THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. IV.] Copyright, 1878, HOUGHTON, OSGOOD & CO. [NO. 143.

BOSTON, SEPTEMBER 21, 1878.

CONTENTS.

IN his late address before the Manchester Society of Architects, Mr. Waterhouse took what has seemed to us to be the manly and sensible position in regard to the criticisms which the public has been prone to make on the work of architects, and the distrust of them which is now and then shown. He said: "May we not be becoming over-sensitive to adverse criticism? Does not the attention bestowed upon our works by some distinguished and cultivated people show a satisfactory interest in modern architecture? and though they may abuse its want of vitality, — sometimes as we may think, ignorantly, — is it not better for our art that their utterances should be sometimes adverse rather than non-existent?" It is in truth the popular interest in what architects are doing, the sense of its necessity, that makes the public care to criticise them. Herein, as we have once said, is the architect's opportunity. It shows him that the work he is doing is of recognized importance, and that if he can command approval his reward is sure. If the public turns to builders or to engineers to do his work, it is simply because it expects to get certain things from them. It becomes the architect's duty to show that so far as these things are a part of his work there is no advantage in going to anybody else for them; that on his own ground he is superior to the engineer and builder, and on common ground he is their equal. From any ground on which he cannot compete with his rivals he must be content to retire, and his professional pride cannot save it to him. We are apt — architects, and American architects perhaps more than others — to make the twofold mistake of assuming that public criticism is an offence, and that we have nothing to learn from it. The criticism of the public is mostly of a practical kind, and indicates practical wants that the public will have supplied by one person or another. There is no practical requisite of our work which we cannot supply to its satisfaction if we will take the trouble, and when the public is convinced that we do this there need be no fear of intrusion by rivals in our proper field. In architectural design the public has always been led by architects, and always will be unless they forfeit its confidence by incapacity in other things which it can better understand. Even here the criticism is of value. It may be often wrong, but it will be often right, and if we were accustomed to listen to it we should soon learn to distinguish tolerably well when it was right. Our architecture is by no means above criticism, — we may as well confess that on the whole it is not very good, — and if to general criticism we could habitually join a professional criticism which should be at once kindly, discriminating, and outspoken, and could learn not to receive dispraise as an affront, but to study what value it might have, our improvement would be quicker.

IT has been the habit to believe that decorative art had its home in France, and *par excellence* in Paris, where it grew so naturally as to have no need of the artificial stimulus of a protective association. But it seems that the great advance which the world outside of France has made in this respect of late years has roused the French into some alarm lest they should lose the preëminence which they have been accustomed to consider their own. A society for the encouragement of such art has therefore been formed in Paris, among whose many presidents are the Prefect of the Seine, the Duc d'Audifret Pasquier, and other notabilities less notable abroad, and with Mr. Cunliffe Owen and Sir Richard Wallace among its honorary presidents. About a hundred and fifty thousand francs was soon subscribed, and a museum was opened with small beginnings in the Pavilion of Flora, in the Tuileries. The society has issued a prospectus calling attention to the advance shown in the decorative work displayed in this year's exhibition by foreign nations, among which Americans may be gratified to find their own mentioned; and reminding their countrymen, probably without exaggeration, that though they "possess, in virtue of their innate taste, a superiority," they must gradually lose it unless they bestir themselves to get the full advantage of the traditions of art which are transmitted among their workmen. Thus it appears that international exhibitions, however doubtful their profits in some respects, continue to bear substantial fruits. The present advance in art of England dates, as we know, from the first world's fair of 1851; our Centennial — favored to be sure by a preëxisting influence in society — has given an immense impulse in the same direction to American industry; and now we see that even in France, secure as she has thought herself in her preëminence, the like opportunity produces the like result.

WE have not seen in any of the recorded testimony before the Congressional Labor Committee more clear sense than in that of Mr. J. H. Walker, a shoe manufacturer of Worcester, Mass. He has written it out at length, at the request of the chairman, and has printed it in the *Boston Daily Advertiser*. It would make an improving pamphlet for distribution among those of the workingmen who are open to instruction on the causes and difficulties of their present condition. The experience of coöperation which he cites is worth quoting for the illustration it gives of the difficulties of this remedy, and the unprepared condition of the workmen's minds at present. The experiments which Mr. Walker has tried, and those which he has watched, have been unsuccessful, because, he says, the workmen cannot be made to believe how small the percentage of profits in manufactures is, and are unwilling to wait for their slow return. Eight years ago he tried to interest his operatives by offering them a share of profits. He asked them to contribute from their wages to the working capital of his business, allowing them their share in the profits *pro rata*, and without taking any account, in the division, either of interest on the "plant," or of compensation for the services of any member of the firm. But no workman below the grade of foreman was willing to try the experiment. Another large manufacturer, who tried coöperation on a different plan, divided a quarter of his net profits among so many of his workmen as stayed long enough to earn a certain sum in any year, — $100 for men, and $50 for women. This was done for six years, in the hope of encouraging good work and economy of material, the dividends being from two to five per cent. (on the capital?) each year, except one year when there was none. But the men could not be made to believe on what small economies of material the profits depended, nor that the dividends, which they expected to be many times greater, were honestly made. The experiment was given up, as of no real benefit, but rather a breeder of distrust and annoyance.

THIS is no more than might be expected by those who will consider the ignorance, not only of workmen, but of all inexperienced people, concerning the employment of capital. Such people are not easily persuaded how small the ratio of profit is to actual disbursement, or to the number of people engaged, just as the communist cannot believe how little way the riches of the wealthy would go, if divided among the poor. If the weaver, tending two or three looms, each of which turns off say forty yards of cotton cloth in a day, could have it fully borne in upon him that the profit of manufacture was only a quarter or even an eighth of a cent the yard, and be made to see that his share of that when it was divided among all concerned must be a small one, he would have a useful lesson. But this is not learned by such experiments in coöperation as Mr. Walker describes, or by any that capitalists are likely to offer. Here is the weakness of all systems of coöperation yet proposed, between manufacturers who must naturally insist on administering their capital, and

their workmen; and here is the value of such attempts as that we mentioned a fortnight ago, by the Crispins of Chicago, to establish a manufactory, by their own capital, and under their own management. Such an arrangement as that devised by Mr. Walker, we may add, could hardly be expected to satisfy the workingman, liberal and even generous as it was in its kind; for it does not answer to his idea of what ought to be allowed him, which is an opportunity, not to save capital for himself, and invest it to advantage under the control of other persons, but to receive for his labor alone, over and above his wages, and with no need of saving, a share in whatever profit is made. Even if this were found to be practicable, however, it would not lead to the result that is the condition of a healthy relation, which is, that if he is to concern himself with capital he should understand the necessities of its employment; the other condition, that he should contentedly acquiesce in the management of those who are wiser than he, being apparently a thing of the unreturning past.

The war between the farmers and miners in California promises to be a close struggle. An association has been formed, to include the farmers of the whole Sacramento region, which is called the Anti-débris Association of the Sacramento Valley. Its purpose is "to prosecute to the courts of last resort" the suits entered by the farmers to defend their estates against the ruin which is threatened them by the débris with which the hydraulic mining companies are flooding the rivers. The litigation must necessarily be very costly, for the interests involved are enormous, and the suits will be contested in every successive court to the last possible point. The subscribers to the association pledged themselves to an assessment of three per cent. on their assumed interests in the contest, and showed a strong determination to carry it to the end. At the organizing meeting, $170,000 was subscribed as the fund on which the assessment was to be levied, but this is probably only a small part of what will be needed to carry on the war, and of what is expected from further subscriptions. On the other hand the mining companies throughout the State are united for the defence. Being wealthy, and more used than the farmers, by virtue of their occupation, to stake their money on hazards, they will make the struggle a long and expensive one.

The whole amount expended on the East River Bridge up to the first of September is shown by the report to the trustees to be $9,833,988, and the amount due upon it, $112,309. The granite necessary to complete the anchorages had been contracted for at a cost of $17,467, and to this must be added 32,000 pounds of iron stay-bars which must be built into the anchorages, at a cost of $1,920, as soon as the great cables are finished, in order to bring the work to this point and make it secure during the winter. To provide for this necessity the recommendation of the Executive Committee was adopted, authorizing the officers to borrow money to the amount of not over $260,000, in anticipation of payments expected from the two cities of New York and Brooklyn, and an order was passed to bring suit against the city of New York to enforce payment of the sums due from it, which the city at present refuses to pay. The subject of the transit of freight and passengers was again referred to a select committee of five trustees, with a view, we suppose, to the vexed question of running trains of cars over the bridge.

The Chicago Academy of Design, reorganized last spring, as we have before described (*American Architect*, May 25, 1878), is promising an active year under its new management. The day schools are fairly at work under Messrs. Earle and Spread; the evening schools were to have opened this week with a class for drawing from the antique, to which a life-class is to be added by and by. A course of historical lectures upon architecture is to be begun next month by Mr. Jenney, late professor of architecture in the University of Michigan. Mr. Leonard Volk, of Chicago, the sculptor of the Douglas monument, is busy with the first of the four statues which he is to model for its base. The figure which is to personify the State of Illinois is to be sitting on the right of the door of the tomb, holding in one hand a shield and in the other a shock of corn, and dictating the story of Douglas's life to History, toward whom her face is turned, and who is to sit on the other side of the door, recording the story upon a tablet. The figures are to be of bronze and of heroic size. It is expected that they will be finished before the summer.

THE NINTH REPORT OF THE MASSACHUSETTS BOARD OF HEALTH.

It was a habit of rustic cynics a generation ago, and, for aught we know, of other cynics, to quench their more fastidious fellows with the dictum that every one must swallow his peck of dirt, — an adage that was mainly of use as an excuse for making the peck a bushel. It had not a scientific basis, but all the researches of modern sanitary science seem bent to show that it was at least within the mark, and that one may be content if he can, with the utmost precaution, keep within this allowance, and can insure that it shall not be poisonous as well as dirty, — in so many and so insidious ways does obnoxious matter intrude itself into what we eat and drink and inhale. The cynicism is apparently not abated by the verification of the adage, even when enforced by the lesson of danger that goes with it. Communities or households which have long lived contented in the conviction that a certain degree of uncleanliness is a matter of course are not easily brought round to the sudden belief, in apparent contradiction of their own experience, that it is pernicious and may be ruinous, at the bidding of a parcel of men whose science they distrust, and whose occupation seems to them idle if not impertinent. Hence the public apathy or hostility to the regulations which sanitarians propose, the slowness of people to learn that a vast amount of disease and death comes by common offences against cleanliness which may be and ought to be prevented by joint action or legal restrictions; and hence it follows that boards of health must add to the labor of providing for the public hygiene the labor of persuading the public that the provision is necessary, and justifies the degree of sacrifice which it requires.

How much the apathy prevails is significantly shown in this Massachusetts health report by the record of the votes cast at the last election, when it was set before the cities in the State by legislative act to decide whether they would appoint boards of health, Boston being up to that time the only city which had one. Out of eighteen cities, eight voted to appoint the boards, five refused, and five ignored the matter altogether. What is more surprising than the small success of the experiment is the small interest in it shown by the voting. In Cambridge, where the vote far exceeded that of any other city on the question, it was carried by 2,003 to 468, the population being about fifty thousand. In Lowell, a somewhat larger city, the vote was 983 to 335, and in no other which accepted the proposition was the aggregate vote greater than eight hundred. In Fall River, a town of about the size of Cambridge, it stood 174 to 52. Indeed, more enthusiasm was shown in rejecting the boards than in accepting them. Thus, in Gloucester, with about seventeen thousand inhabitants, the vote was 629 to 819; in Newton, with the same number, 545 to 779; in Fitchburg, with twelve thousand, 118 to 648; in Lynn, with thirty-three thousand, 312 to 739. Yet Gloucester, which refused to provide itself with such officers, is a town that is in an exceptionally unfortunate plight with its drainage, and has, within the past few years, been scourged with diphtheria in a manner that might be expected to bring the most disregardful population to reason; and Taunton, which did not honor the question with a vote, being in a very similar condition, was last year savagely attacked by the same disease.

The report itself of the Board of Health is a good example of what such a document should be, — clear, simple, and sensible in its recommendations, moderate and judicial in its tone. The subjects it has to deal with being somewhat unpopular, its recommendations are obviously tempered to the undeveloped condition of public opinion. In this we dare say the Board shows a true sense of what is practicable, while it stops short in several respects of what we should like to see done, and doubtless of what it hopes ultimately to accomplish. Its chief attention is given necessarily to questions of sewerage, of water supply, and of the pollution of streams, its most important practical recommendation being the passage of a bill which the Board has prepared and proposes for the action of the next legislature, to limit the pollutions of streams, with which are included ponds and tidal waters. The bill is very moderate in its provisions, and drawn with as much tenderness for existing rights or privileges as is consistent with reasonable efficiency. It forbids any town, corporation, or individual to discharge solid refuse of any kind into streams, public ponds, or tidal waters, or to interfere with their volume or flow except for the sake of sanitary or other improvements; and all filling or other "improvement" is to be under charge of the town authorities, subject to regulations of a

River Pollution Commission. In regard to streams or ponds used as water-supplies, the bill forbids any increase of the quantity of refuse now poured into them, or the discharge into them of any of the soil from dwellings within thirty miles up stream from the point at which water is taken. It is also provided that any refuse whatever that is discharged into such waters shall be purified to the satisfaction of the River Pollution Commission; but this provision, taken in connection with the preceding, is rendered almost nugatory by the limitation that it shall not apply to any now existing pollution. The pollution of other waters is to be regulated by the boards of health of the various towns, in conjunction with the Commission. Other sections of the bill are intended to protect towns which are sewered against the discharge into their sewers of substances which will injure or obstruct them, or make the sewage more difficult to dispose of. The plans of all new systems of water supply or sewerage and of all new dams are to be subject to the approval of the Commission, and the same restriction is applied to the arrangement of water-supply and drainage in all new state buildings. Finally, the direct discharge of soil from privies, water-closets, and wash-tubs — sinks and bowls might well have been added — into any stream whatever is forbidden.

The section which provides that in any sewered town "the local board of health shall, upon application from any parties, order any privy or cesspool to be abolished, and connection to be made with the public sewers," would be likely, unless modified, to lead to collision in cities like Cambridge, where an unfortunate ordinance exists that requires every house-drain to empty into a cesspool, from which only the overflow may be carried into the sewers. That privies and cesspools shall be abated is devoutly to be desired; yet to enact that in a town where they are required by ordinance the board of health shall, without discretion, abate any of them on application of any person, whether he be affected by them or not, seems to us to be making a law which must remain a dead letter, or else had better give place once for all to one which nullifies all such ordinances.

It will be seen that, excepting for the provisions against discharging into streams the soil from human dwellings, which in some form or other are absolutely necessary, the bill carefully abstains from interfering with existing privileges, and confines itself to preventing as far as may be any increase of the pollution which now is. Nevertheless, it is pretty clear that even the existing uses of the water will, if continued, in time do serious injury, and that therefore something more than the modest restrictions now proposed must by and by be imposed. In regard especially to defilement by soil from dwellings, the thirty-mile limit proposed by the Board in case of water supplies cannot be considered as absolutely safe, as it certainly cannot be counted comfortable, when doctors disagree as to the possibility of disinfecting sewage by any amount of dilution. One authority quoted in this report, the late Dr. Letheby, medical officer of London, claimed that sewage diluted with twenty volumes of water would be destroyed in a flow of six or eight miles: on the other hand the English Commission on the Pollution of Rivers has reported that "there is no river in the United Kingdom long enough to secure the oxidation of any sewage which may be discharged into it, even at its source." On the whole, cautious people and fastidious people will unite in concluding that the only course is absolutely to exclude, from all waters at least which lead to any water-supply, all taint of house-drainage whatever, and that in this case even existing privileges should give way without delay.

This year's report contains the results of a careful examination of the basins of the Hoosac and Housatonic rivers, illustrated with maps, and showing the condition of the towns in those valleys, and the kind and position of the manufactories which discharge their refuse into the streams. A circular was sent to manufacturers throughout the State, asking for information as to the actual pollution of streams, what kind of manufactories were most mischievous, and what the best remedies. The answers, when they were obtained, were conflicting, as might be supposed. Woollen mills, on the whole, seemed to be most unpopular, dye-houses and bleacheries perhaps next; but the reader of the report is led to surmise that the most offensive neighbor is apt to be the nearest. The remedies oftenest suggested are settling-tanks and irrigation. Some manufacturers agree that there is nothing to do with the refuse but to let it run, while other correspondents protest energetically that the only thing is "to keep the stuff out of the streams." Some of the conclusions which the Board draws from its examination will surprise many people, though no doubt they are fully sustained. One is that the hill towns are found to be distinctly less healthy than the valley towns, both pulmonary diseases and typhoid fevers being decidedly more prevalent in them, and the population on the whole less strong and well. This is corroborated by the results of some examinations made for the army during the late war. The reasons given are the thinness of the soil, underlain by impervious rock full of hollows, in which water is retained, making a damp subsoil; and the impregnation of this shallow ground and the wells in it with the discharge from privies, cesspools, stable-yards, etc. In Gloucester, where these conditions obtain, though it is not a hill town, and in North Adams, in the upper part of the Hoosac Valley, the soil has become so contaminated as to poison the ground and apparently to make pollution of the drinking-water the usual condition. In both these towns the ravages of diphtheria have of late years been startling. North Adams has now so far taken warning as to supply itself with pure water; Gloucester, as we have just seen, has contumaciously rejected salvation by means of a board of health. The drainage of such towns is, to be sure, peculiarly difficult. The report rightly objects to both ordinary privies and cesspools, especially those with dry walls, and says in regard to North Adams: "A considerable increase in the pollution of the Hoosac River, if that is necessary, would be a much less evil than those now existing of unremoved filth." This is probably true, but is nevertheless a doctrine to lend itself easily to abuse. It is worth while to keep clearly before people the distinction between offences where punishment falls chiefly on those who commit them and those whose injury is laid up for others; thus, between the acts of those who defile their own houses and those who poison the waters for their neighbors and the earth for their successors. The report rightly recommends water-carriage where it is practicable, and dry removal where, as in Gloucester, sewerage is very difficult, and it is not too severe upon cesspools. Yet it seems to us that surface irrigation, as in the Mould system, and even the use of tight uncovered vaults for dry-soil, where it can be easily disinfected and often removed if people will, and which ought to save the earth from contamination, is preferable to the discharge of sewage into any ordinary watercourses.

With the general report are included a number of special papers of interest, which we have not time to notice in detail. The description of a cottage hospital in Pittsfield is interesting, as an example of a kind of institution which ought to become common. We cannot, however, commend as a model the plan which Dr. Adams displays with some complacency. The contagious ward is in the midst of the servants' bed-rooms; the water-closets for male and female patients are massed together in the middle of the house, close to the reception-room and the main staircase. They are placed in the bath-rooms, an arrangement which is faulty in a dwelling-house and preposterous in a hospital; the soil-pipes are carried into the chimneys, and the drainage into leaching cesspools. It is a little amusing, after reading the grave condemnations of cesspools and the protests against contamination of the soil, of which the main report is full, to come here upon the naïve remark that "the soil, being a coarse, bibulous gravel, is well adapted for cesspools."

There is an interesting paper on dangers from color blindness by Dr. Jeffries; a report on the sanitary condition of Cambridge by Dr. Coggswell, not so flattering to that city as one might wish; a tabular report on the health of towns in the State, with detailed notices of the prevalence of diphtheria and typhoid fever in Gloucester and Taunton; a careful essay on scarlet fever by Dr. A. H. Johnson; and a not very encouraging report on the sanitary condition of public schools in Massachusetts by Dr. D. F. Lincoln, of Boston. The paper on filtration of potable water, both for domestic use and on a large scale for town supplies, by Professor Nichols of the Massachusetts Institute of Technology, is a clear and well-studied account of an important subject, full of interesting information and valuable suggestion. It deserves to be published separately in a form for general circulation.

PAPERS ON PERSPECTIVE.

XIII. DISTORTIONS AND CORRECTIONS CONTINUED; CYLINDRICAL, CURVILINEAR, OR PANORAMIC PERSPECTIVE.

271. The previous paper has discussed the so-called distortions to which circular, cylindrical, and spherical objects are subjected when drawn according to the methods of plane perspective, and has explained the so-called corrections which are applied to such objects.

Similar distortions, it was shown, attend the putting of the human figure into perspective, and similar corrections apply. Indeed, it was pointed out (261) that every object not exactly at the centre of the picture must necessarily be more or less out of drawing, though the distortion is not generally such as to attract notice save in the cases mentioned.

272. Plate XIV. demonstrates the existence of these distortions, exhibits some instances in which they are intolerable, even in the case of rectilinear objects, and shows yet another way of correcting them. By *distortion*, as has been said, we mean that the outline given in the drawing is different from the outline presented to the eye by the object drawn. Now the rays of light that pass from the outline of an object to the eye form a cone, whose base is this outline itself. The perspective representation of this outline is the line in which this cone of rays is cut by the plane of the picture. If this plane cuts the cone of rays in a direction at right angles to its axis — that is to say, if the object is at the centre of the picture — then the section is of the same shape as the base; the perspective is of the same shape as the object. But if the plane of the picture cuts the cone of rays obliquely — as must be the case with all objects not just at the centre — then the section is not of the same shape as the base, and the perspective does not look like the object; it is, so to speak, distorted. Of course, when seen from the station-point, obliquely, the perspective is foreshortened and looks just as the object does. But in itself, and when looked at merely as a line, it presents a different form.

273. This is illustrated in Fig. 70, in which is seen a rectangular block, drawn in parallel perspective, but considerably to the right of the centre. Its proportions are such as no rectangular block could ever possibly present to the eye. It exhibits three faces, one of which is a square. But if a rectangular block is held so that one of its faces shows four right angles, it must be held so that neither of the other faces can be seen at all. If on the other hand it stands so that two adjacent faces are seen, as this block evidently does, then all the angles must appear either acute or obtuse. The figure within the circle shows how the block really looks when one looks straight at it, and this is the way it is drawn when at the centre of the picture. The difference between these two representations exemplifies the distortion to which all shapes are subjected when the line from the object to the eye is not at right angles to the picture.

But this distortion in the drawing is corrected, by foreshortening, when one looks at the drawing from the station-point S, which in this case is a few inches in front of C, in Fig. 66. In fact, Fig. 70, *a*, was sketched from this point, and is a view not of the cube itself, but of the Fig. 70, *b*, thus foreshortened into a real likeness of the object it represents.

274. Fig. 66 exhibits other and even more striking phenomena. Take first the church on the left hand. It is horribly out of drawing, although the picture does not extend, on this side, very far from the centre. But the objects drawn are so placed as to make but a small angle with the plane of the picture, as may be seen in the plan below, and when this is the case, this sort of distortion often presents itself. It is often seen in old fashioned prints and in photographs of very long buildings, taken nearly in elevation. It arises, as is obvious, from both vanishing points, V^R and V^L, being on the same side.

275. The distortions at the other end of the picture, however, though less offensive and consequently much more common, are almost as great, giving the buildings quite different proportions from what they would present to a spectator at S. For the proportions of an object, that is to say, the relative size of its parts, depend upon the relative angular dimension of the parts, that is, upon the relative size of the angles they subtend at the eye. Their apparent distance apart, right and left, or up and down, is angular distance. A painter, then, who would represent things in their true proportions, as they look, and in their apparent relations one to another, would have to proportion the linear dimensions upon his canvas as to the angular dimensions of his object. And this, in fact, is just what every painter, every draughtsman of whatever kind, always does when he undertakes to sketch from nature. It is the method of every artist who undertakes, outdoors or in, to draw things as he sees them; he can have no other; he must give to the representation of objects the apparent shape and the relative size that the objects themselves present to his eye. In other words, he proportions the linear dimension upon his canvas to the angular dimension of the object. Now this is exactly what perspective does not do. In sketching, one may begin in the middle, fix the position of his central object, and distribute other things about it to the right and left, according to their apparent distance from it. Their distance is proportioned to their angular distance, and their size to the difference of the angular distance of their edges. But in a perspective drawing, as is clearly shown in the plan, the distance of an object from the centre of the picture is proportional to the *tangent* of its angular distance, and its size is accordingly proportioned, not to its angular dimension, but to the difference of the tangents of the angular distance of its edges from the centre, The scale to which they are drawn accordingly increases from the centre outward, just as in Mercator's Projection, which gives indeed a sort of perspec ive view of the terrestrial sphere, as seen from a station point at its centre.

276. It is plain that the scheme of making every linear dimension in a drawing correspond with the angular dimension subtended by the object could be thoroughly carried out only by drawing on the inside of a hollow spherical surface, a condition difficult to fulfil. A cylindrical surface, however, answers nearly as well, especially when, as is usually the case, the vertical dimensions are relatively small; a cylinder, moreover, has the advantage of being a *developable* surface; it can be rolled out flat. This is the surface employed in circular panoramas, and it is virtually that employed in sketching from nature. For as one turns from one object to another he virtually keeps the corresponding part of his canvas in front of him, just as if it were a cylindrical surface.

277. The plate illustrates the result of this procedure, and affords an opportunity of comparing it with the results of plane perspective. In the plan of the street we have the position of the spectator indicated at S, that of a transparent plane, representing a picture plane, at *p p*, and that of a transparent cylinder at *a c b*. The centre of the perspective picture is at *c*, the point nearest the spectator, and the plane and cylinder are tangent at that point. Visual rays drawn from the principal points in the street to the station point pierce both surfaces, and pictures drawn upon them would, when seen from the point S, obviously coincide with each other and exactly cover the objects represented.

278. Fig. 66 exhibits the result, as shown on the plane *p p*, and Fig. 67 that shown on the cylinder *a c b*. The first strikingly illustrates what has been said of the inevitable distortion of objects in plane, perspective, and of their gradual exaggeration of scale as they recede from the centre. Fig. 67 shows the effect of making the linear dimensions in the drawing correspond to the angular dimensions of the objects drawn, that is to say, of drawing everything just as it appears. Of these effects the most noticeable are these: that in the first place the distortion of the church on the left entirely disappears, and in the second place the distortion on the right disappears also, the houses and the landscape beyond being reduced to dimensions proportioned to the dimensions given to the nearer objects, while the size of the picture is greatly diminished. All this is a great gain. But on the other hand the horizontal parallel lines which in Fig. 66 are all straight and converge to a single vanishing point are in Fig. 67 all more or less curved, converging towards the two vanishing points of the system to which these lines belong, 180° distant from one another. This curvature would of course disappear if the paper were bent into a cylindrical form and the eye placed at the axis opposite the horizon, and in the large circular panoramas which are sometimes exhibited, and which have given to this method the name of Panoramic Perspective, this of course is done. But in general the developed cylinder has to remain flat, and it must be confessed that this curvature of lines which in nature are straight is itself a distortion which most persons find extremely objectionable.

279. It is worth while to remark, however, that this phenomenon of the apparent curvature of straight lines is of constant occurrence in nature; and it is just one of those phenomena of nature with which perspective has to do, being concerned with the appearances of parallel lines. All systems of lines which are long enough to indicate both their vanishing points, converging to one point on the right and to another on the left, have an apparent curvature. Such are the long parallel lines of cloud which often cover the sky, or the sunbeams and shadows which sometimes at sunset pass completely over from west to east. In both these cases each particular cloud or sunbeam, as one looks at it, seems quite straight; but all the others on either side seem concave towards it. In fact, as they all meet, or tend to meet, at two different points, and to separate between them, they *must* seem curved; *straight* lines can meet at only one point.

It is the same with the horizon itself, which seems straight when one looks at it, but seems curved when one looks up or down. So with other long lines, such as eaves, sidewalks, and house-tops. As one turns his eye rapidly from one end of a street to the other, the apparent curvature reveals itself unmistakably.

280. To one who is accustomed to observe this curious phenomenon, the curvature of the lines in cylindrical, or, as we may now call it, *Curvilinear* Perspective is but a trifling evil, hardly to be counted against its manifold advantages. Of these the chief is perhaps, as has been said, the perfect conformity of its results with those obtained in sketching from nature. Of this an excellent illustration is afforded by Fig. 68, a rude outline sketch from a water-color by Turner, representing the Ducal Palace at Venice, and the adjacent buildings. He sketched each building just as it looked, and did not mind the resulting curvature of the horizontal lines of his drawing.

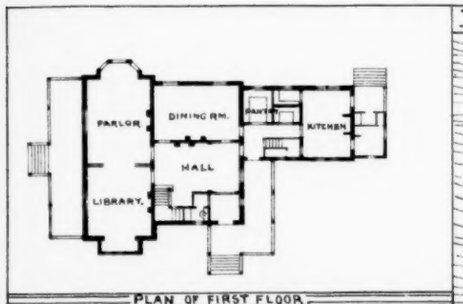
This drawing exhibits, however, what is perhaps the most objectionable distortion of all, an apparent convexity in the objects represented. The quay, which in fact is straight, looks convex.

281. But perhaps, after all, the chief merit of Curvilinear or Panoramic Perspective is this: that it permits the limits of the picture to be extended indefinitely without the rapidly increasing distortions to which plane perspective is liable. Fig. 69, which is borrowed, though much reduced, from a rare and little-known work, by Mr. W. G. Herdman, published in Liverpool in 1853, exhibits this excellence in a striking degree. It represents the meeting of two streets in some foreign town, and succeeds in showing both sides of both streets, without distorting any part of either. The horizontal angle embraced must be more than a hundred degrees. The dotted curved lines which in the original were carried across the picture in order to show the theory on which the drawing is constructed, are here omitted. Where the sky-line is as broken as here, and the continuous horizontal lines are so few, the disadvantages of this method, as is evident from the figure, are reduced to a minimum.

American Architect and Building News Sept. 21 1878.

No. 143.

DESIGN FOR A COUNTRY HOUSE — R. G. KENNEDY — ARCHT.



PLAN OF FIRST FLOOR

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

PLATE XIV. CURVILINEAR PERSPECTIVE.

FIG. 66

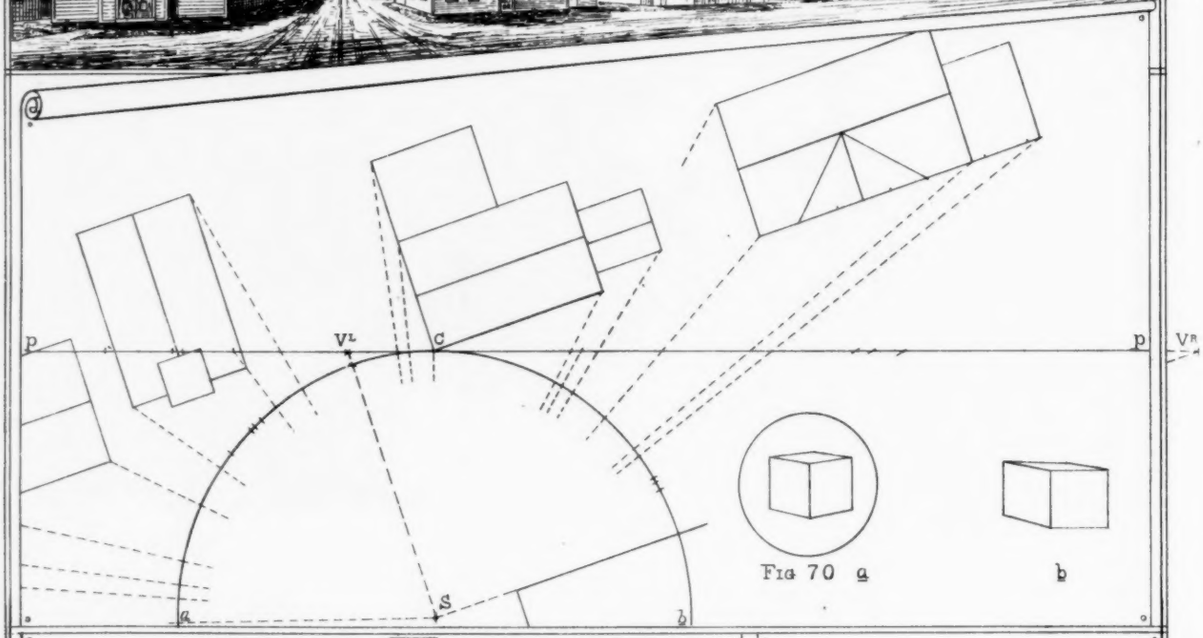


FIG 70 a

b

FIG. 67

FIG. 68

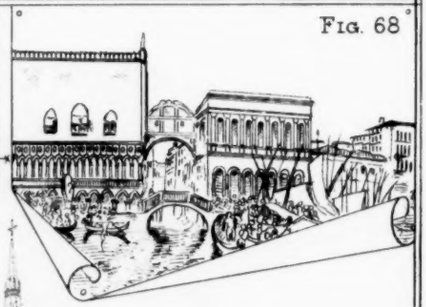
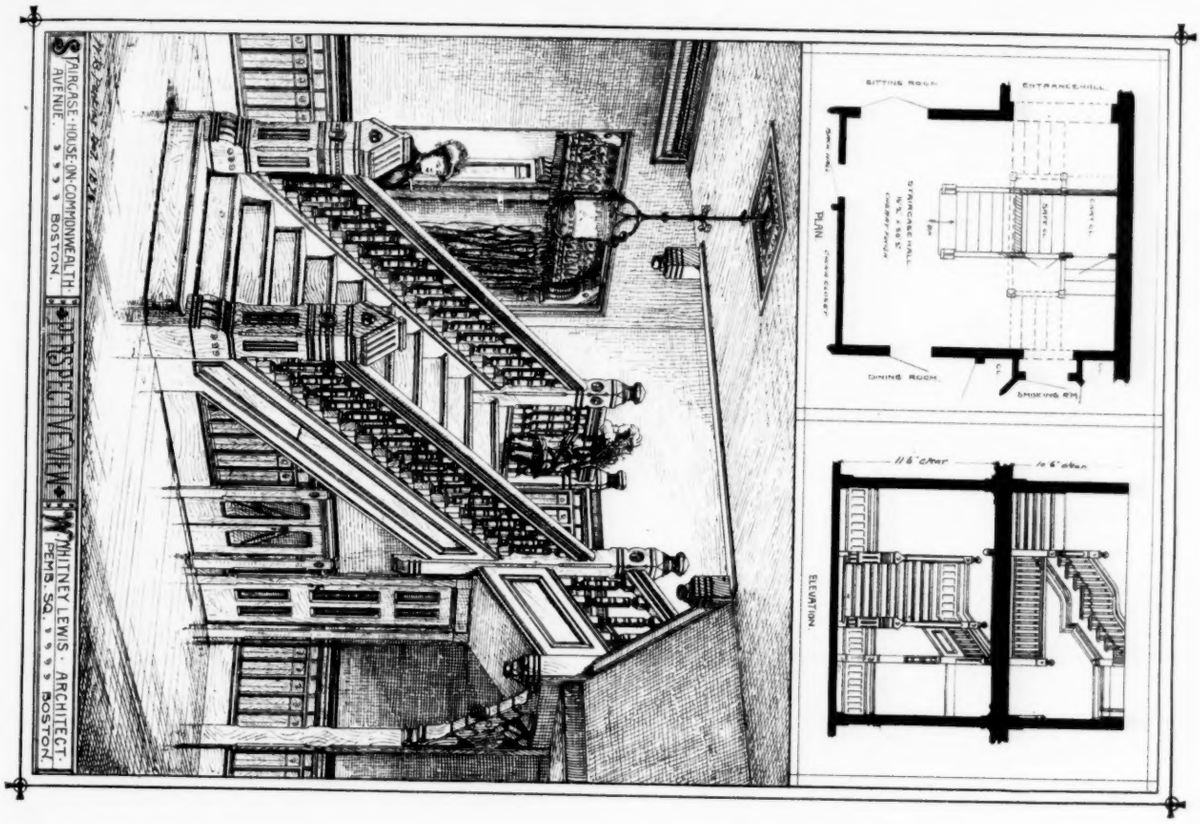


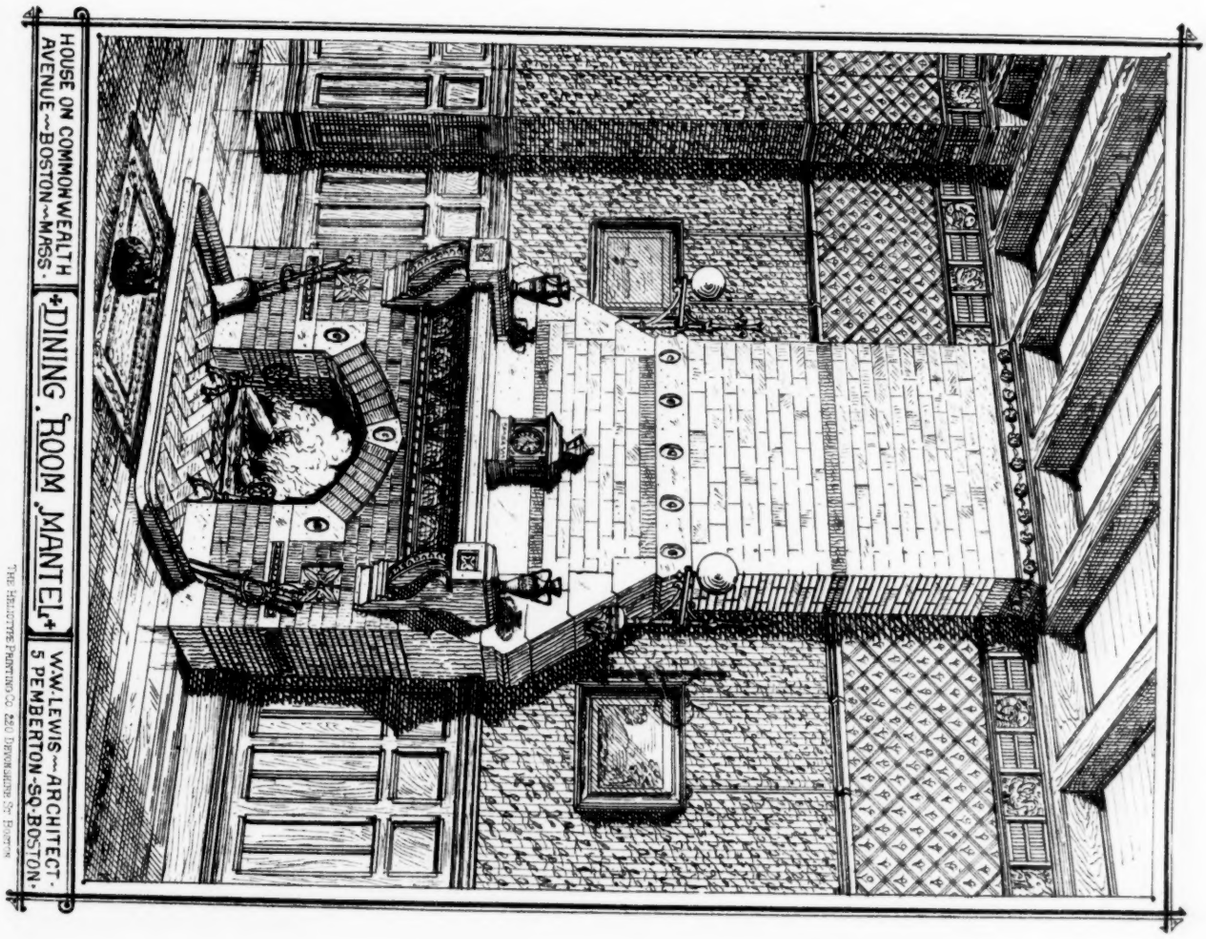
FIG. 69 (COPIED FROM HERDMAN'S CURVILINEAR PERSPECTIVE.)

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON

THE HELIOTYPE PRINTING Co 220 DEVONSHIRE ST BOSTON

THE HELIOTYPE PRINTING CO. 220 DEVONSHIRE ST. BOSTON.





THE HELIOTYPE PRINTING CO. 330 DEVONSHIRE ST. BOSTON.

282. Whether in any given case plane or cylindrical perspective is to be preferred is a matter of judgment, and one's decision must depend chiefly upon the nature of his subject. For architecture, except in picturesque sketches, the latter is in general obviously unfit. But for the landscape painter it affords the same means of escape from the inevitable distortions of plane perspective that the painter of figures finds in the corrections described in the previous paper.

The next paper will show how drawings in Curvilinear or Panoramic Perspective may be geometrically constructed.

THE ILLUSTRATIONS.

ALTERATIONS IN HOUSE FOR SANDS SEELY, ESQ., STAMFORD, CONN. MR. W. RICHARD BRIGGS, ARCHITECT.

THIS alteration was completed a year ago, at a cost of about $3,000. The old roof was not altered, nor were the windows or doors moved, the additions being put on with as little change as possible.

DESIGN FOR A COUNTRY HOUSE. MR. R. G. KENNEDY, ARCHITECT, PHILADELPHIA.

STAIRCASE, HALL, AND FIREPLACE IN A HOUSE ON COMMONWEALTH AVENUE, BOSTON, MASS. MR. W. W. LEWIS, ARCHITECT, BOSTON.

COTTAGE AT W. LEBANON, N. H. DESIGNED BY MR. C. A. RICH.

This cottage, to be built this fall for Mr. C. B. Drake, is situated on one of the terraces of the Connecticut River, overlooking it, with a western view up the White River. It is to be finished inside with pine throughout, and painted on the outside in party colors, with red roof. Estimated cost, $1,500.

STUDY IN PERSPECTIVE. PLATE XIV.

See "Paper on Perspective," in this number.

VERNACULAR ARCHITECTURE. V.

"HOUSE-PLANS FOR EVERYBODY," by S. B. Reed, Architect,[1] a collection of designs for cheap houses, mostly rural, published in the *American Agriculturist* during the last three years, is the latest exposition of the Vernacular Architecture presented to us in form for notice. If additional proof were needed that our popular fashions of building have been crystallized into a recognized and characteristic style, based upon contemporary manners and customs and upon our natural resources of material, this volume comes with a stamp of legitimacy upon it which cannot be denied. It distinctly sets forth the way in which we, in the Northern States especially, plan and build the simpler sorts of country houses, farm houses, and what, for the want of a more convenient term, we must call "suburban villas." There is nothing in it from beginning to end indicating that the author has ever indulged himself either in the reproduction of foreign forms or in the dangerous play of original invention. We have here what the profession is prompt to stigmatize as "carpenter's architecture," but what the profession must needs respect (to present an almost self-evident analogy) as a dialect which, although it may be vulgar, contains the vigorous roots of pure language. We still insist that the business of the architect is to accept these conditions, and devote himself to the proper and harmonious development of the elementary style thus furnished to him, so far, at least, as relates to his less monumental and more domestic works. Contempt for the present vulgarity of it, and especially for the crudeness of its more ambitious manifestations, is a natural feeling for the scholar familiar with higher types of architectural forms and accustomed to work in what may be called the ideal regions of design, but out of such contempt no direct contribution to the progress of American domestic architecture can possibly be developed.

The designs in this book are the commonplace results of adapting machine-made double-hung sashes, machine-made doors and blinds, machine-made mouldings and details, to elevations which, for the most part, pretty readily grow out of plans adapted by experience and observation to the needs of frugal country people, who do their own household work, sometimes perhaps with the assistance of a single servant, and whose habits of living are adjusted to a very small scale of expenditure. The text and the wood-cuts clearly explain all the devices of economical construction, with which, by the bye, architects of education would do well to make themselves more familiar. Of course the quality of the designs is best where there is the least attempt at adventitious or superficial ornamentation, but, although none of the designs are free from the usual illiterate detail, the book has fewer offences of wild jig-sawed brackets, gingerbread eaves-boards, gorgeous but cheap dormers, bastard mansards, top-lofty finials, and the other peculiarities of our more ambitious vernacular, than most of the works on the subject. The costs range from $250 to $8,000, and those architects who desire to know by what mysterious processes carpenters are able to produce houses far within what seem to be the lowest limits of expense, will find in this book much to enlighten them.

[1] *House-Plans for Everybody, for Village and Country Residences, costing from $250 to $8,000, including full Descriptions and Estimates in Detail*, etc. 175 Illustrations. By S. B. Reed, Architect. New York: Orange Judd Company.

In each case the estimates are given in detail, and seem to be honest enough. It may be interesting, in view of the question of economy, to present one of these detailed estimates in full. It relates to a farmhouse 45′ 6″ x 30ft., in two stories and a roof.

The following estimate has been carefully compiled, and may be relied on for quantities, etc. Prices vary in different localities, but the figures here given form a good basis of calculation: —

65 yards excavation, at 20c. per yard	$13.00
882 ft. foundation, at 15c. per ft.	132.30
725 ft. foundation, at 10c. per ft.	72.50
6,000 bricks in chimneys, at $12 per M.	72.00
40 ft. stone steps and coping, at 30c. per ft.	12.00
900 yards lath and plastering, at 28c. per yard	252.00
4,799 ft. of timber, at $15 per M.	72.00
Sills, 4x8 in. 218 ft. long. / 45 beams, 3x8 in. 16 ft. long.	
1 girt, 4x8 in. 20 ft. long. / 22 beams, 3x8 in. 22 ft. long.	
7 posts 4x7 in. 22 ft. long. / 15 beams 3x7 in. 9 ft. long.	
2 posts 4x7 in. 18 ft. long. / 4 valleys, 3x8 in. 20 ft. long.	
Ties and plates, 4x6 in. 384 ft. long.	
500 wall-strips, 2x4 in. 13 ft. long, at 11c. each	55.00
340 novelty siding boards, 9½ in., at 28c. each	95.20
150 lbs. tarred felting, at 5c. per lb.	7.50
300 matched flooring boards, 9½ in. wide, at 28c. each	84.00
20 rough spruce plank, at 25c. each	5.00
270 shingling-lath, at 6c. each	16.20
48 bunches shingles, at $1.50 each	72.00
75 hemlock boards, 10-inch, at 18c. each	13.50
7 squares of tin roofing, at $9 per square	63.00
Materials in cornices and outside casings	60.00
33 narrow pine flooring for front piazza, at 25c. each	8.25
67 narrow pine ceiling, at 25c. each	16.75
1 bay-window, complete	75.00
26 plain windows, complete, at $12 each	312.00
4 cellar windows, complete, at $6 each	24.00
30 doors, complete, at $10 each	300.00
Stairs, complete, $70; 8 closets, fitted complete, $40	110.00
2 marble and 2 pine mantles	50.00
Nails, $20; range, with elevated oven, $80	100.00
Plumbing, $84; cartage, average 1 mile, $27.08	111.08
Carpenter's labor, not included above	250.00
Painting	120.00
Incidentals	25.72
Total cost, complete	$2,600.00

The questionable element in such estimates must always be the item of labor, which is obtained by "guesswork" and not by calculation, and varies in different localities enough to affect the total cost materially. But the other items, though in some cases ranging far below what is required by the higher class of work with which architects are more familiar, seem to be fairly considered.

The wood-cuts, worn by hard service in the *Agriculturist*, are coarse and badly drawn; the details are in all cases slurred over by the engraver, who is utterly destitute of sympathy for architectural forms; and the original conception of the architectural forms, except when confined to the simplest and most familiar developments, is, as we have already intimated, crude and illiterate. But common sense and practical experience lie at the root of them, and these make the value of the book not only to the prudent farmer, tradesman, or mechanic, who requires sound advice in the building of his modest homestead, but to the architect, who seeks to know the devices and appliances of cheap construction, and the true basis of style in our rural or suburban domestic architecture.

CORRESPONDENCE.

BUILDING NOTES. — FIRES.

ST. LOUIS.

DURING the half year ending July 1, 1878, 933 building permits were issued. The aggregate valuation of the improvements was $1,376,793. An equal activity for the second half year would yield something over 1,800 permits, less than for several years past, the number in 1877 being 2,115; in 1876, 1,825; in 1875, 1,972.

Of the 933 permits, 228 were for frame buildings. This is about twenty-five per cent of the whole number. Their aggregate valuation, however, was but $42,718, less than four per cent of the whole valuation. This comparison shows the insignificancy of frame building in St. Louis, where the cheapness and excellence of the bricks, and the comparative dearness of wood, combined with wise fire regulations and a popular prejudice for once in the right, have almost totally excluded frame houses within and without the city limits. The frame permits are usually for sheds, stables, frame kitchens, and like accessories to other premises. Four only of the 228 reached $1,000 in value, and their average was but $200 apiece; while there were forty under $25 each, three for $10 each, and one for $5.

Just across the river, however, in East St. Louis, where there is no brick clay, and the only foundation is river alluvium of unknown depth and doubtful consistency, frame houses are more popular, and quite outnumber their more substantial-looking brick rivals.

Most of the 705 brick buildings erected this year are, of course, dwellings, generally small, of but six or eight rooms, and built either singly or in blocks of three or four. The long blocks of dwellings so common in other large cities are rare here, and large houses are generally in poor demand among renters, save in the narrow and select

district most affected by the wealthy few who have not yet built for themselves, though usually hoping to do so at some time. The small houses are most wanted and pay the best return on their cost.

Early in the spring three fine-three-story houses of twelve or thirteen rooms each were finished and offered for rent. They cost with ground $8,000 each. They have handsome fronts of stone ashlar, slate roofs, furnace heat throughout, a concreted and plastered cellar, hot and cold water from cistern and hydrants on two floors; front, side, and rear yards paved, sodded, and inclosed by a wall of dressed stone, and every appointment without and within of a first-class dwelling for a family of moderate means. They stand on a well-shaded avenue, in an excellent neighborhood, once as fashionable as any, and near our finest park; are convenient to street cars, and but twenty minutes' ride from the court-house. These most attractive houses were offered for several months at $780 a year, without success. The rent was then lowered to $660, and one was taken. About a month later a second was occupied. The third is still vacant.

In the fashionable "West End," inferior houses are sought eagerly at higher rents; but elsewhere no excellence of accommodation or cheapness of rent will persuade people to take large houses. They do not need the rooms, and they do not want to furnish them nor to hire extra servants to keep them in order. They will pay as high or higher rents for a smaller house.

In notable contrast with the above may be mentioned a row of eight small brick tenements, for two families each, in suites of three rooms on a floor, which were built about the same time. Each family is completely isolated from all the others, and there is liberal provision of separate closets, coal-boxes, water-closets, balconies, etc., for each. The ground was cheap and the entire cost of ground and houses hardly exceeded $800 to a family. These houses were all taken as soon as finished at $12 a month each, and have continued fully occupied ever since. After deducting all expenses they are yielding a net return of about fifteen per cent on the investment. Moreover, as the rent is low for the accommodation given, the above income may be expected to be tolerably permanent. These two illustrations show the necessity of adapting improvements to the neighborhood in which they are to be placed if satisfactory results are to follow.

A moderate amount of building usually continues through the winter, the cold weather seldom occasioning any prolonged interruption of such work. Last winter was so mild that hardly a day was lost.

This city ought to be a favorite with fire-insurance companies. In the six months from January to June, inclusive, the entire loss by fire was but $159,613.76, and the loss to insurance companies was only $132,939.94. There are many single companies that could carry the whole loss without assistance or great inconvenience.

CESSPOOL VENTILATION.

Boston, September, 1878.

To the Editor of the American Architect:

Your correspondent "V," in last week's paper (August 31), brings to notice some questions in sanitary science which deserve a careful answer, being of general importance, and covering points on which a general misapprehension seems to prevail. I submit the following reply: The trouble complained of arose from ventilating the cesspool through the house drains and through the special pipe outside the house, attached to the house and "carried up above the roof." Experience has shown in hundreds of cases within my notice that human workmanship is too imperfect in its nature to justify us in inviting into or even near to our dwellings the foul products of decomposing sewage, through *pipes* of any kind whatsoever. The cardinal principle in the removal of offal by water carriage, is to get it carried off *at once* from our houses, as far as possible, without giving any time for putrefaction, and having done so, to exclude by all means in our power the return of the gaseous products of its decomposition to the neighborhood of our houses, either through the drains or any other pipes. Cesspools are at best but poor substitutes for sewers, because they keep the filth too near our houses during its decomposition. They should, therefore, be guarded with more jealousy than sewers, and should be located as far as possible from the houses. When houses are too much crowded to admit of the cesspool being removed at least one hundred feet from them, and where no sewers are provided, the system of "water carriage" is of very doubtful propriety, and might often be abandoned with gain, and substituted by some system of daily removal by hand, such as is practiced in Rochdale and many other English towns with success. At any rate the cesspool vent should never come near the house, and its gases should be cut off from the house by a trap in the main drain outside the house, with a vent-hole close to the trap on the upper side of same, that is, next the house in the same way as if connecting with a sewer. With such a vent hole, opening in a well or man-hole with perforated cover, close to a house, either in front lawn or back yard no offense is likely to occur, for the heat of the house, whether by fire in winter or by sunshine on the roof in summer, is sure to keep a constant draft of air outward by the soil pipe which passes up through the roof, drawing the air *inward* at this vent-hole near the trap. The only chance of an outward draft occurring near the trap is from slight puffs of air pushed forward by columns of water descending the soil pipes. These are only instantaneous in their nature, to be sucked back again by the constant draft in the next instant. The walls of the man-hole should be laid in stone without mortar up to within two feet of the surface, like a well lining, so that any such puffs of air from the drain would come in contact with the earth, whose absorbent and purifying powers are well known to be efficient within such limited quantity as may here be required. Such a system has been applied with perfect success in a large number of cases by myself. With such a protection the air in the house-drain can never become very foul, for though a certain amount of decomposing slime always adheres to the inside of such pipes, the constant current of air established by this arrangement would effectually prevent any such concentration of poison as must always exist in the air chamber of a cesspool and its vent pipes.

In England, and other climates of less rigor than that of Boston, it is easier and more sure to make the disconnection between the house and sewer or cesspool by allowing the drain to be quite open for a foot in length, just inside the main trap, and to introduce the waste water from bath-tubs, sinks, rain-spouts, etc., by an open delivery over this point. Such a system is made compulsory in many European towns where the local authorities have taken the pains to study the best methods, and it is to be hoped a similar one may be made so here and adapted to local circumstances.

Edward S. Philbrick.

To the Editor of the American Architect:

Dear Sir, — Your correspondent "V.," who complains of a smell from the pipe which ventilates his cesspool, would do better to carry the pipe higher, so as to give the utmost possible freedom of diffusion in the surrounding air. In still nights the gas, diffusing itself in all directions, reaches the roof before it is much diluted, and the mixed air creeps along the surface of the roof and walls to the ground. The remedy is to have the mouth of the pipe farther from the roof, so that the escaping gas may be more diluted before it reaches the surfaces over which it creeps, and also that the chances may be greater of its being swept away by a current of air.

It is hard to explain why the smell should be strongest at the base of the pipe. Perhaps the air is more stagnant there, so that the gas from above makes a more sensible impression, or possibly a mixture of different gases may, by some interpenetration of their atoms, be occasionally heavier than either separately.

Common illuminating gas, escaping into a room, will travel a long distance, and descend considerably below its source, clinging close to the walls, so that the smell will be quite strong two or three inches from the wall, while it cannot be detected at a greater distance. The whole subject of the diffusion and conduction of gases needs scientific investigation. Whatever may be the reason, it is a common experience to find the smell from open soil pipes descending or ascending into chamber windows in warm, damp weather.

It is doubtful whether the charcoal would be of service; some sanitarians think it useless even when applied much more thoroughly than your correspondent purposes. The covering of oil over the contents of the cesspool might do good, — I think it is sometimes used for similar purposes, — or a little sulphate of iron, in powder or in solution, thrown into the cesspool occasionally, will do much toward keeping down the smells.

Does your correspondent notice whether any stench descends from the open soil pipe? If not, that is an indication that a similar situation for the ventilating pipe would be satisfactory.

Your correspondent does not say whether there is any overflow or other possible source of air to the cesspool except the two pipes. If not, one of the pipes, naturally the longest and warmest, should act as the outlet, and the other as the inlet, and the inlet flue, which in this case is probably the ventilation pipe, might with advantage have its area contracted to that of the soil pipe, which is likely to act mostly as outlet. If, on the other hand, there is some access for air to the cesspool besides the two pipes, both of them act as withdrawing shafts, which is of little advantage, as one answers all purposes of preventing the accumulation of gas under pressure, and a dozen would not make the cesspool sweet, and the two shafts convey an unnecessary amount of the cesspool air to the roof of the house. In this case the ventilating pipe might as well be closed entirely. If the joints of the soil pipe leak, the additional pipe will not help them much; but they are not likely to leak if the work was properly done.

T. M. C.

THE DWELLINGS OF THE POOR.[1]

The question before us to-day is so complicated that it will be impossible to consider it now in all its different aspects. Sewerage, ventilation, lighting, heating, the avoidance of dampness, the necessary number of rooms, the cubic space that should be allowed for every individual, and the disposition of the kitchens, are all points which must be decided, but which cannot be treated simultaneously and satisfactorily in the course of ten short minutes. Such a summary would allow only a minute for each problem, though these problems have been discussed for years, and are not yet solved! Permit me, then, to confine my remarks to only one of these questions, to that which is most familiar to me, and which was the starting point of an important enterprise that I have been fortunate enough to render successful.

[1] A Paper read by Mr. Thomas Griffiths, at the International Congress of Hygiene in Paris.

If there be one thing that is a special grievance to us in England, that one thing is the dampness of our climate; and it may be conceived with what energy we have sought to overcome this common enemy. Diseases of the chest, rheumatism, etc., are disproportionately frequent in our little island, surrounded as it is with currents of warm air, coming from the Gulf of Mexico and from the tropics, condensing on our cold coasts, and falling on our dwellings in the shape of fine rain or dense fog. This incessant moisture makes its way at last through the most solidly constructed walls, whilst persons who inhabit the cheap little houses run up by greedy speculators, are constantly exposed to the fatal effects of our climate. From day to day we see rising from the earth, like clusters of fungi, groups of little houses, built up with extraordinary rapidity on waste lands, in the marshy districts that surround great towns. These dwellings are inhabited, before even they are properly dried, by our poor trading classes, laborers, and needy families. The same might be said, possibly, not only of all the great English centres, but of all the centres of Europe; and in all countries more or less suffering is caused by damp.

What have we done to avert these dangers? In the houses of the poor, very little; in the palaces of the rich, very much. The results are, however, more equalized; for neither the poor nor the rich have, as yet, succeeded in protecting themselves effectively against damp. However, I hope to show you that there is one thoroughly efficacious means which can be employed, as easily for the poor as for the rich. I allude to the superficial petrification of the interior or exterior coatings of the wall. This petrifaction is consolidated, rather than weakened, by the contact of water and damp; it protects not only the health of man, but the durability of the dwelling. It has often been remarked that the mortar or cement of old castles, etc., had become as hard and solid as stone. The remarkable fact is due to the action of time; in mixing the silex of sand with lime, a silicate of lime is produced quite naturally. But this has taken many years — even centuries. Happily, we have now a liquid which will give to our walls, in a few days, that which it has hitherto required centuries to accomplish.

This preparation, the petrifying liquid, is a solution of a silicate, the use of which may be intrusted to the most inexperienced workmen. It sinks into the walls, like water, with the greatest rapidity, but after a few hours the water with which the silicate is mixed evaporates, and a petrification takes place, so that the wall is soon covered with a thick coating impenetrable as stone. The walls may then be washed with water. Should there have been contagious diseases or other infections, the walls may be exposed to the most destructive fumigations, or washed with strong antiseptics, without in any way affecting the surface.

The liquid is generally mixed with coloring matters that are not poisonous, or it is used in its simple state for the first coating, to which is added the silicate paint manufactured by the same company. The principal constituent of the paint is obtained from a natural source, and is very pure, and appears to be produced by a volcanic action which must have desolated the country in prehistoric ages. With this silex the Silicate Paint Company of London and of Liverpool manufacture the petrifying liquid of which I have already spoken, and the silicate paints, and also an enamel paint. All these manufactures have an important hygienic significance. The first protects us from the damp that penetrates our walls, the second forms a paint that resists all climates and contains no poisonous matter, and the third furnishes a very cheap enamel that resembles porcelain, and has the same advantages as regards cleanliness. Here we have, then, an easy means of improving the health conditions of the poorer classes.

Dr. Du Mesnil, in his report to the Congress, gives us in a few powerful phrases a summary of the causes that ruin the health of the poor; and unfortunately we must all agree as to the truthfulness of his picture. The sun's rays, he says, do not always reach the narrow streets, which are thus deprived of the natural purification and disinfection provided by Nature in the light of the sun. The staircases are dingy and dirty, and much used; and if germs of disease were to fall there, germs which live on impurity, they would find there a breeding place, and grow and develop.

Is it not, therefore, desirable to wash and cleanse these staircases once for all, and to cover them with a coating of paint or enamel which would not offer the same facilities for the accumulation of dust and dirt, and which, on the other hand, would be much more easy to wash and to keep in a state of proper cleanliness? Dr. Du Mesnil adds that the tile roofs often let in damp and moisture, but the petrifying liquid to which I have alluded is a certain remedy for this. Finally, the learned reporter complains of walls that are covered with torn paper.

This final detail is undoubtedly most important, and I should like to make a few observations upon it. Wall-paper is often dangerous, and especially in the houses of the poor, where it facilitates the disguising of a false plaster wall from which it does not exclude the humidity, while it attracts dust and vermin, and the damp encourages the detachment of particles of coloring matter, containing, very often, arsenic or copper. Green wall-papers are not alone in their arsenical effects; the finest brown tints often contain arsenic. There is also the danger of accumulations of wall-papers to be guarded against. How often has it been remarked, that not one or two layers, but twelve, thirteen, fourteen, twenty, and, in one special case, twenty-five layers of paper have been found placed one over another! In the last-mentioned case the family inhabiting the house had often noticed a disagreeable odor; and finally, as a natural consequence, typhoid fever set in. It was then only, and after vain examination of all the causes that might have produced the odor already mentioned, that the twenty-five layers of paper on the wall were discovered. The paste in a state of putrefaction caused emanations that had poisoned the blood of the family. In order to avoid all these accidents and inconveniences, we must have our walls painted, and painted with a composition that is at once economical and harmless.

The paints manufactured by the Silicate Paint Company have been frequently analyzed by scientific men; among others, Professor Flageolet, of Paris, who declared that the sample he examined contained 79 per cent of pure silex, 13 per cent of water, 3 per cent of oxide of iron, 4 per cent of alumina, and 1 per cent of magnesia. The material is, it will be seen, thoroughly unique, and the silica, which is almost pure, can, when calcined, and reduced to powder, be employed in many ways. The great railway companies and steam packet companies, the great manufacturing firms, and the Governments of England, Germany, Austria, Italy, Spain, Russia, and Egypt, use this silex paint for the better preservation of their ships, arsenals, etc. In the hospitals, the workhouses, the refuges, and primary schools of England, a large quantity of this preparation is employed, for the purpose of keeping the walls free from damp, by using it as a hygienic substitute for wall-paper; and, finally, as a means of insuring cleanliness, and lessening the risks of contagion.

Had I the time, I might allude to several other questions raised by the report which we have read with so much interest; but I will content myself with that which I have already said, for I know that in your hands all that concerns the well-being of humanity will receive the attention it merits. If I have confined my remarks to one detail, it is because I am convinced that the detail is important. Finally, let me thank you for your patience, and beg of you, if I have spoken to you at too great length on one subject, to excuse the enthusiasm of a specialist.

ST. ALBAN'S NAVE.

MR. NEALE'S accurate measurements settle the controversy as to the relative lengths of St. Alban's and Winchester Cathedral in favor of the latter. The extreme external length of St. Alban's "from the plinth of the buttress of the east wall of the Lady Chapel to the face of the buttress of the west porch" is 550 feet $1\frac{1}{4}$ inches; while that of Winchester, measured between corresponding points, is 557 feet 9 inches, exceeding its Hertfordshire rival by 7 feet $7\frac{3}{4}$ inches. This superiority, however, is entirely due to the eastern limb, the nave of St. Alban's exceeding that of Winchester in length by nearly nine feet — 284 feet $5\frac{1}{2}$ inches, as against 275 feet 7 inches — while the effect of its length is much greater. "The repetition of the strong unbroken lines of precisely similar length at different levels in the nave and aisles at St. Alban's drives home to the imagination in a way quite unique the impression of length. The nave of St. Alban's is not only the longest in the kingdom, but the longest in the world." It was, however, surpassed by that of Old St. Paul's, which, according to Mr. E. B. Ferrey's drawings, must have been more than three hundred feet long, the entire length of the Cathedral being about five hundred and ninety-six feet, while it must not be forgotten that St. Petronius, at Bologna, is only the nave of the intended building, and would have incontestably been the longest Gothic church ever built. We of course exclude St. Peter's from the consideration. In the case of Old St. Paul's the effect of length must have been far greater, the main elevation of the building being maintained from end to end, as at York, Lincoln, and Worcester, without any computation of long low chapels to the east, as at Winchester and St. Alban's, or of a galilee to the west, as at Ely and Durham. The gigantic conceptions of Abbot Paul, to whom we owe the vast and stern fabric which, in Mr. Freeman's words, "for size at least, if not for beauty, has remained the wonder of all succeeding ages," are well brought out by Mr. Neale by a comparison with the slightly earlier churches of his relative — some said his father — Lanfranc, at Caen and at Canterbury. The tables given, to which we must refer our readers, will show how vastly the scale adopted by Paul exceeded not only those minsters, — the dimensions of which, however, are to some extent conjectured, — but all contemporary buildings of which we have any knowledge, St. Paul's being the only exception. — *The Saturday Review.*

NOTES AND CLIPPINGS.

FOUNDATIONS FOR BRIDGES. — The system of making foundations for bridges in marshy soils, adopted by French engineers in the case of the Charentes Railway, a line which cro-ses a peat valley to the junction of two small rivers, seems to have solved the problem of what is required in such cases. The thickness of peat at this point was so great that any attempt to reach the solid ground would have been extremely expensive. In order, therefore, to obtain a good support for the bridge, two large masses of ballast, accurately rammed, were made on each bank of the river, and a third on the peninsula between the two. The slopes of these heaps were pitched with dry stones, for preventing the sand from being washed away by the rains or by the floods in the rivers. Over the ballast a timber platform was laid, this platform carrying the girders of the bridge, which has two spans about sixty feet each. When some sinking down takes place the girders are easily kept to the proper level by packing the ballast under the timber platform, — this platform packing being made by the plate-layers with their ordinary materials. In another case, that of a railway in Algiers, a differ-

ent plan of engineering was resorted to. The road crosses a peaty plain nearly a mile broad, the floods and the elasticity of the ground preventing the formation of any embankment. The road was to be carried over a viaduct across the valley, but the foundations of this viaduct presented serious difficulties, the thickness of peat or of compressible ground being nearly eighty feet. It was quite possible to reach the solid ground with cast-iron tubes sunk with compressed air, or any other system; but neither the implements, the workmen, nor the material for such an undertaking were accessible in that region. Under these circumstances the engineers began boring holes ten inches in diameter down to the solid ground; these holes, lined with thin plate iron pipes, were afterwards filled with concrete up to the very level of the ground. Each of these concrete columns bears a cast-iron column, these columns being braced together in a suitable manner, thus supporting the girders of the viaduct. — *Railway Review.*

Hints on Varnishing. — Cassell's *Household Guide* gives the following direction as to varnishing: "Before beginning to varnish it is necessary that the surface to which it is to be applied should be perfectly free from all grease and smoke stains, for it will be found that if this is not attended to the varnish will not dry hard. If the varnish is to be applied to old articles, it is necessary to wash them very carefully with soap and water before applying it. When it is wished that the varnish should dry quickly and hard it is necessary to be careful that the varnish should always be kept as long a time as possible before being used; and also that too high a temperature has not been used in manufacturing the varnish employed. It is likewise customary, when it can be done, to expose the article to the atmosphere of a heated room. This is called "stoving" it, and is found to greatly improve the appearance of the work, as well as to cause the varnish to dry quickly. After the surface is varnished, to remove all the marks left by the brush it is usually carefully polished with finely-powdered pumice-stone and water. Afterwards, to give the surface the greatest polish it is capable of receiving, it is rubbed over with a clean, soft rag, on the surface of which a mixture of very finely-powdered tripoli and oil has been applied. The surface is afterwards cleaned with a soft rag and powdered starch, and the last polish is given with the palm of the hand. This method is, however, only employed when those varnishes are used which, when dry, become sufficiently hard to admit of it. When it is wished to varnish drawings, engravings, or other paper articles, it is usual to previously paint them over with a clear solution of gelatine. This is usually prepared from parchment cuttings."

Natural Gas Supply. — It is said that the town of Fredonia, in Chautauqua County, N. Y., has been supplied during the past fifty-two years with natural gas, which finds its source between two large coal measures.

The Decoration of St. Paul's. — It is said that the dean and chapter of St. Paul's have entertained the idea of abandoning the use of mosaics for the new decorations and substituting in their stead hand-painted tiles.

Ventilating Fans. — Messrs. Verity Brothers, of London we believe, have invented and patented a very clever and simple apparatus for inducing currents of air in a building. A tank of any desired size is placed at the top of the building, and from it the water is led to the apparatus by a $\frac{3}{8}$-inch pipe. The apparatus consists of a fly-wheel, with sets of fans on either side of it, and attached to the same axis with it. This axis is journaled on jewelled centres, so that the system revolves on the application of the slightest force. Upon the fly-wheel two or more fine jets of water from the tank are directed through two pin-holes, and thus cause the fans to revolve rapidly. It is said that a current of air can thus be created having a velocity of one thousand feet or more per minute. It is evident that, as the head of water and the number of jets can be regulated at will, almost any degree of velocity can be obtained. The waste water is made to pass in a thin sheet over the inlet for fresh air, and so wash from the air the impurities contained in it. As the same method can be applied to supply and to exhaust fans, the ventilation of a building is thus made a very simple thing.

Ship-Canal. — The bill authorizing the Barataria Ship-Canal Company to construct a canal from New Orleans to the Gulf of Mexico, and granting the right of way for that purpose, has become a law.

Absorption of Carbonic Oxide by Living Organisms. — N. Gréhaut has experimented with mixtures of air and minute portions of carbonic oxide. He finds that a man or an animal, when compelled for a half hour to breathe an atmosphere containing only $\frac{1}{1779}$ of carbonic oxide, absorbs that gas in sufficient quantities to saturate about half of the red globules of the blood, so that they become incapable of absorbing oxygen. In an atmosphere containing $\frac{1}{1449}$ of carbonic oxide, about a quarter of the red globules are similarly saturated. These results are interesting and important in relation to physiology and hygiene. — *Comptes Rendus.*

Dybutz. — If there were nothing else to mark the skill, genius, and artistic workmanship of the Japanese, the great bronze statue of Dia Bootsz would be sufficient to make their name imperishable. Dia Bootsz would be worthy of a place among the wonders of the world, equally so with the Colossus of Rhodes, Cleopatra's Needles, or the Sphinx of Egypt. This sacred image was not only built of bronze, but the joints were so exact in their fit that they were barely perceptible to the closest observer. Its base rested on a dais of masonry about 5 feet in height. The elevation of the body was 5 jios or 50 feet; between the edge of the hair of the head and the legs crossed, 42 feet; from knee to knee, seated cross-legged, 36 feet, and the circumference of the body was 98 feet. The following were the minor dimensions: Face, $8\frac{1}{2}$ feet long; circular spot on forehead, $1\frac{1}{2}$ feet in circumference; eyes, 4 feet long; eyebrows, 4 feet $2\frac{1}{2}$ inches; ear, 6 feet 7 inches; nose, 3 feet 9 inches vertical and 2 feet 4 inches horizontal measurement; mouth, 4 feet $3\frac{1}{2}$ inches wide; shaved portion of head on top called *kik kokee*, 2 feet 4 inches in diameter. The spirally curled locks of hair on the head were $9\frac{1}{2}$ inches wide and 830 in number; each thumb measured 3 feet in circumference. These figures will convey some idea of the dimensions, if not the magnificence, of this almost superhuman exhibition of Japanese art. The interior of the statue formed a beautiful temple in which were gilt images of Buddhist saints, with crosiers and glories and other appropriate objects of worship or reverence. In front and at the foot of the statue was an altar on which were incense pots and urns to receive the votive offerings of visitors attracted thither by sentiments of religious fervor or curiosity. — *Philadelphia Press.*

The Real Inventor of the Telephone. — An article in a recent number of the Pekin *Gazette*, written by Chin Hoo, says Kung Foo Whing, a distinguished philosopher who flourished about the year 976, invented the telephone, which is known in China as "Thumthsein," in the year 968.

Archæology in Palestine. — The remains of a large and magnificent church, built of unusually great stones, has been observed at Amwas near 'Abu Shusheh, in Palestine. It dates probably anterior to crusading times, and possibly from the fifth century.

How to smuggle Pictures out of Italy. — Referring to the mischance of an English collector in having a picture by an old master, acquired in Italy, taken from his agent by the Italian customs officials at the frontier, and placed in one of the government picture-galleries, a correspondent of the *Pall Mall Gazette* says that venders sometimes suggest a way to evade this unpleasant difficulty, a difficulty which is countenanced by a law which prohibits any work of art being taken out of the country without the express permission of the government, — a permission rarely granted; while the government arrogates to itself the right of buying the work of art in question, but only at two thirds the purchase price. The way of evading seizure is to have a modern painting painted over the work of the old master, with the knowledge that modern work can be cleaned away by careful hands, and leave the masterpiece unhurt. "The suggestion," he says, "is ingenious, but my advice is, do not avail yourself of it. Some five and twenty years ago a traveller picked up a veritable gem from a well-known gallery, whose owner parted from it with tears and only for a very considerable consideration; and that it might be safely smuggled out of the country, a modern landscape was painted over it. 'When you get it to England, any picture-cleaner with a light finger will remove the veil of the modern painter, and reveal the beauties which it concealed.' The plan succeeded admirably up to a certain point. The picture-cleaner had not a 'light finger.' He removed the modern landscape, but in doing so unfortunately rubbed out at the same time the old master; and the purchaser, when the picture was cleaned, found that all he had really got to adorn his gallery was the portrait of a general officer of the time of George I. in full uniform."

Disinfectants and Deodorants. — Mr. Thos. Taylor, Microscopist of the Department of Agriculture, gives the following in the Washington *Evening Star:* "During the year 1876 I made a series of experiments with essential oils, including the oil of eucalyptus globulus and the spirits of turpentine, which were published in the report of the Department of Agriculture for that year. I found that the oil of eucalyptus disinfected fresh meat as effectually as carbolic acid, besides being a powerful deodorizer, and on combining it with soap found it agreeable, forming a valuable substitute for the carbolic, especially for the sick room. Turpentine I found to be also a most powerful deodorizer. A tablespoonful of the latter, added to a pailful of water, will destroy the odor of cesspools instantly, and in the sick chamber will prove a powerful auxiliary in the destruction of germs and bad odors, being both a disinfectant and deodorizer. I have quite recently added to the list of disinfectants one of general application, and it has for many purposes the advantage of cheapness with remarkable effectiveness. I allude to gasoline, one of the products of petroleum. Gasoline when applied to the germs of fungi or of other cryptogamic plants instantly destroys them, although it fails to deodorize gases. Being a solvent of oils and fats it destroys animal germs, and fatty degeneration gives way to it. It may be employed full strength to wash delicate and tender plants and sores without producing pain. It is wholly devoid of the caustic principle; even when applied to the tongue it produces no disagreeable sensation. A single drop applied to any insect will kill it, and even its vapors have a most destructive effect on the lower forms of animal life. When gasoline is applied to a wound or to any delicate part of the body, on evaporation it produces a sensation of cold, followed soon after by a sensation of heat. Of course all experiments should be made in the absence of artificial light, as it is a very explosive gas."

Accidents from Machinery in France. — The French government has upon several occasions since the alteration of the laws regulating the use of steam engines published statistics of the accidents which have been caused by them each year. The returns, very carefully prepared, like all the statistical work done by the French Government, but not brought down to date, deal with the four years between 1873 and 1876 inclusive; and from them it appears that there were 121 accidents (30 in 1873, 32 in 1874, 24 in 1875, and 35 in 1876), which resulted in the death of 145 persons, 193 others being more or less severely injured. Most of the severe accidents were due to the use of boilers which had no inner grate. Only three accidents were caused by the explosion of the boilers of railway engines, and in neither of these cases was there any loss of life.

It is worthy of note that there are fewer accidents in the very large factories than in the second and third rate establishments, though when they do happen they have more disastrous results than any of the others, because of the large number of people employed. At least one-fifth of the accidents have been due to the want of water in the boiler; but in many cases it has been impossible to speak positively as to the cause.

Of the 145 fatal cases, 14 are set down to defects of construction, 3 to the bad quality of the metal, 27 to excessive wear, 23 to corrosion of the sides of the boiler, 3 to over-pressure, 23 to the want of water, 14 to the carelessness of the stoker, and 6 to insufficient cleaning. The number of these accidents might, by increased care and watchfulness, be reduced; but the returns vary little from one year to another, and as upwards of 40,000 steam machines are at work, the bill of mortality is not so heavy as it is in some other countries. — *Hardware Reporter.*