competitors is as much out of place as it would be among the disappointed suitors for the hand of a princess. In the present case there is no reason to complain of the action of the Government which, having at its command only the six hundred dollars allowed for the purpose by Congress, followed the usual custom by offering it in three prizes, of three hundred, two hundred, and one hundred dollars, and then, when the architects protested that the prizes were too small, did what it could to make the stake more valuable by rolling them into one. It is the prevailing custom that is at fault, as we think, simply because the matter has never been sufficiently considered to set it right, and for this architects are as responsible as anybody.

The objection to a graduation of premiums is, that it gives a wrong turn to competitions, and, while it does not advance their legitimate end, it aggravates their peculiar evils. The purpose of all competitions is, to get the best choice of designs for particular works. The inducements to architects are, first, the hope of getting work to do, and second, a greater or less opportunity to make known their names and capabilities. The disadvantages of them — and they are so serious that a great many thoughtful architects condemn competitions altogether because of them — are, that they demand a great amount of unrecompensed labor; that they are apt to be decided by incompetent persons or committees, and therefore not according to the real merits of the designs; that therefore they are as much a matter of chance as a lottery; that they allure architects by an excitement like that of gambling, and lead to a great amount of trickery, partizanship, ill-feeling, and recrimination. It is important, if competitions are to continue, that they should secure their object as directly and with as little of these disadvantages as possible.

Now the one prize in any competition, the only thing that to an architect of assured position is worth the effort of competing, is the execution of the work itself. There are also the advantages, to those whose position is not yet assured, of the opportunity to attract attention and to make their names known by even an unaccepted design. The premiums offered are never, unless in very extraordinary cases, an equivalent for the work that is rendered by the competitors. It is desirable that committees should be disabused of the idea that they offer any thing, except the work they have to give, which is an equivalent for the labor they demand. No architect in successful practice would think of giving designs for the premiums which are ordinarily offered in competitions were it not for the chance of getting the work for which he competes. The nominal honor of being classed as second or third or fourth in a general competition may naturally appeal to school children, but is worthless to professional men who respect their own position. That a committee, after having obtained what they want and selected a design, should go on to assign an order of merit to the archi-

tects whom they have decided not to employ, is at least gratuitous; if, as is almost always the case, they are technically uninformed, it would be considered an unwarrantable assumption if it were not sanctioned by habit. As a matter of fact the classification of premiums does not command the respect of competitors. The only effect of it is to add a little excitement by the chance of one's getting a little better premium than some one else, which, as far as it goes, is simply unwholesome. Neither the rather childish gratification of being rated above the next competitor by a doubtful authority, nor the pecuniary advantage of having one's small remuneration increased at the expense of his fellow's, is a worthy object of professional ambition.

What, then, is the use of the premiums? An ideal competition would give the work to the best man and pay the rest, all alike, a fair remuneration for their labor. This is sometimes attempted in restricted competitions, but as a general rule it is not to be looked for. The next best thing is, while securing what is thought the best design, to demand as little unremunerated labor as possible, that is, to pay for as much of it as possible. Since there is a regular and uniform fee for architectural work, it may be assumed that the work of the competitors should be paid alike. Whatever money is afforded in premiums might therefore be fairly divided in equal shares among the unsuccessful competitors, the successful one being employed in the ordinary way. But this would in most cases make the sums ridiculously disproportionate to the work done, and so small as to be hardly worth having. Competitors would prefer the chances of a substantial fee to the certainty of a trivial one. The other alternative, then, is to divide the whole amount into equal shares large enough to bear some proportion to the work submitted, and if possible to at least prevent those who receive them from being out of pocket by the competition. The adjustment of these sums would be a matter for judgment in each case. They might be assigned by lot among the disappointed ones, but no one would object to a committee's natural desire to award them, with this limitation, to the designs they preferred. An equal division of premiums seems to us to be the only one which does not belie the true idea of a professional competition: to adopt it would be at least to lessen the aleatory element which is the bane of all honest competitions.

From the point of view of a committeeman we should say that equal premiums were much to be commended. Few judicial positions are more difficult and more thankless than his. By undertaking to decide competitions at all he too often exposes himself to solicitation and recrimination, as well as to error. He cannot avoid the responsibility of choosing a design, nor can he hope to secure good competitors without premiums; but he would do well to spare himself extra labor and responsibility. It is no part of his duty to assign rank to disappointed competitors, and any graduation of premiums is to him an added risk. He must take the risk of selection; but to assume in addition that of classification is simply to invite superfluous opportunities of blundering and of exciting ill-will.

It is the care of architects in this as in other things, to encourage right views of their professional relations. They may properly let it be understood that, if they compete, their competitions are for practice and not for precedence. They want first the natural prizes of their profession, — work to do, and a reasonable recognition of it, — and then to throw away as little unrecompensed labor as possible.

MODERN PLUMBING. V.

WASH-BASINS.

To take up now the particular forms of plumbing apparatus, we will begin with that most universally used, the most delightful when clean and sweet, and the most dangerous when foul or improperly put in, — the set wash-bowl.

Perhaps this is the distinctive luxury of the Northern States in the way of household appliances. There are thousands of modest dwellings, destitute of any other plumbing work, which display their one set basin, either in the best chamber, or, not unfrequently, in the parlor, for greater effect upon visitors; and Americans generally of all classes take great pleasure in marble slabs and running water. There is something touching in this universal love of cleanliness to those who have learned how heavy is the price at which it is gratified; but it can no longer be denied that plumbing work in living or sleeping rooms, especially cheap plumbing work, in the majority of cases, contributes toward shortening the lives, or at least diminishing the health and happiness of the occupants.

As set wash-basins, from being usually placed in or near sleeping rooms, are the source of more evils than any other plumbing appliances, and as from the smallness of their traps these are peculiarly subject to siphonage, we will take occasion, in describing the different varieties of bowls, to explain the principles on which the system of waste-pipes within the walls of a house should be arranged. The same principles apply also to the drainage of sinks, baths, or other apparatus, but as the evil effects of neglect of them will appear soonest, and with the worst consequences, through the medium of the basins, it will be well to enforce them thus early and in this connection.

Our ordinary wash-bowl apparatus consists of a marbled earthenware bowl, fourteen, fifteen, or sixteen inches in outside diameter, with a brass socket and strainer cemented into the bottom, secured beneath a marble slab by three clamps, and the joint filled with plaster of Paris. The waste-pipe, usually one and a quarter or one and a half inch, is secured to the outlet of the socket by a brass coupling, and the upper part of the bowl is pierced with ten or twelve small holes, opening into a short earthenware tube or "horn" attached to the bowl, which is inserted into a lead pipe communicating with the waste-pipe below, and this joint is filled with putty. This serves as an overflow. Hot and cold water cocks are fixed into the marble by a screw passing through it and a nut below, and the lower part of the screw, when the cocks are fixed, is furnished with a coupling for the attachment of the lead supply pipes.

To hold the water in the bowl there is a plug of earthenware, brass, or rubber, as the case may be, fitting the socket, and a chain to pull it up, fastened to a chain-stay bolted down to the marble. All the visible metal is silver or nickel plated. The supply pipes are generally one half inch, and the cocks three eighths or one half inch. The stoneware or brass plug is perhaps more durable than rubber, and to save annoyance should be attached by a safety chain, each link of which is in one piece, so that it cannot be separated except by a force sufficient to tear asunder the metal.

A little beneath the bowl the waste and overflow pipes join, and run together to the S-trap, which is apt to be inconveniently placed under the floor. The trap, in the old practice, was often larger than the waste-pipe, but is now made of the same, or even smaller, diameter.

The defects of this arrangement are many and great. Referring to Fig. 1, it is evident that any sewer-gas which returns past the trap will enter the room immediately, if not through the waste, which may be stopped by the plug, through the overflow, which remains always open; and it is certain that an S-trap without ventilation, which not one in a thousand has, is very permeable to the vapors of the drain. Even if the S-trap remained full of water, the pressure of gas in the soil-pipe, which occurs if the pipe is not open at the top whenever the tide rises in the sewers, or a heavy rain fills them, or when hot water is poured down, and in any soil-pipe, ventilated or not, if a considerable quantity of water is poured in at the top, will force a stream of bubbles through the trapping water; even without any pressure the vapor on the drain side of the trap will be slowly transmitted through the water to diffuse itself in the room. But in practice an S-trap in an unventilated drain-pipe is rarely full of water, and in very many cases it never retains water enough to seal the outlet at all. An instructive experiment may be made by cutting holes in an S-trap under an ordinary basin, and inserting pieces of glass, making the joints water-tight. If the basin is partly filled with water, and the plug drawn, the water will be seen to descend to the trap, and after some bubbling the whole body passes around the bend, as if drawn by suction beyond. After a moment the sucking force relaxes, and we see a little water run back into the bend of the trap, more or less according to the length of the the waste-pipe or other circumstances, but rarely more than just enough to touch the top of the bend, and very often not enough even for that, so that a free though perhaps narrow passage is left for air to pass from the drain to the overflow of the basin. Whether the quantity of water discharged is large or small, the result is about the same.

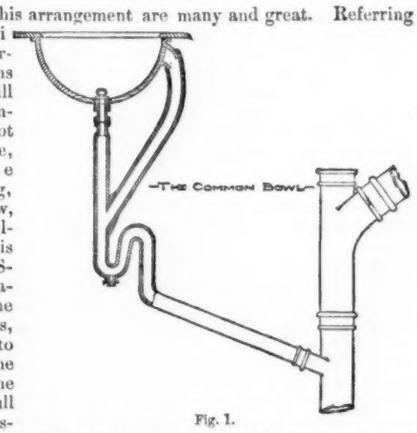


Fig. 1.

Fig. 2 shows the theoretical condition of the water in an unventilated basin trap after discharge. Fig. 3 shows the actual condition under favorable circumstances, and Fig. 4 the actual condition in a very great number of cases.

If the air in the pipe beyond the trap should be rarefied by the passage of a large body of water down the soil-pipe, or by the lowering of the total volume of water in the sewer, the trapping water, as soon as the difference of barometic pressure becomes sufficient to overcome its weight, will all vanish, as if by magic, leaving the trap dry.

This unsealing by rarefaction of the air below, as well as by siphonage, and the forcing of the trap by pressure, may be prevented by ventilation of the trap; but ventilation will only hasten evaporation, which will soon unseal any ordinary water-trap, again leaving the way free for gas to enter the room. This is especially to be feared in city houses left closed for the summer. The basin traps soon lose what little protection they ever had, and foul air pours un-

Fig. 2.

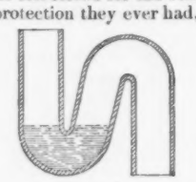


Fig. 3.

Fig. 4.

checked into the room, saturating the carpets and curtains so that no airing will restore their freshness. All city houses left vacant in the summer, and country houses left in the winter, should have the plugs or waste valves tightly closed, and paper pasted over all the overflows; and any basin, bath, or sink left unused should have water run through it at least once a week, if it is not sealed up altogether. Some plumbers put a stop-cock on the waste-pipe, below the junction of the overflow, to be shut off when the house or room is uninhabited. This is a thorough protection and easily applied.

With so many causes of failure, it is not surprising that there are few wash basins which do not sometimes form inlets for sewer gas.

An evidence of the uncertainty of S-traps is found in the popularity of the Wellington wash-bowl (Fig. 5), which consists of an outer and inner shell, the lower edge of the outer shell projecting downward so as to dip below the surface of a cup filled with water, which overflows into the waste-pipe. The overflow of the basin takes place over the edge of the inner shell. Both the overflow and outlet are thus trapped by the slight dip of the outer shell into the cup-shaped head of the waste-pipe, and this feeble trap, which is not liable to be siphoned out, although it opposes little resistance to back pressure of gas, and is quickly unsealed by evaporation, is found in practice to be more reliable in keeping out the drain smells than the common S-trap, which in theory ought to be, and if ventilated would be, far more efficient.

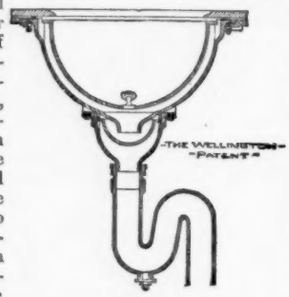


Fig. 5.

There are other basins, which go much farther in their resistance to the evils of unventilated waste-pipes by substituting for the water-trap a brass plunger valve, which is ground to its seat in the mouth of the waste-pipe, closing it perfectly until raised by the hand. The weak point of apparatus of this class is the overflow, which is either carried down separately, defended only by a water-trap, or is managed by having the plunger hollow and open at the top, so that when the water level rises to the upper opening it runs over into the waste-pipe. The obvious effect of this is that the chamber in which the plunger works is filled with gas, which oozes constantly into the room around the stem of the valve, unless a good trap is placed below the basin. A far superior device has been lately introduced under the name of Boyle's patent (Fig. 6), in which the waste is shut off by a brass plunger, as in other basins; but the plunger is made hollow, and of such dimensions that when the water rises in the bowl and in the valve chamber which communicates freely with it to a certain height the displacement of the plunger is sufficient to float it up from its seat, when the water escapes from below. A chain attached to the top serves to raise the plunger when it is desired to empty the basin. The lower edge of the plunger dips into a channel managed around the top of the waste-pipe so as to form a bell-trap of about an inch seal, and when the valve is raised there is still a quarter of an inch seal to guard against stray puffs of returning vapor.

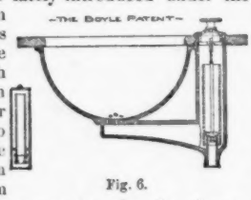


Fig. 6.

If the waste-pipe is furnished with a ventilating pipe leading from a point near the outlet of the bowl to the air, this basin leaves nothing to be desired; the brass plunger, closed at all points, is a perfect protection against returning gas, and no siphonage, vacuum, or evaporation affects its action, even if the house is deserted for years; and the bowl itself, with its valve chamber in one piece of porcelain, and the trap which can be opened and examined or cleaned by simply unscrewing a plate on top of the marble slab, form a very neat and compact apparatus. If the waste-pipe is long and unventilated, the action of the overflow in the basins, as now made, will be interfered with by the suction inevitably attending the discharge of water down such a pipe, which will draw the floating plunger back to its seat for a few seconds at a time, and possibly allow the bowl to overflow.

Col. Geo. E. Waring, Jr., devised a basin[1] in which the overflow was effectually protected by being furnished with a stopcock, worked by the same spindle as the supply cock, so that the overflow was open only when the supply cock was also open. The waste was closed by a valve, weighted so as to remain closed unless the lever was held up (Fig. 7). This was thorough work, but rather cumbrous, as overflows had to be provided for both hot and cold water to insure perfect action, and it was not always convenient to stand and hold up the waste-valve until the water had run out; and his later apparatus, in which the basin and cocks are not different from those commonly used, but the trap below the junction of waste and overflow is guarded by a brass valve, seems much better adapted for general use. The trap, as shown in the figure in its latest form, consists of a water-sealed trap, provided with a cup-shaped, weighted valve, which is thrown up by the passage of fluids, and falls back into place afterwards. No returning gas can pass the valve, which is only more tightly closed by the pressure, and any possible siphonage or evaporation of the water in the trap will not impair the seal of the valve. The action of the overflow and waste is unaffected by any suction or other action due to too great length of the waste-pipe; and to complete the list of good qualities of this apparatus, the two trap screws, one above and one below, permit easy and thorough cleaning.

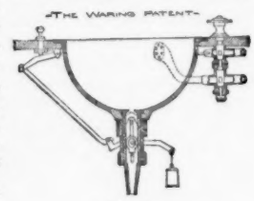


Fig. 7.

Among traps without a metallic "gate"-valve, the rubber ball-trap most nearly approaches in efficiency that just described, and under ordinary circumstances may be quite equal to it.

All these devices must, however, be regarded as palliatives, more or less efficient, of the evils arising from the radical defect of want of ventilation in the drains. With drains and waste-pipes thoroughly ventilated, the dangers against which such elaborate precautions must be taken cease to exist; with air-pipes below the traps, siphonage becomes impossible; with soil-pipes open at each end, back pressure is no longer to be feared. The only risk to which the efficiency even of water-sealed traps is exposed is that of losing their seal by evaporation, while in an unventilated system, although we can, by the use of valves, as we have seen, close our wash-basins against the entrance of sewer-gas, the foul air nevertheless remains in the pipes, at times under considerable pressure, ready to escape into the house through a leaky pipe or joint, or by the way of the sinks, bath-tubs, or other apparatus, whose traps cannot be, or have not yet been, guarded with the same successful care that has been bestowed upon basin traps.

The partial ventilation of the soil-pipe by carrying it up through the roof of the full size, and leaving the end open, or putting on a ventilating cap, is now quite general, at least in city plumbing; but the opening at the bottom, necessary to perfect action, is almost unknown in this country, though common in England. If the pipe is open only at the top, its condition is like that of a deep well, filled with stagnant vapors, which are ready to diffuse themselves through any opening. Under ordinary circumstances the gas will not accumulate pressure enough to force the traps; but sometimes, especially in city buildings, a volume of water discharged into the upper part of a soil-pipe will close the bore of the pipe, and descending, like a piston, will compress the air between itself and the tight cesspool or water-trap at the bottom of the pipe, so as to force all the connecting traps with violence, sometimes even throwing their contents out into the air.

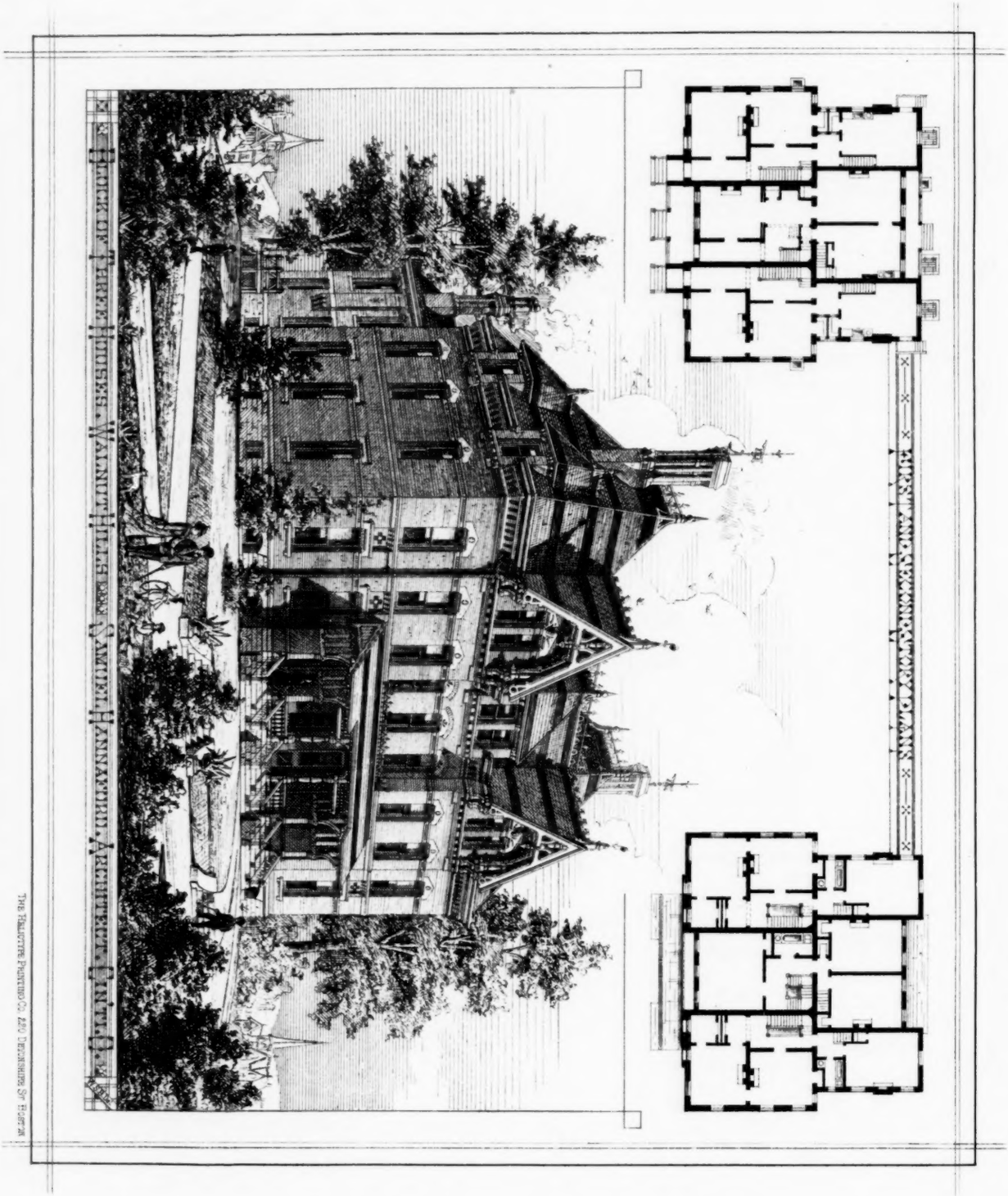
By admitting fresh air at the bottom of the soil-pipe all this is changed; a current is set up, the pipe acting as a chimney, so rapid that the air is only slightly tainted in passing, and compression by descending water is impossible.

The admission of air at the foot of the pipe is effected in England by arranging it to discharge a little above a grating, under which is a trapped receptacle communicating with the drain, but such an arrangement is impossible in our climate. In country houses ventilation may be obtained by allowing the drain to run directly to the cesspool, without the intervention of a trap; then by a grated opening in the cover of the cesspool air is admitted to the whole length of the pipe. In city houses it is better to trap the drain between the house and the sewer, and carry an air-pipe from within the trap, of the same size as the soil-pipe, up through the roof. This air-pipe is sometimes carried to the external atmosphere at the curb-stone, but this is objectionable.

Besides the ventilation of the drains and soil-pipes, the siphoning of the traps must be prevented by carrying a good-sized pipe from each trap, just beyond the bend, to the open air. These may conveniently be connected into a vertical pipe extending up through the roof, with open mouth. Every trap should have a vent-pipe, whether the soil-pipe is ventilated or not; with such vent, even an S-trap is as secure as any water-sealed trap can be; without one, even so good an apparatus as Boyle's valve works at a disadvantage, and the independent ventilation of the smaller waste-pipes is an important auxiliary to that of the soil-pipe.

With soil and waste pipes thus ventilated, we should have little to

[1] See *American Architect* for February 9, 1878.



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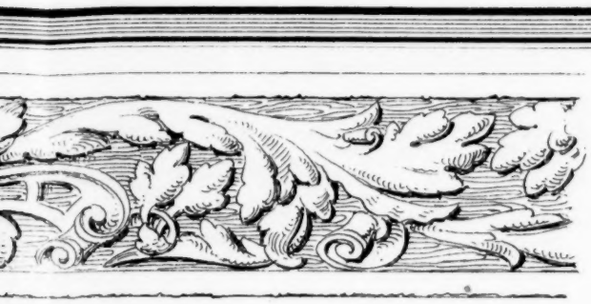
The Heliotype Printing Co. 280 Devonshire St. Boston



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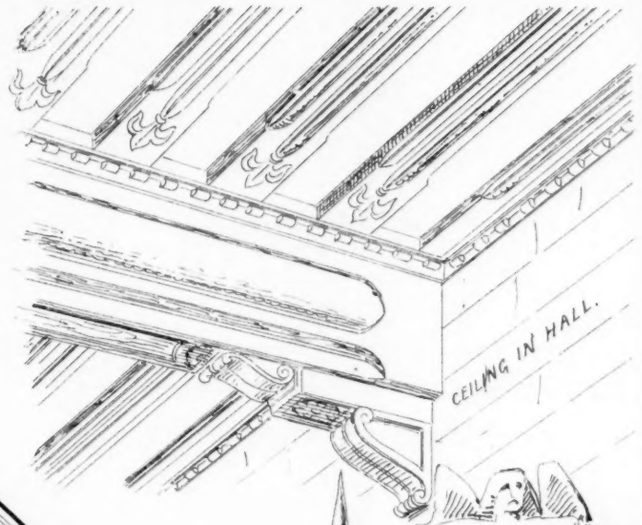
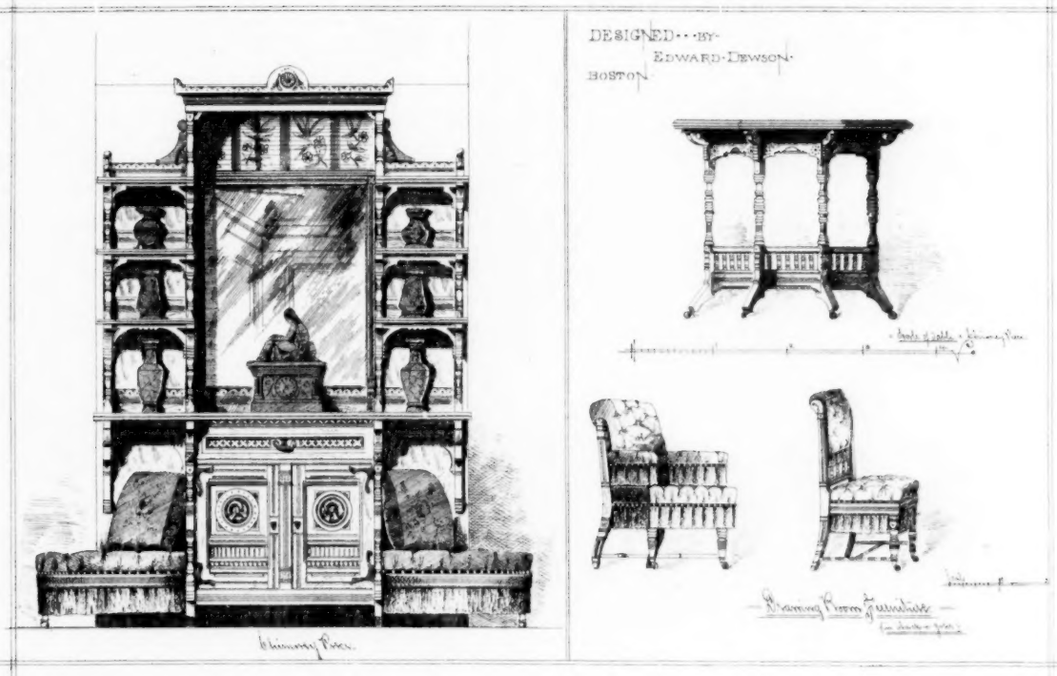


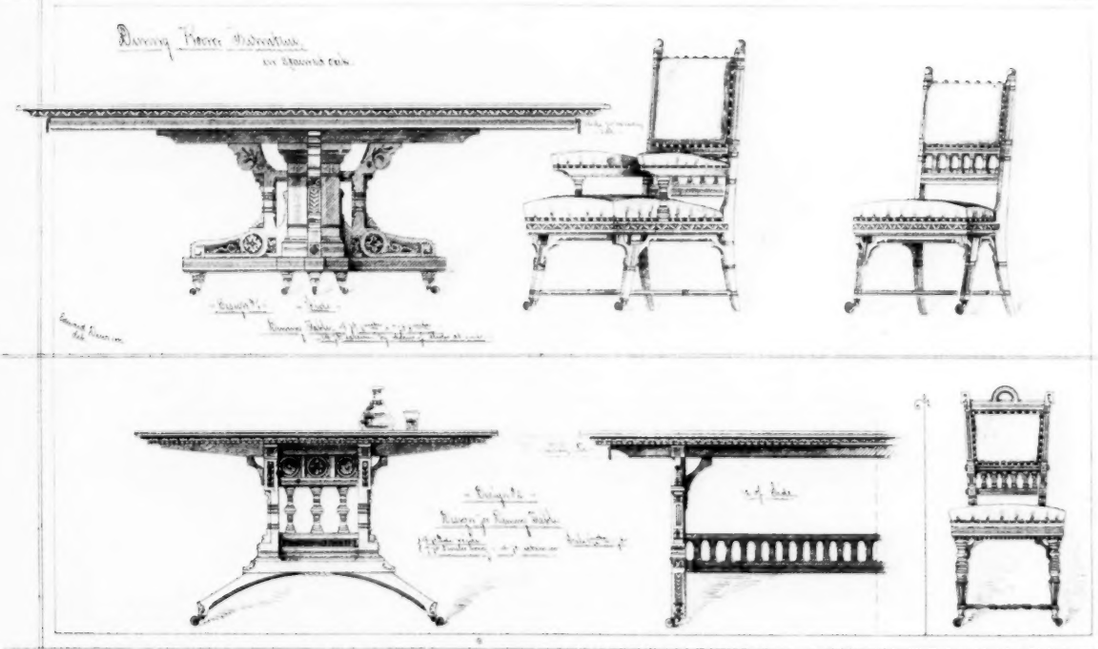
CEILING IN HALL.

MASK ON FOUNTAIN

STONE SHIELD

STANDARD BEARER SURMOUNTING GABLE.





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fear from foul air. Not only does the free access of air keep the traps in their highest efficiency, but in case of their failure by evaporation the current in the soil-pipe will tend to draw in air through the basins or sinks, instead of allowing vapor to escape, and even if, by reason of a considerable difference in temperature between the outside air and that of the room, the contrary should take place, the oxidation and dilution of the gas will have proceeded so far as to deprive it of its worst qualities.

THE ILLUSTRATIONS.

THE RATHHAUS AT ROTHENBURG. DRAWN BY MR. L. S. IPSEN, ARCHITECT.

FURNITURE FOR LIBRARY AND DINING ROOM, BY MR. EDWARD DEWSON, DESIGNER.

BLOCK OF THREE HOUSES NEAR CINCINNATI, O. MR. S. HANNAFORD, ARCHITECT.

THE ENGLISH NATIONAL WATER SUPPLY.[1]

No one who has given attention to the subject can doubt that great advantage will result from the public discussion which H. R. H. has initiated; for, although it is not possible to devise any one scheme of works or mode of supply applicable to the whole country, it is equally certain that it will be only by a perfect comprehension of the facts bearing upon the subject that any general action can be taken.

To secure general action of any kind it is necessary that every one should be convinced, in the first instance, that there exists at command a superabundance of water for all present and future requirements, even in the driest years, not by mere general statements, but by sufficient data to satisfy the most critical minds; and, in the next, that it only requires appropriate legislative facilities and a proper presiding control to develop the special capabilities of districts under their varying conditions, and to satisfy small villages and rural districts as well as towns and wealthy places.

To realize the first consideration, it is desirable that the following data should be before the meeting: —

1. The quantity of water falling upon the surface of England and Wales, in the shape of rain, — which is the source of all water supply, — taking the total area to be 37,324,883 acres, and the average annual rainfall to be thirty-two inches, is 27,019,632,000,000 gallons per year, which is equal to a supply of 723,904 gallons per acre.

2. The present population of England and Wales (1878) may be taken to be 25,000,000 — almost exactly two persons to every three acres of surface; and if this number be multiplied by 25, which may be taken to be the number of gallons required per person for all purposes, public as well as private, the quantity of water at present wanted would amount to 625,000,000 of gallons per diem, or 228,125,000,000 per annum; and if we double this quantity for future requirements, and add to it the quantity of water consumed by farm stock, horses and other animals, and that which is lost by conversion into steam, the total quantity prospectively required for all purposes may be put at 500,000,000,000 gallons per annum. This, it will be seen, is equal to one fifty-fourth part of the *average* rainfall.

3 The *minimum* quantity of rain that has been known to fall on the surface of England and Wales in any year within the period during which there has been any systematic record of the rainfall may be taken to have been twenty-two inches, or about thirty-five and a half times the necessary provision; but inasmuch as a quantity approaching three fourths of the rainfall (in dry years) is lost by evaporation as soon as it reaches the surface, there practically remains in such years only five and one half inches of water to maintain the river systems. This minimum depth of rain, however, represents about nine times the quantity of water required for all purposes when the present population of the country shall have been doubled, — say fifty years hence.

4. The *maximum* quantity of rain falling on the surface of the country may be taken to be as much above the average fall as the minimum is below it. At least forty inches of rain falls in the wettest years, and then as much water runs to waste and causes injury in the shape of floods and freshets as equals the whole rainfall in the driest years.

To realize the second consideration, the following physical and social facts should be recognized: —

1. That rain falling on uncultivated surfaces, naturally impervious and for the most part so much elevated as to be beyond the pernicious influence of human habitations and trade emanations, is the best of all waters for domestic supply, and is capable of storage to a very great extent as such.

2. That all rivers and watercourses originate in springs issuing from the water-bearing strata, and are maintained by the rain as it is absorbed at their surfaces. These springs, as they issue from the surfaces, remain, with few exceptions, as pure at the present time, and are as serviceable for potable use, — if their position were known and recorded, and their volume collected and stored, — as when the country existed in its aboriginal condition.

3. That the water-bearing strata which absorb, store, and eject, in the shape of springs, a considerable share of the rainfall, represent at their outcrop the larger proportion of the surface of England and Wales. The waters collected and stored in their subterranean depths are capable of affording to towns and villages singly, or in combination, throughout the breadth of their outcrops, a very large and cheap supply, if the condition of those subterranean waters were accurately known and tangibly recorded.

4. That in wet years, when a large proportion of the rainfall is not absorbed, but passes at once off the surface to collect in the valleys on its way to the sea, there exists a capability of storing such surplus water, not for potable use, for which it is unfit, but for compensating rivers and streams for the abstraction of pure water at their sources.

5. That all our principal rivers, and the majority of the tributary watercourses which support them, as soon as they form a collected volume, become unfit for potable uses, owing to their position as the drains of valleys, whereby they must receive all liquids flowing off the surfaces within their water-sheds, let the conditions of such liquids be what they may. Although rivers and streams, if they are once contaminated with putrescible matters, cease to be serviceable for human consumption, they may be retained for use in trade and agriculture, and for the production of fish, if certain standards of purity for liquids admissible into rivers were adopted and enforced, such as were suggested by the Rivers Pollution Commissioners.

6. That no jurisdiction of rivers can fully develop their capabilities that does not extend from their source to the sea; and that inasmuch as many springs which feed rivers rise at a great distance from their trunks, and flow by minor courses through private properties, it follows that no conservancy can be perfect which does not extend beyond the main rivers and minor streams to the extreme water-shed that is tributary to them. All springs which maintain rivers and rise in private estates, and are thus made private property, should be guarded by conservancy as vigilantly as the river-courses themselves, on the ground that they contribute to the general water supply of the country, and should be available for human consumption at their source before pollution. Many of the streams fed by these springs, and by the water of under-drainage, being polluted by mixture with the off-flowing water from cultivated surfaces, may be restored to a safe condition by filtration through natural soil, and thereby rendered fit for human consumption, where waters from uncultivated surfaces, or from springs, or from subterranean water-beds cannot be directly obtained.

7. That Parliamentary powers are frequently sought, and occasionally obtained, enabling large and wealthy communities to obtain supplies of water from distant river-basins, irrespective of local and prospective demands, before the capabilities of the basins within which such wealthy and large towns exist have been exhausted, although the committees granting these powers are incompetent in themselves to appreciate the difficult questions involved in the water economy of a country, the population of which has doubled itself within the last fifty years, without any means of extending its superficial area, or of increasing the rain falling upon it.

As it is the wish of H. R. H. the Prince of Wales to ascertain "how far the great resources of the kingdom might, by some large and comprehensive scheme of a national character, adapted to the various specialities and wants of districts, be turned to account for the advantage of the general body of the nation at large," I desire to express my conviction that if by the term "large and comprehensive scheme of a national character" it is suggested that one scheme of works or one mode of supply can be devised which shall be applicable to the whole country, I am not of opinion that such an object is practicable. The great difference that exists in the rainfall as a source of supply, the diversity of surface, the variety of soil upon which the rain falls, and the irregular denseness or sparseness of population in proportion to space forbid the realization of such an idea.

I am, nevertheless, perfectly convinced that if there existed (1) a proper conservancy of rivers extending over the whole area of their basins, (2) an exact knowledge of the hydro-geological conditions of each river-basin, and (3) legal facilities for dealing with the water rising up within, and flowing through, and existing under private properties, there would not be a single village in the country but might be abundantly supplied with pure water.

To render river conservancies competent to exercise that control over river systems which would preserve riparian and private rights, while securing to the public the enjoyment of the chief element of health, — pure water, — the first step to be taken should be the collection of all existing information bearing upon the surface and subterranean waters within each river-basin, prepared on such a form as to be immediately available and capable of enlargement as fresh information may be obtained. At present there is no reliable record of such data within the reach of either local authorities or engineers, although a mass of information exists in a scattered and very costly form, in the Ordnance and Geological Survey Departments, which might afford data whereby neglected springs and subterranean waters might be turned to account. Were this information obtainable in an authoritative shape, the indisposition of the owners of landed estates to place at the service of sanitary authorities the sources of supply which they possess by territorial right would cease to operate as injuriously as it now does.

[1] A paper presented to the late National Water Supply Congress by Mr. J. Bailey Denton, and published in the *Journal of the Society of Arts*

Numberless examples of what may be done in the way of water economy, by the use of wheels, turbines, rams, and pumps, and in the way of storage, for village supply, are to be found scattered over the whole face of the country. If these instances, instead of being disregarded, or only cursorily mentioned in Parliamentary Committees, were carefully examined and described in a popular but practical form, the serious want of water experienced in villages and rural districts, which induced H. R. H. the Prince of Wales to come to their rescue, would vanish in a great majority of cases; though so long as permissive laws stand in the place of compulsory laws in a matter of such vital consequence to every one as pure water, and Boards of Guardians are the judges of the time and course of action, so long will the present state of things exist.

During the last session "The Limited Owners Reservoirs and Water Supply Further Facilities Act, 1877," was passed, enabling land-owners to construct works of water-supply on their own estates, after having entered into a contract with any neighboring sanitary authority, to supply the inhabitants of their district with water, to borrow money for the purpose, and, with the approval of the Inclosure Commissioners, to charge their estates with the amount borrowed. Two conditions are imposed: first, that the amount borrowed should be repaid by instalments extending over a limited period of years; and, second, that the income to be derived from the sanitary authority for water should be sufficient to satisfy the Commissioners that the reversionary interests in the estates charged will be benefited by the transaction. If the powers of this Act were judiciously administered, they would work most advantageously to the country. So comprehensive are its provisions that a land-owner can not only construct reservoirs, or erect dams, for the storage of water, but he may utilize springs issuing from the surface, or he may sink wells into a water-bearing stratum, and, having secured a sufficient quantity, conduct it by proper service mains, in connection with suitable appliances, to any inhabited district within reach.

In the present session of Parliament, "a Bill to amend the Public Health Act, 1875, so far as relates to the supply of water," has passed through committee. Its object is, primarily, to compel the owners of small dwellings in rural districts to provide water where it does not exist "within a reasonable distance;" and, secondly, to facilitate the acquisition of a district supply where it is shown that a general provision would be more economical than separate arrangements. To those who are intimately acquainted with the conditions and influences which govern rural districts, and know that the owners of cottages in villages are generally persons of small means, with very limited belief in sanitary benefits, while the members of the Board of Guardians, who are to order the water to be supplied, are themselves, for the most part, the employers of the laborers who occupy those cottages to be supplied, and who will, therefore, have to pay for the water in one way if not in another, this bill does not promise much. It is believed that the want of proper dwellings for rural laborers, and the absence of all profit from cottage-building, are difficulties in themselves, which should be overcome before it is legally declared that the cost of providing water to cottages in a village should be borne by the owners of those cottages rather than by the village community as a body.

IRON AS A BUILDING MATERIAL.

Using a popular formula of speech, it is often said that iron is the material of the future. The fancy of the philosophic builder is supposed to run over a hundred instances in which the more commonplace substances used in construction are found wanting. Visions of what might have been if ingenuity had not been hampered in its enterprise by the conditions attaching to mere stone and brick, timber and boards, are supposed to overwhelm his mind. He finds rest in the contemplation of the Crystal Palace, the St. Pancras roof, the Britannia Bridge, the Vienna dome; perhaps the Great Eastern, the Devastation, and the Thunderer. "Ah, well," he reflects, "iron is the material of the future; the time will come, although I shall not live to see it, when a gentleman will run his iron house down to his place in the country by rail in August, and up again to the Belgravia of the day in February; when balloons of No. 40 or 50 gauge sheet will travel daily between London and New York; and when a new St. Albert's Cathedral, in a central situation at Wimbledon, will be built of Professor Barff's best black oxidized." Professor Barry, for instance, of the Royal Academy, who officially might not have been expected to look so far ahead, is amongst others as enthusiastic upon this point as could be desired. The architecture of the world in the future can scarcely fail, he says, to be modified by our scientific knowledge of iron, which as a building material has been almost discovered by the present generation. From the Egyptians — to whom it is, of course, impossible not to allude — we have no doubt much to learn; from the Greeks also. But had the Romans known as much about iron as we do they would have been able to teach us something. The mediæval builders also would not have clung to their primitive arcuation if they had known about iron. In the present day architects are too considerate of the past; if they would but consent to let engineers help them in construction in exchange for similar assistance in decoration, — in short, iron would then become the material of the future.

The Conference of Architects, which was held last week, seems to have dealt with iron, if nothing else, seriously. Professor Barff explained his system of creating upon the surface of this metal — as the weather does upon certain others, such as lead and zinc — a preservative oxide. Under the presidency of Mr. George Godwin a variety of fireproof inventors discoursed to each other upon the protection of iron from its inevitable destruction in great fires. Mr. Barlow, C. E., described at another meeting the construction of an iron roof recently designed by him; and thereupon Mr. E. M. Barry wound up the whole with the thoughtful reflections we have quoted. If nothing comes of all this, it cannot be said that architects have not at least, and at last, taken the subject into consideration.

But there are people of still more careful habits of thought who will shake their heads, and say that nothing can come of it after all. Indeed, when Mr. Barlow, speaking incidentally of the great Tubular Bridge of Robert Stephenson, tells us of one thing being perfectly clear, — that no such structure will ever be built again; and when Mr. Carroll, of "unpractical, romantic Dublin," tells us how he and an engineer companion, as they travelled along it, shook in their shoes with a great fear lest the wonder of the world should shake itself and all that was within it forthwith into eternity, by reason of the "tons upon tons" of ruinous red rust shaken perpetually from its dreadful flanks, these authorities are indicating pretty clearly that the scientific mind is already being rapidly disillusioned, and that before long there will be no one left to believe in the perfectibility of iron buildings, unless it be such a one as a professor, whether of architecture or of chemistry, in the Royal Academy.

It is by no means a paradox to say that nature does not undertake to supply man with building materials. He is permitted, no doubt, to hew stone from the rock, and to fell timber in the forest, and it must be acknowledged that these accidental products have gone very far indeed to serve the builder's purposes; but the not unreasonable theory that the artificial objects of building must be taken to point to the use of correspondingly artificial materials is one that has in reality been exemplified from the most primitive ages, — in the invention, for instance, of such an odd thing as brickwork; and when we are led in modern times to try what can be done with iron, it is the self-same principle that is manifesting itself, — building is being driven by its own essential artificiality to seek artificial materials. In other words, reasoning upon the matter *a priori* if not otherwise, we are entitled to say that nature cannot be expected to provide to the architect and the engineer, more than to the machinist, anything beyond the crude components out of which he shall make for himself such materials as shall best serve his ends. But however this may be, it is plain enough that in this respect the line must be drawn somewhere which shall divide the practicable from the impracticable; and it is, perhaps, more than probable just now that that line must be taken to exclude iron in a very great measure from the list of true — that is, permanent — building materials, and to leave it almost entirely to mechanical engineering and other such manufacturing art as its more proper province. Such perfectly artificial materials, for instance, as brick, terra-cotta, artificial stone, concrete, cements and plasters, lead, glass, paint, and so on, answer the builder's artificial purpose admirably. There are, likewise, many appliances of building, akin to mechanical work, in which iron is almost as invaluable as it is to the mechanician generally. There are also certain incidents of building in which, for even structural features, iron comes to take the place of timber with excellent effect, as in columns and girders judiciously introduced. But here it would really seem as if we must stop forever; crude as natural stone may be, iron cannot take its place, and, fatal as may be the effect upon timber of the dilapidation of centuries, the case of iron as a substitute is much more serious within much shorter periods of time.

The employment of iron in ordinary building is to be fairly described as being altogether that of an equivalent for timber. The principles involved — those of the post and girder, the bent arch, the truss, and whatever else — are precisely those of timber-work, and a sheet-iron covering merely takes the place of boarding. Bolts and rivets represent screws and nails, and even the angle-iron has its prototype in the work of the joiner. The only advantages derived from the use of the metal are in respect of strength and lightness, complexity of scientific design, and minute precision of calculation. Apart from these considerations, we might just as well even now be dependent exclusively upon our old-fashioned fir and oak, — old-fashioned, no doubt, but still as far as ever from being obsolete. Where, then, is the great drawback in the use of iron-work? Why is it that it has not during the last fifty years, since the invaluable article of poor Cort's invention — rolled iron — has become so intimately available and so cheap, acquired an absolute ascendency over the timber-work which seems by its side so clumsy and unmanageable? The answer may be given in a single word, — rust. Of all metals, perhaps this, the most useful in a thousand ways, is the worst to wear against the weather. Moisture in the simplest form is its deadliest enemy. Lead or zinc, for instance, as we have already hinted, when exposed to atmospheric action, becomes coated with an oxide of itself, which renders paint useless as a preservative; but iron, in forming its oxide in the same circumstances, develops a process of absolute disintegration, and falls rapidly to powder, and no preservative process yet known will protect it. Common painting, it has to be borne in mind, is simply the act of attaching to the surface of any more perishable material a coating of carbonate of lead as a material less perishable and easily renewed. Not merely oil paint, however, but the application of a coating of zinc, a much more scientific and

successful invention, is scarcely of any permanent use in practice; and if we fail in protecting our iron-work from disastrous rust, we fail in making it really serviceable as a recognized building material. Not only the architect, but the engineer none the less, must acknowledge this; and when the architect is obliged to discard iron in so great a measure, it becomes a question of time when the engineer also may have, however reluctantly, to regard it with universal anxiety.

Supposing that the general surface of the iron may, by the judicious application of some specially adapted coating, and its frequent renewal, be kept quite free from oxidation; this unfortunately does not help us, after all. It is the peculiarity of iron-work that it is never at rest. It expands and contracts considerably under ordinary changes of temperature. It vibrates still more considerably under ordinary pressures. If, therefore, we are obliged to put it together by means of such a process as riveting, — if, in other words, we have to make it up of small pieces pinned together, — then are these considerations which at once appear with reference to rust. A thousand joints offer access to the microscopic influence of atmospheric moisture in a thousand places. A thousand pins — call them by what name we please — are in one way or another constantly moving under strain, however minute their movement. Nor is this all; for, in the very act of putting the work together at first, if any preservative had been previously applied to the surfaces that are now brought into contact under the force of the smith's hammer, it is only too p'ain that at the very weakest points of all the preservative has been abraded quite away, and the veriest nakedness of the metal exposed again to the most direct and rapid creation of rust. Not only oil paint, but what is called the galvanized coating of zinc, is obviously immediately rubbed off whenever a rivet is hammered, or even a bolt tightened by a wrench. What makes the case still worse is the circumstance that oxidation, when once begun, will insidiously continue to progress even under the preservative coating. It is easy, then, to see that, of all materials as yet employed in building, iron is in practice the most incapable of defence against a peculiarly disastrous decay produced by the most commonplace, most universal, most unavoidable, and most insidious process of attack. The invisible and motionless vapor of the air, which nourishes the world, is the inevitable and special destroyer of the mightiest substance manufactured by the ingenuity of man.

That these reflections are a serious check to the aspirations of building science it is needless to deny, but enough has been said to show even to the meanest capacity that, so far as it has yet gone, iron is emphatically not the material of the future. — *The Architect.*

CORRESPONDENCE.

WHAT THE ELEVATED RAILWAY ACTUALLY DOES FOR STREET ARCHITECTURE.

NEW YORK.

IT had been my pleasure, as it had been no doubt the agreeable occupation of many others as well, to take frequent strolls about the city, studying the buildings and finding amusement and profit in seeing what had been accomplished, and gaining warning and wisdom by the failures of others. But now upon several important avenues of the city this experience is enjoyed only in reminiscence, for with the rise of the elevated roads the opportunity to do anything in the way of sight-seeing is entirely gone. Before the streets were straddled by these gridiron structures there was opportunity to see the collection of buildings which make up the town, but now it is only by much care in selection that one may find a vista, where up and down the thoroughfare the eye may wander along the lines of buildings, and enjoy a panorama which can only be met in the heart of a great city. Do you not believe it? Come with me, and let us work our way up town, under the shadow of this thing, which stands at once a monument of American character and simplicity, shows with what a reckless disregard of cost New Yorkers set about securing their ends, and proves that their squandering is not all done during European trips.

We are at the Battery, where, if the will only existed, the finest residence in the city might be secured without any need of rapid transit. Turning into New Church Street, cut through at so great an expense but a few years ago, we find one end of the long iron ribbon. The street is dark and damp; not quite as dark as a tunnel, nor is it running with water, but it has not the bright, open sunniness that we have a right to expect. The first few blocks are ordinary warehouses and not much is lost when they are cut off from view. To our right is the great pile of the rear of the Adams Express Company's Building, worth looking at, but lost to view forever. Trinity Church comes next, and here the sacrilege of the road begins; not content with making a Pandemonium of the neighborhood of the church, they have cut off what was one of the best views of it. The seven-lighted chancel window, with the quatre-foil in the gable, and the clerestory and the rows of pinnacles, bearing testimony to the honest, unambitious work of one of the first architects New York ever had, all are gone; while the Withers addition to the chancel end of the church, which we have hardly yet had an opportunity of seeing, is, as it were, smothered in its birth. Its effect may be good, as its details are certainly carefully studied, but it is gridironed out of sight. Across the street a lowly structure, now a vile-smelling stable, bows its ancient head before the iron Moloch, and recalls the poet Bryant's natal year in the inscription over the door, "The Episcopal Charity School, 1794." Mr. R. M. Upjohn suffers no less than his father in having the Trinity schools cut off. To be sure, from Trinity Place the upper story and tower may be seen, but such disjointed views of a building are unsatisfactory, while the gargoyle heads at the tower corners look out as though to vomit their indignation upon the incubus below. St. Peter's School, on the corner street, suffers with its neighbor, showing that the railway is no respecter of creeds, as it surely is not of personal rights. The Liberty Street Police Station next is thrown into the shade, while the view of Liberty Street to the Mutual Insurance clock is another of the past privileges. The Coal and Iron Exchange suffers with a station directly at its side. The angle view of the building is gone, but then one can walk Church Street, even though it be in partial darkness, without catching a glimpse of that meaningless pediment and pair of columns which make the main entrance of the building so pretentious. St. Paul's Church, now the oldest ecclesiastical structure in the city, is not spared, and the view from Fulton Street across the old church-yard to the Wren-isle spire, is gone, with all its associations. At the northwest corner of Vesey and Church Streets is an iron front worth the looking at if it could be taken in perspective; but now the only view is one in elevation, had with the penalty of an almost dislocated neck. The classic front of St. Peter's Church, at Barclay and Church Streets, from the opposite junction of three thoroughfares, now shows only a few bases with bits of column attached.

We will be honest in our observations, not shut our eyes to the good points of the road and note that at Park Place a providentially placed station hides in a measure the *Tribune* tower. But the road is leaving Church Street, and makes an ugly twist over the sidewalk at Murray Street; and it is noteworthy with what respectful deference thus far even the busiest of those below avoid the chance of a crush, and give the iron horse the right of way below as he certainly has it above. When he has passed on we resume our walk. College Place lying low the posts run high, and the groping is rather less strongly felt. At Chambers Street the view up West Broadway and along to South Fifth Avenue can no more be taken. Thruber's store is there yet, about this point, but its cheek is rudely rubbed by the intruder. Claflin's wholesale house is caught by the iron band about the third floor, and on warm days the dust, smoke, and cinders flying in at the open windows can be no advantage to the fine goods. One result of having the road high is that all the little, scrubby shanties show off as well as ever. The little parks along the route are pounced upon by the station designers to drop their dog-legged stairs and threatening platforms upon. St. John's Church has a Renaissance tower, and looking up York Street it could once be fairly viewed, but can be so looked upon no longer. Jumping Canal Street, the comparatively new church of St. Alphonse gets whatever of beauty it may have had effectually blotted from sight. Very considerately the road of South Fifth Avenue constricts itself, giving us a chance to still look upon the "dear cabin homes" which bolster each other up along this broad avenue, and give shelter to countless broods of pickaninnies. Along this section, too, the hollow box-girders which are employed respond like so many sounding-boards to the roar of the passing trains, and a capital imitation of heavy thunder is afforded the street passenger. At the corner of West Third Street is another twist and another passage over the sidewalk, and again the sub-ferruginous public respectfully stand aside. Here St. Clement's Church gets its quaint little face still further hidden. The Union Reformed Dutch Church wardens no doubt thought they had a choice site on Sixth Avenue opposite Third Street, but they must now take a very close view of their shrine, since the iron will of the contractors has cut off the long view. St. Joseph's Church, on the block above, never very conspicuous, is still less so now, and the Greenwich Bank building, by Mr. Thomas, architect, has lost its quiet dignity in the company of the mid-air rail. At the Jefferson Market Court House there is provocation for a downright anathema. We had hardly begun to get at the full merits of the tower and its attachments, and had only begun to enjoy this really good thing, when it is swept from our sight by this piece of convenient ugliness. The old Lutheran Church at Fifteenth Street, and the Jardine flats corner Fifteenth and Sixteenth streets, suffer for their contiguity with the road by having all good view of them cut off. The modest bit of crude Gothic in the Church of the Holy Communion, corner Twentieth Street, has gone into an iron, in addition to its leafy, seclusion.

At the corner of Twenty-third Street the road makes a double stroke, and decapitates at once Renwick's excellent bit of Italian in Booth's Theatre and Le Brun's Masonic Temple. No doubt there are many who admire both of the buildings, but they can do so now no more. The confusion and the obscuration are intensified by the great platform built at this point. St. Omer's Hotel, under the flank of the Temple, runs chance of having its secrets exposed to the rattling passengers, while its garish face is lost to sight.

The Racquet Club building is the next victim of the road, and a real victim too, for it had a story to impress of honesty in construction, freedom from shams, and truth of expression which no other building of the city so well combines; but it is gone. It was one of the few buildings of the city that are really architectural in conception and treatment. Ah, here is another good point! By keeping carefully to the west side of Sixth Avenue the traveler may walk up and down without having the Union Dime monstrosity thrust in his

face; for this, thanks. Dr. Taylor's church once enjoyed a favored and conspicuous site, but now it takes its chance with the other victims along the line. From the opposite side of Reservoir Square the passing to and fro of trains makes a pretty spectacle; but Lyric Hall is out of view, and on the opposite way the churches on Fortieth and Forty-second Streets, with the Harmony Club House and the Hotel Royal, all go into obscurity to Sixth Avenue pedestrians. Above Forty-second Street a few showy flats have their gaudiness put out of sight by the road, though no one loses much except perhaps the owner, who finds pleasure in seeing brown stone tortured. At Fiftieth Street, there was at one time a view up the street to the Roman Catholic Cathedral, where one tower could be seen, but the pleasure of this view is henceforth a mere remembrance. Dr. Hall's church and Dr. Morgan's church have towers and spires which are worth the looking at, but now the occasional glimpses that might have been caught over the house-top or along the street openings are gone. At last we reach the Park, where there is a great pother of puffing dummies backing to and fro, making an escape into the Park a leap from Hades to the shady side of Elysium. With such a construction before him, there is no encouragement for a property owner on the line to build a striking or expensive façade. And then think of the money sunk in attractive signs along the route! The four miles of the road render useless, because invisible to any large number of people, at least twenty thousand dollars' worth of signs.

But let us shake off the general dustiness we have gathered by the walk along the substructure of the road, forget the holes burned in our coats by hot cinders, overlook the few grease splashes upon our summer hat, and forgive the brakemen who found amusement in squirting tobacco juice down upon us, and let us go up and follow the unthinking populace in encouraging the monopoly. Oh, how delightful! Bless me, here we are at old Trinity again! I take it all back; let architecture and property rights and personal privileges and past associations, perish, so long as we can so fly through the air without following suit. W.

A QUESTION IN PYRONOMICS.

Charleston, S. C.

To the Editor of the American Architect:

Dear Sir,— Will you be kind enough to inform us, if you can, if there is danger of spontaneous combustion arising from sawdust being confined in the floors and walls, etc., of a factory (door) such as our own.

Also, if there would be danger from the same material being used as filling to deaden sound between the ceiling and floor of a schoolhouse; would spontaneous combustion be likely to arise under these circumstances?

An early reply will greatly oblige, yours very respectfully,

T. Manuf. Co.

NOTES AND CLIPPINGS.

The Assault on Labor-Saving Machines. — The Grangers of Ohio and Illinois are reported to be suffering just now from a most audacious attempt at wholesale "rattening," which is done either at the instance of the army of tramps or of communistic workingmen. The old-time war cry against labor-saving machines has been raised once more, and the farmers, under threats of barn-burning and bodily injury, have in many places been obliged to put by the reaping machines and binders, on whose powers they have depended to save them from pecuniary loss in harvesting the crops, and have been forced to get in their grain by hand. It is a question whether those who yield to the threats will be any better off than those who resist them, as far as pecuniary matters are concerned; for it can hardly be the intention of the men who make the threats to labor honestly as was done before the days of reaping machines, even if disuse has not caused them to lose their quondam skill. Wages have not fallen in the same ratio as the market prices of daily necessaries, and to attempt to make a profit on grain that must be sold at ante-bellum prices, while wages double those paid fifteen years ago must now be paid for half the work, cannot but prove disastrous. It cannot cause wonder that some farmers have decided to harvest by machinery, or else let the crops rot where they stand.

What British Workmen may see at Paris. — Apropos of the suggestion of the Prince of Wales that a body of English artisans should be sent to Paris to examine and report on the Exhibition, in the same way that the French *ouvriers* visited the Centennial Exhibition and as a similar body of Austrian workmen is visiting the Exhibition at Paris, the *Pall Mall Gazette* offers this pertinent bit of advice: "In order that it may be as useful as possible, the artisan reporters should be advised to take careful note of the great advance made by foreign manufacturers in competition with English, an advance that of course arises mainly from two causes, — the superiority of their workmen, and the fact that they can be depended upon to execute orders. They will find that strikes, and the uncertainty they have introduced into contracts, — no manufacturer feeling sure that he shall be able to execute his contract either as to time or as to price, — are rapidly throwing the work of the world into foreign hands. They will find that while they have been standing idle, — in a self-created paradise, as if they had a monopoly of technical intelligence and skill, — the foreigner has gone ahead, and that his workmanship in many departments of skilled labor is now equal to or even better than English. If they bring back from Paris a conviction that no time must be lost in retracing false steps, and can succeed in imparting that conviction to their fellows in their several workshops, they will do a service to the class to which they belong exceeding any knowledge of processes or products which they may acquire." This lesson might with advantage be taken to heart by our own workmen.

Government Treasure-Vaults in New York. — In addition to the great vault attached to the Assay Office in Wall Street, built about three years ago, and having space for the storage of $8,800,000 in silver coin, the Federal Government has in course of construction in the basement of the Sub-Treasury building still another of far larger dimensions, which will be finished October 1. The former is 18 x 17½ feet, and 8 feet in height, made of boiler iron; the latter, 47 x 28 feet inside, and 12 feet high, made burglar proof, designed for the expected large accumulation of silver coin under the operation of the new law. This new vault is building under a contract with Geo. L. Damon, of Boston, who has about twenty men employed on the work, and is spoken of as the largest in the world, considered as a single inclosure, surpassing even that of the Bank of England. The estimated cost is $22,000. The outside granite walls are six feet thick, while the safe proper will be two inches in thickness on all sides, formed of alternate layers of iron and steel. The plates for the floor are laid directly on a stone flagging, supported by a solid bed of concrete, so that it would be folly for burglars to attempt to reach the treasure within by any process of excavation from outside. The top of the vault will be supported by rolled iron beams and girders let into granite columns, while lattice partitions of iron to support the bags of coin will divide the vault into a dozen stalls, arranged on either side of a longitudinal aisle. The general plan is not unlike that of an ordinary horse stable, and keeping in mind the heaps of treasure to be stored on the spot hereafter, is suggestive of excellent feeding. Four openings in the ceiling and as many in the floor, covered by strong gratings, will provide for ventilation. The process of cutting out the brick floor of the Sub-Treasury building so as to convert two stories into one, is the laborious task now engaging attention, directly under what is known as "the gold-room." When completed, communication between the gold-room and vault will be by means of an elevator and staircase, so that coin can be easily transferred. — *The Iron Age.*

Cheap Land. — A large sale of land was made in New York on June 26, which was remarkable for the low price at which the land was sold. The average price per acre, realized on 360,000 acres of good white-oak timber and mineral lands in McDowell County, W. Va., was only one cent.

Delaware Mounds. — Certain mounds on Middle Sound, about ten miles east of Wilmington, Del., have been opened lately, and in the middle of one of them were found charred bones which evidently belonged to more than one person. It has been suggested that they may be the remains of some of the colonists of Sir Walter Raleigh's unfortunate expedition, concerning whose fate so little is known.

The Sutro Tunnel. — About 11 o'clock P. M., July 8, connection was made between the tunnel and the 1650-foot level of the Savage mine. A strong draft of air at once poured into the mine, blowing out the miners' lanterns and wafting the Savage drift with dust and gravel.

Waterloo Bridge, London. — The trouble with the Waterloo Bridge in London is that when it was built sixty years ago the masonry was started on piles, only two feet below the bed of the river. The river is now eight feet deeper than it was then, and the wooden crutches appear to have suffered from undermining, and are now considered unequal to support the superstructure above. The engineers recommend that the wooden pier be fenced round with wrought-iron caissons filled with concrete till the whole is a solid mass, which, it is stated, will render the bridge perfectly safe.

Durability of Lead Roofs. — It is said that the lead roof of George Heriot's Hospital, at Edinburgh, has lasted since 1650, an occasional patch being the only repairing that climatic action has made necessary.

Influence of Light upon Cement. — Dr. Heintzel thinks that the influence of light upon cement has not hitherto been sufficiently considered. He instituted some experiments upon a quantity of cement, which he divided into three parcels, exposing parcel A to the air and full light, B to the air and diffused light, and secluding C in darkness from the air. After six months he found that A made a weak mortar, by absorbing 38 per cent of its weight in water, and it had become crumbly; B, with 33⅓ per cent of water, made a mortar which was too adhesive to the trowel, and it yielded up none of its water; C, with 33⅓ per cent of water, made an excellent mortar, easily stirred and flowing, and it relinquished some of its water. After setting for twenty-eight days, the relative strength was: A, 3; B, 37.9; C, 44.6. — *Dingler's Journal.*

Photography and the Electric Light. — An architectural photograph of a large building, says the *Scientific American*, has been taken in Dundee by means of the light from a Gramme dynamo-electric machine of a power equal to 800 candles. The view was taken by fifteen minutes' exposure in a crowded thoroughfare, during a drenching rain, and within an hour of midnight.

A New Way of Producing Magnetic Oxide. — The Chicago *Tribune* says that a process simpler than Professor Barff's for protecting iron from rust has been invented by Mr. G. Bower. He places the articles to be coated in a chamber of fire-clay provided with two pipes, one for the admission and the other for the escape of air. Both pipes having been closed, the heat is raised to a temperature of about 1,700 degrees Fahrenheit. At the end of each hour the pipes are opened, so that atmospheric air may be forced into the chamber by the one, and the deoxodized air driven out through the other. This is continued until a sufficient film of magnetic oxide is formed on the articles The coating is a beautiful light gray or neutral tint, very delicate in appearance, and it perfectly protects iron from rust. Under all circumstances, the invention is deemed to be invaluable.

Statues for the University of Kiel. — The models of the statues which are to decorate the façade of the University of Kiel have been submitted for approval by the sculptor, Leopold Rau. They represent Plato, Solon, Hippocrates, and Aristotle, and are highly commended.